
Your Dreams Our Goal

POORNIMA UNIVERSITY

Member of Association of Indian Universities & Approved by UGC (Govt. of India) under 2(f) & 12(B)

# FACULTY OF SCIENCE & HUMANITIES

## PROGRAM: B.Sc. ECC

## SCHEME & SYLLABUS BOOKLET

**BATCH 2025-2029**

## SCHEME & SYLLABUS (2025-2029)

# FACULTY OF SCIENCE & HUMANITIES

## PROGRAM: B.Sc. ECC

## INDEX



**Disclaimer:** The scheme, syllabus and other materials published in this booklet may be changed or modified as per the requirement after approval of competent authority. The decision taken by the management of Poornima University will be final and abiding to all.

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POORNIMA UNIVERSITY

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# Vision

Our vision is to create knowledge based society with scientific temper, team spirit and dignity of labour to face global competitive challenges.

# Mission

Our mission is to evolve and develop skill based systems for effective delivery of knowledge so as to equip young professionals with dedication and commitment to excellence in all spheres of life.

# Quality Policy

To provide quality education through faculty development, updating of facilities and continual improvement for meeting norms laid down by the government, keeping the stakeholders satisfied. Poornima University has forged industrial alliances with Top MNC's worldwide which assures high educational standards, up to- date and forward-thinking curricula, and professional relevance. At Poornima University you will have a distinct advantage through exposure to the corporate standard environment through industry sponsored infrastructure and expert faculty. The University involves global industry leaders in many ways.

# Knowledge Wheel

At Poornima, the academic atmosphere is a rare blend of modern technical as well as soft skills and traditional systems of learning processes.

# About Program and Program Outcomes (PO)

**Title of the Program: Bachelor of Science (B.Sc.)**

**Nature of the Program: B. Sc. is three-year full-time programme**

## Program Outcomes (POs):

Graduates will be able to:

**PO1: Disciplinary knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of B.Sc. program.

**PO2: Scientific reasoning and Problem solving:** Ability to analyze, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences Capacity to extrapolate from what one has learned and apply their competencies to solve real life-situations

**PO3: Analytical reasoning and Research related skills:** Define problems, formulate hypotheses, test, analyze, interpret and draw conclusions from data and report the results of an experiment or investigation

**PO4: Critical thinking:** identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.

**PO5: Digital literacy:** Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.

**PO6: Reflective thinking:** Possess knowledge of Critical sensibility to lived experiences, with self- awareness and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.

**PO7: Environment and sustainability: A**ppreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.

**PO8: Moral and ethical awareness:** Ability to embrace ethical values in conducting one's life, formulates a position about an ethical issue from multiple perspectives, and use ethical practices in all work.

**PO9: Leadership qualities:** Capability for mapping out the tasks of a team or an organization, and setting direction to work effectively and respectfully with diverse teams; and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team.

**PO10: Communication Skills:** Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; present complex information in a clear and concise manner.

**PO11: Project management and finance**: Ability to work independently, identify appropriate resources required for a project, and manage a project.

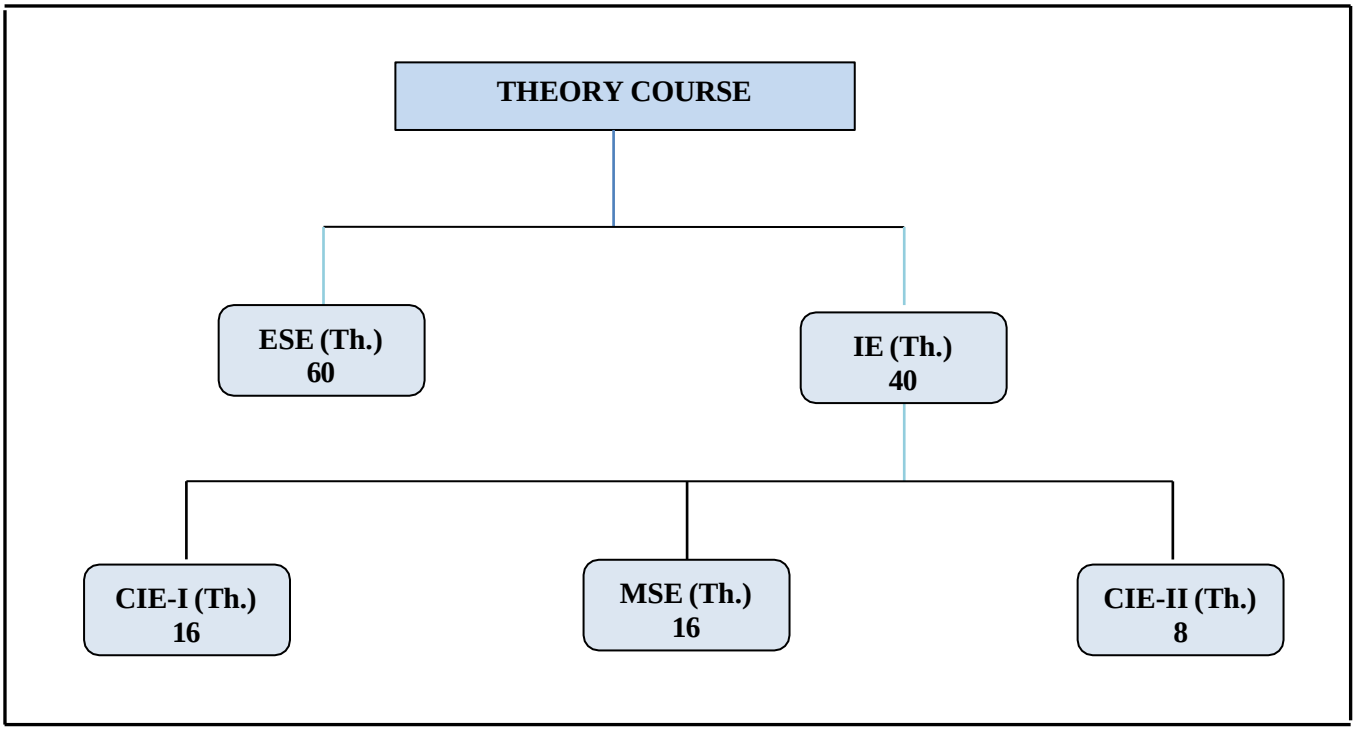
**PO12: Lifelong learning:** Ability to acquire knowledge and skills in learning activities throughout life aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place.

## Program Specific Outcomes (PSOs):

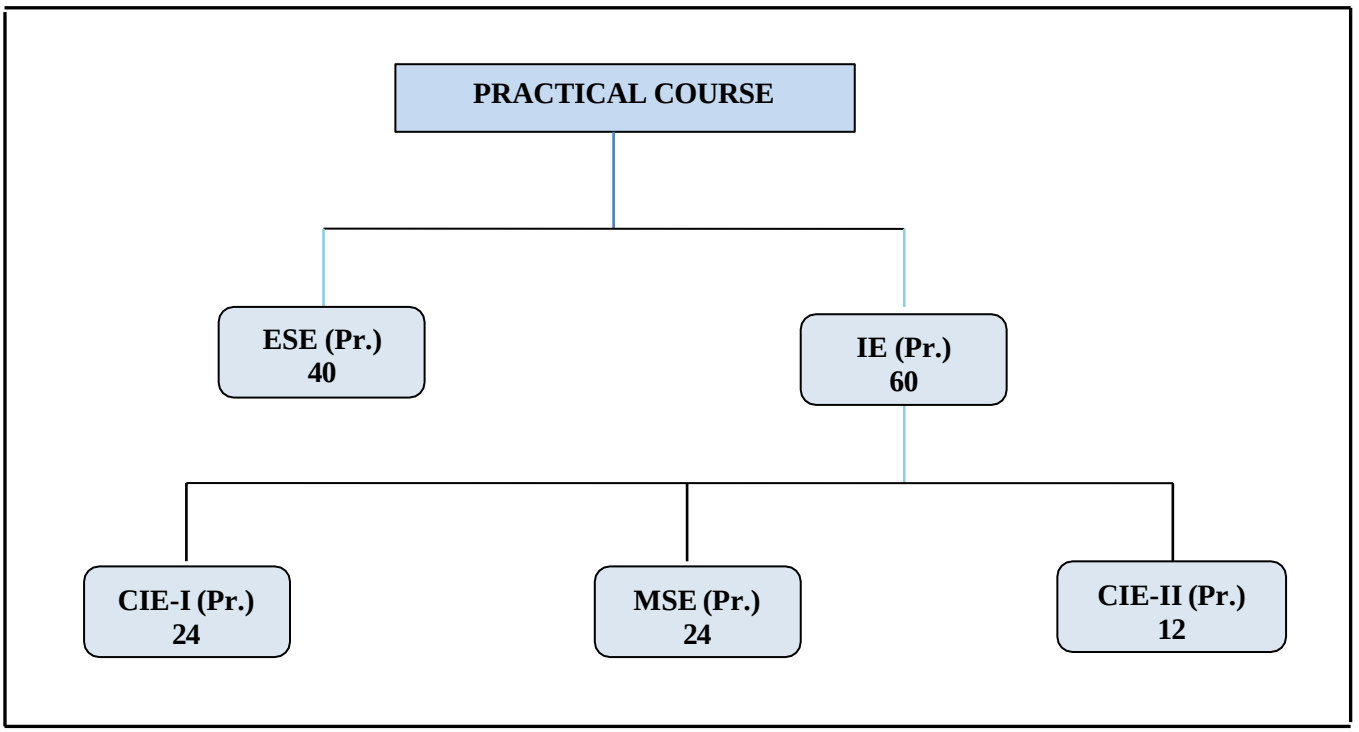
1. **PSO1:** Advancement in Science: The ability to comprehend and implement the knowledge of various aspects of Science i.e. Physics, Chemistry and Mathematics.
2. **PSO2.**Technical skills: The proficiency to understand, apply and analyze the concepts of various technical fields like Fundamentals of computer, programming in C, MATLAB and renewable energy.
3. **PSO3.**Career Skills: The skills to apply analyze and evaluate industry best practices by developing innovative projects and acquaintance of attitude required to work professionally, for higher studies and research, and to be an entrepreneur.

## Examination System

## Marks Distribution of Theory Course:




**A. Marks Distribution of Practical Course :**




**Th**.: Theory, Pr**.**: Practical, **ESE:** End Semester Examination, **MSE:** Mid Semester Examination, **CIE:** Continuous Internal Evaluation.

## CO Wise Marks Distribution:

| Exam Entity | Theory Subject | | Practical/ Studio Subject | |
|---|---|---|---|---|
| | Maximum Marks | CO to be Covered | CO to be Covered | Maximum Marks |
| **CIE-I** | 16 ( 8 + 8) | 1 & 2 | 1 & 2 | 24 (12 + 12) |
| **MSE** | 16 ( 8 + 8) | 3 & 4 | 3 & 4 | 24 (12 + 12) |
| **CIE-II (Activity/ Assignment )** | 8 (8) | 5 | 5 | 12 (12) |
| **ESE** | 60 | - | - | 40 |
| **TOTAL** | 100 | - | - | 100 |

## Minimum Passing Percentage in All Exams:

| S. No. | Program Name | Minimum Passing Percentage in | | |
|---|---|---|---|---|
| | | IE Component | ESE Component | Total Component |
| 1 | Course Work for PhD Registration | - | - | 50% |
| 2 | B. Arch., FIRE Dept. ( BBA, B. Com., MBA) | - | 45% | 50% |
| 3 | MBA, MCA, M.Des., M.Tech., M.Plan, MHA, MPH | - | 40% | 40% |
| 4 | B. Tech., B. Des., BVA, BCA, B.Sc., BBA, B.Com., B.A. & any other program | - | 35% | 35% |

## SGPA Calculation

$$SGPA = \frac{C_1G_1 + C_2G_2 + \ldots\ldots\ldots + C_nG_n}{C_1 + C_2 + \ldots\ldots + C_n}$$

$$SGPA = \frac{\sum_i C_i \times G_i}{\sum_i C_i}$$

where (as per teaching scheme & syllabus):

$C_i$ is the number of credits of subject i,

$G_i$ is the Grade Point for the subject I and i = 1 to n,

n = number of subjects in a course in the semester

## CGPA Calculation

$$CGPA = \frac{C_1G_1 + C_2G_2 + \ldots\ldots\ldots + C_nG_n}{C_1 + C_2 + \ldots\ldots + C_n}$$

$$CGPA = \frac{\sum_i C_i \times G_i}{\sum_i C_i}$$

where (as per teaching scheme & syllabus):

$C_i$ is the number of credits of subject i,

$G_i$ is the Grade Point for the subject I and i = 1 to n,

n = number of subjects in a course of all the semesters up to which CGPA is computed

## Grading Table:

**Table-A**
Applicable for B.Arch., FIRE Courses
(BBA, B.Com, MBA), & PhD. Course Work

| Academic Performance | Grade | Grade Point | Marks Range (in %) |
|---|---|---|---|
| Outstanding | O | 10 | 90≤ x ≤100 |
| Excellent | A+ | 9 | 80≤ x <90 |
| Very Good | A | 8 | 70≤ x <80 |
| Good | B+ | 7 | 60≤ x <70 |
| Above Average | B | 6 | 50≤ x <60 |
| Fail | F | 0 | x <50 |
| Absent | Ab | 0 | Absent |

**Table-B**
Applicable for All Courses except Table-A

| Academic Performance | Grade | Grade Point | Marks Range (in %) |
|---|---|---|---|
| Outstanding | O | 10 | 90≤ x ≤100 |
| Excellent | A+ | 9 | 80≤ x <90 |
| Very Good | A | 8 | 70≤ x <80 |
| Good | B+ | 7 | 60≤ x <70 |
| Above Average | B | 6 | 50≤ x <60 |
| Average | C | 5 | 40≤ x <50 |
| Pass* | P | 4 | 35≤ x <40 |
| Fail | F | 0 | x <35 |
| Absent | Ab | 0 | Absent |

*** Not applicable for master programs**

## CGPA to percentage conversion rule:

**Equivalent % of Marks in the Program = *CGPA* *10**

## Award of Class

| CGPA | Percentage | Equivalent Division |
|---|---|---|
| 7.50 ≤ CGPA | 75% or more | First Division with Distinction |
| 6.00 ≤ CGPA < 7.50 | 60% ≤ x <75% | First Division |
| 5.00 ≤ CGPA < 6.00 | 50% ≤ x <60% | Second Division |
| 4.00 ≤ CGPA < 5.00 | 40% ≤ x < 50% | Pass Class |

# Guidelines for Massive Open Online Courses (MOOCs)

## (Session 2024-25)

Poornima University, in its never ending endeavor to equip students with best-of-class learning and knowledge, has undertaken to include MOOC courses as part of its credit scheme from session 2023-24 onwards. The objective behind this is to enable students to study courses designed by the best teachers in the country and to scale their knowledge base with the rest of learners from the nation. The MOOCs which are included under this scheme is can be chosen from SWAYAM- NPTEL.

## 1. Introduction of MOOCs: SWAYAM-NPTEL

### About SWAYAM-NPTEL

NPTEL (National Programme on Technology Enhanced Learning), is a joint venture of the IITs and IISc, funded by the Ministry of Education (MoE) Government of India, and was launched in 2003. Initially started as a project to take quality education to all corners of the country, NPTEL now offers close to 600+ courses for certification every semester in about 22 disciplines.

### Some highlights:

- Largest online repository in the world of courses in engineering, basic sciences and selected humanities and management subjects
- YouTube channel for NPTEL – most subscribed educational channel, 1.3 billion views and 40+ lakhs subscribers
- More than 56000 hours of video content, transcribed and subtitled
- Most accessed library of peer-reviewed educational content in the world
- Translation of more than 12000 hrs of English transcripts in regional Indian languages

### NPTEL Online Certification:

The objective of enabling students obtain certificates for courses is to make students employable in the industry or pursue a suitable higher education programme. Through an online portal, 4, 8, or 12- week online courses, typically on topics relevant to students in all years of higher education along with basic core courses in sciences and humanities with exposure to relevant tools and technologies, are being offered. Enrolment to and learning from these courses is free. Following these online courses, an in-person, proctored certification exam is conducted and a certificate is provided through the participating institutions and industry, as applicable.

Some statistics regarding the open online courses since March 2014 till Dec 2021

Completed courses: 3496;

Enrollments across courses: 1.58 CRORE +

Number of exam registrations: 15.1 LAKH +

All the statistics pertaining to completed courses are available at https://beta.nptel.ac.in/courses.

All courses are completely free to enroll and learn from. The certification exam is optional and comes at a fee of Rs 1000/course exam.

# 2. MOOCs at Poornima University:

MOOCs envelops best in class teaching - learning processes along with meeting the requirements of various courses in terms of quality of teaching and evaluation system. To promote the MOOCs among students of Poornima University, it is decided to consider the credits earned through MOOCs.

## (a) MOOCs as Credit Courses

**(For this document, only those MOOCs will be considered which are available only on NPTEL platforms)**

- Credit and Non-credit SWAYAM-NPTEL MOOCs can be opted by anyone, anytime, anywhere and in any language. However, prior-permission of the University Authorities is mandatory if the credits are to be transferred to regular degree.
- As Open Elective (for batches entered till 2022) / Multidisciplinary Courses (for batches admitted from 2023-24 onwards): Open Elective (for batches entered till 2022) courses were available at University level in offline mode till 2022-23 for which relevant booklets were published. From session 2023-24, Multidisciplinary Courses are introduces in lieu of open elective courses as per NEP 2020. These courses carries 02 credits. These category/type of courses (similar/different) are available as MOOC courses on SWAYAM-NPTEL platform which are being introduced from session 2023-24 onwards for all the students. The respective Deans / HODs shall provide all the information to all the students pertaining to MOOCs as per details given below:

1. Deans / HODs shall prepare a list of up to 10 appropriate MOOC courses (From NPTEL Only) of Minimum 02/03 credits each, well in advance (at-least 15 days prior to commencement of semester) and take approval from the Office of Dean, Academics / Pro-President, PU.
2. After approval, the respective Deans / HODs shall circulate a notice to all their respective students so that they can select any one course from the list, the credits (only 02) of which will be counted against Open Elective/ Multidisciplinary courses pertaining to that particular semester.
3. The tutor of the class shall monitor the progress (assignments, feedback, any problem etc.) on weekly basis and report to Head/Dean and provide the academic support to students as per requirement.

## (b) Important points related to MOOCs at Poornima University

- Only one MOOC shall be allowed in a particular semester for the purpose of credit transfer in the beginning.
- No attendance will be taken for MOOC courses.
- The method of assessments of MOOC such as assignments and examination are completely associated with that particular MOOC and no internal exam (IE component) will be conducted by the department as well as by the Examination Cell.
- The respective Dean / HOD must submit the detail of course i.e., code, name and credit of MOOC opted against that particular course in particular semester attached with highlighting in the related examination scheme of syllabus of that semester signed by BOS Convener / HoD and Dean of Faculty to the office of Pro-President before commencement of the classes.
- The center of examination for MOOCs will be finalized by SWAYAM-NPTEL. All the responsibility related to registration for MOOCs, timely submission of assignments, examinations etc. will be borne by the students only.
- NPTEL will award a certificate to all the students passing the examination.
- The list of registered students in MOOC along with name of course will be submitted to the Examination Cell by the Deans / HoDs before commencement of the classes.
- An ESE Exam of each said MOOC course will also be conducted by the University as per University norms.
- The award of marks/grading will be computed as given below:

| Award of marks/grading | Remarks |
|---|---|
| 1. 20% weightage taken from MOOC Certificate +80% weightage taken from ESE Exam of Poornima University<br>**OR**<br>2. 100% of weightage taken from MOOC Certificate<br>Note: The Higher Marks/Grades of the above two will be considered | The Certificate of MOOC to be Submitted as per date notified by COE, Poornima University |

- Any student who would not be able to clear/pass the said course, will be required to appear as a back exam candidate of the University as per PU norms. Students who have not passed the MOOC exam are required to register and participate in the next semester for either the same subject or a similar subject (Ensuring at least 60% of the syllabus matches with the back subject and also approved by respective Dean) offered through NPTEL.
- The scorecard and related certificate of MOOC along with a consolidated list of students with marks of assignment and final exam will be submitted to the examination cell by the concerned Dean / HOD for further process. It is also recommended that alteration/changes/scaling in marks obtained by the students in any MOOC will not be considered.
- The exam registration fee of MOOC up to Max. INR 1000/- will be reimbursed to the student only after successful completion of the course in first attempt and submission of the fee receipt, score-card and certificate of the MOOC to the concerned department within stipulated time after declaration of the results.
- There will be no provision of re-evaluation of MOOC.

**NOTE: This is to be noted that the procedure for getting approval from BOS, Faculty Board, Academic Council and BoM is to be followed as per regular process.**

## Attached Items:

| | |
|---|---|
| Ability Enhancement Courses | Annexure-1 |
| Value Added Course Booklet | Annexure-2 |

# POORNIMA UNIVERSITY, JAIPUR

Faculty of Science & Humanities

**Name of Program: BSC (ECC)** **Duration: 3 years** **Total Credits: 142**

## Teaching Scheme for Batch 2025-28

### Semester-I

| Course Code | Name of Course | Teaching Scheme | | | Marks Distribution | | | Credits |
|---|---|---|---|---|---|---|---|---|
| | | Lecture (L) | Tutorial (T) | Practical (P) | IE | ESE | Total | |
| **A.** | **Major (Core Courses)** | | | | | | | |
| **A.1** | Theory | | | | | | | |
| 25BESCES1101 | Fundamentals of Environmental Science | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 25BESCES1102 | Organic Chemistry | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 25BESCES1103 | MS office | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 25BESCES1104 | Operating Systems | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **A.2** | Practical | | | | | | | |
| | NIL | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **B.** | **Minor Stream Courses/ Department Electives** | | | | | | | |
| **B.1** | Theory | | | | | | | |
| 25BESEES1101 | Inorganic Chemistry | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 25BESEES1102 | Computer Fundamentals & C Programming | | | | | | | |
| **B.2** | Practical | | | | | | | |
| 25BESEES1201 | Environmental Science Lab-I | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| 25BESEES1202 | Chemistry Lab-I | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| 25BESEES1203 | MS office Lab-I | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| **C** | **Multidisciplinary Courses** | | | | | | | |
| 25BESCMC1121 | Elementary & Vedic Mathematics | 2 | 0 | 0 | 40 | 60 | 100 | 2 |
| **D** | **Ability Enhancement Courses (AEC)** | | | | | | | |
| 25BEACHM1205 | Applied English Communication Skills-I | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| **E** | **Skill Enhancement Courses (SEC)** | | | | | | | |
| 25BELCSE1201 | Skill Enhancement Generic Course-I | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| **F** | **Value Added Courses (VAC)** | | | | | | | |
| 25BUVCVA1201/25 BUVCVH1201 | Performing Arts/Universal Human Values and Professional Ethics | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| **G** | **Summer Internship / Research Project / Dissertation** | | | | | | | |
| | Nil | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total** | | 17 | 0 | 12 | | | | 23 |
| **Total Teaching Hours** | | 29 | | | | | | |

# POORNIMA UNIVERSITY, JAIPUR
## Faculty of Science & Humanities

## Name of Programs: BSC (ECC) Duration: 3 years Total Credits: 142

## Teaching Scheme for Batch 2025-28

## Semester-II

| Course Code | Name of Course | Teaching Scheme | | | Marks Distribution | | | Credits |
|---|---|---|---|---|---|---|---|---|
| | | Lecture (L) | Tutorial (T) | Practical (P) | IE | ESE | Total | |
| **A.** | **Major (Core Courses)** | | | | | | | |
| **A.1** | Theory | | | | | | | |
| 25BESCES2101 | Geospatial Techniques-I | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 25BESCES2102 | Environmental Pollution and Control-I | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 25BESCES2103 | Organic Chemistry | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 25BESCES2104 | Web Development | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **A.2** | Practical | | | | | | | |
| 25BESCES2204 | Exploratory Project-I | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| **B.** | **Minor Stream Courses/ Department Electives** | | | | | | | |
| **B.1** | Theory | | | | | | | |
| | NIL | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **B.2** | Practical | | | | | | | |
| 25BESEES2201 | Environmental Science Lab-II | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| 25BESEES2202 | Chemistry Lab-II | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| 25BESEES2203 | Web Development Lab-II | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| **C** | **Multidisciplinary Courses** | | | | | | | |
| 25BESEMC2121 | MOOC Course-I | 2 | 0 | 0 | 40 | 60 | 100 | 2 |
| **D** | **Ability Enhancement Courses (AEC)** | | | | | | | |
| 25BEACHM2211 | Applied English Communication Skills-II | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| **E** | **Skill Enhancement Courses (SEC)** | | | | | | | |
| 25BELCSE2201 | Skill Enhancement Generic Course-II | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| **F** | **Value Added Courses (VAC)** | | | | | | | |
| 25BUVCVE2102 | Environment and sustainability | 2 | 0 | 0 | 40 | 60 | 100 | 2 |
| 25BUVCVH2104 | Yoga For Life | 2 | 0 | 0 | 40 | 60 | 100 | 2 |
| **G** | **Summer Internship / Research Project / Dissertation** | | | | | | | |
| | Nil | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total** | | 18 | 0 | 12 | | | | 24 |
| **Total Teaching Hours** | | 30 | | | | | | |

# POORNIMA UNIVERSITY, JAIPUR

Faculty of Science & Humanities

**Name of Program: BSC (ECC)** **Duration: 3 years** **Total Credits: 142**

## Teaching Scheme for Batch 2025-28

### Semester-III

| Course Code | Name of Course | Teaching Scheme | | | Marks Distribution | | | Credits |
|---|---|---|---|---|---|---|---|---|
| | | Lecture (L) | Tutorial (T) | Practical (P) | IE | ESE | Total | |
| **A.** | **Major (Core Courses)** | | | | | | | |
| **A.1** | Theory | | | | | | | |
| 25BESCES3101 | Environmental Pollution and Control-II | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 25BESCES3102 | Inorganic Chemistry | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 25BESCES3103 | Physical Chemistry | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 25BESCES3104 | DBMS | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **A.2** | Practical | | | | | | | |
| | NIL | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **B.** | **Minor Stream Courses/ Department Electives** | | | | | | | |
| **B.1** | Theory | | | | | | | |
| 25BESEES3101 | Environmental Impact Assessment | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 25BESEES3102 | Environment Management | | | | | | | |
| **B.2** | Practical | | | | | | | |
| 25BESEES3201 | Environmental Science Lab-III | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| 25BESEES3202 | Chemistry Lab-III | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| 25BESEES3203 | DBMS Lab-III | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| **C** | **Multidisciplinary Courses** | | | | | | | |
| 25BESEMC3121 | MOOC Course-II | 2 | 0 | 0 | 40 | 60 | 100 | 2 |
| **D** | **Ability Enhancement Courses (AEC)** | | | | | | | |
| 25BEACHM3218 | Quantitative And Verbal Aptitude Training-I | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| **E** | **Skill Enhancement Courses (SEC)** | | | | | | | |
| 25BULCSE3201 | Skill Enhancement Generic Course-III | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| **F** | **Value Added Courses (VAC)** | | | | | | | |
| 25BUVCVA3104 | Bharat Varsha: A Land of Rare Natural Endowments | 2 | 0 | 0 | 40 | 60 | 100 | 2 |
| **G** | **Summer Internship / Research Project / Dissertation** | | | | | | | |
| | Nil | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total** | | 19 | 0 | 10 | | | | 24 |
| **Total Teaching Hours** | | 29 | | | | | | |

# POORNIMA UNIVERSITY, JAIPUR

Faculty of Science & Humanities

**Name of Program: BSC (ECC)** **Duration: 3 years** **Total Credits: 142**

## Teaching Scheme for Batch 2025-28

### Semester-IV

| Course Code | Name of Course | Teaching Scheme | | | Marks Distribution | | | Credits |
|---|---|---|---|---|---|---|---|---|
| | | Lecture (L) | Tutorial (T) | Practical (P) | IE | ESE | Total | |
| **A.** | **Major (Core Courses)** | | | | | | | |
| **A.1** | Theory | | | | | | | |
| 25BESCES4101 | Geospatial Techniques-II | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 25BESCES4102 | Organic Chemistry | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 25BESCES4103 | Python Programming | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 25BESCES4104 | Data Science | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **A.2** | Practical | | | | | | | |
| | Nil | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **B.** | **Minor Stream Courses/ Department Electives** | | | | | | | |
| **B.1** | Theory | | | | | | | |
| 25BESEES4101 | Physical Chemistry | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 25BESEES4102 | Renewable and Alternate Energy | | | | | | | |
| **B.2** | Practical | | | | | | | |
| 25BESEES4201 | Environmental Science Lab-IV | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| 25BESEES4202 | Chemistry Lab-IV | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| 25BESEES4203 | Data Science with Python Lab-IV | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| **C** | **Multidisciplinary Courses** | | | | | | | |
| 25BESEMC4121 | MOOC Course-III | 2 | 0 | 0 | 40 | 60 | 100 | 2 |
| **D** | **Ability Enhancement Courses (AEC)** | | | | | | | |
| 25BEACHM4224 | Quantitative And Verbal Aptitude Training-II | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| 25BUACHM4223 | Public Speaking | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| **E** | **Skill Enhancement Courses (SEC)** | | | | | | | |
| 25BULCSE4201 | Skill Enhancement Generic Course-IV | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| **F** | **Value Added Courses (VAC)** | | | | | | | |
| | Nil | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **G** | **Summer Internship / Research Project / Dissertation** | | | | | | | |
| | Nil | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total** | | 17 | 0 | 12 | | | | 23 |
| **Total Teaching Hours** | | 29 | | | | | | |

# POORNIMA UNIVERSITY, JAIPUR

Faculty of Science & Humanities

**Name of Program : BSC (ECC)** **Duration: 3 years** **Total Credits: 142**

## Teaching Scheme for Batch 2025-28

### Semester-V

| Course Code | Name of Course | Teaching Scheme | | | Marks Distribution | | | Credits |
|---|---|---|---|---|---|---|---|---|
| | | Lecture (L) | Tutorial (T) | Practical (P) | IE | ESE | Total | |
| **A.** | **Major (Core Courses)** | | | | | | | |
| **A.1** | Theory | | | | | | | |
| 25BESCES5101 | General Meteorology | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 25BESCES5102 | Geospatial Techniques-III | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 25BESCES5103 | Organic Chemistry | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 25BESCES5104 | Fundamentals of cloud computing | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **A.2** | Practical | | | | | | | |
| | Nil | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **B.** | **Minor Stream Courses/ Department Electives** | | | | | | | |
| **B.1** | Theory | | | | | | | |
| 25BESEES5101 | Inorganic Chemistry | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 25BESEES5102 | Computer Organization and Architecture | | | | | | | |
| **B.2** | Practical | | | | | | | |
| 25BESEES5201 | Environmental science Lab-V | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| 25BESEES5202 | Chemistry Lab-V | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| 25BESEES5203 | Power-Bi Lab-V | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| **C** | **Multidisciplinary Courses** | | | | | | | |
| 25BESEMC5121 | MOOC Course-IV | 2 | 0 | 0 | 40 | 60 | 100 | 2 |
| **D** | **Ability Enhancement Courses (AEC)** | | | | | | | |
| 25BUACHM5114 | Presentation & Interview Skills | 2 | 0 | 0 | 40 | 60 | 100 | 2 |
| **E** | **Skill Enhancement Courses (SEC)** | | | | | | | |
| 25BULCSE5201 | Skill Enhancement Generic Course- V | 2 | 0 | 0 | 40 | 60 | 100 | 2 |
| **F** | **Value Added Courses (VAC)** | | | | | | | |
| | Nil | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **G** | **Summer Internship / Research Project / Dissertation** | | | | | | | |
| 25BESCES5401 | Industrial Training & Seminar | 0 | 0 | 2 | 60 | 40 | 100 | 3 |
| **Total** | | 21 | 0 | 8 | | | | 27 |
| **Total Teaching Hours** | | 29 | | | | | | |

# POORNIMA UNIVERSITY, JAIPUR

Faculty of Science & Humanities

**Name of Program : BSC (ECC)** **Duration: 3 years** **Total Credits: 142**

## Teaching Scheme for Batch 2025-28

### Semester-VI

| Course Code | Name of Course | Teaching Scheme | | | Marks Distribution | | | Credits |
|---|---|---|---|---|---|---|---|---|
| | | Lecture (L) | Tutorial (T) | Practical (P) | IE | ESE | Total | |
| **A.** | **Major (Core Courses)** | | | | | | | |
| **A.1** | Theory | | | | | | | |
| 25BESCES6101 | Disaster Management | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 25BESCES6102 | Physical Chemistry | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 25BESCES6103 | Soft Computing | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **A.2** | Practical | | | | | | | |
| 25BESCES6201 | Technical Seminar | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| **B.** | **Minor Stream Courses/ Department Electives** | | | | | | | |
| **B.1** | Theory | | | | | | | |
| | Nil | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **B.2** | Practical | | | | | | | |
| | Nil | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Nil | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **C** | **Multidisciplinary Courses** | | | | | | | |
| | Nil | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **D** | **Ability Enhancement Courses (AEC)** | | | | | | | |
| 25BUACHM6115 | Entrepreneurial &Managerial Skills | 2 | 0 | 0 | 40 | 60 | 100 | 2 |
| 25BUACHM6219 | Leadership Communication Lab | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| **E** | **Skill Enhancement Courses (SEC)** | | | | | | | |
| 25BULCSE6201 | Skill Enhancement Generic Course-VI | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| 25BULCSE6202 | Skill Enhancement Course-VII | 0 | 0 | 2 | 60 | 40 | 100 | 2 |
| **F** | **Value Added Courses (VAC)** | | | | | | | |
| | Nil | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **G** | **Summer Internship / Research Project / Dissertation** | | | | | | | |
| 25BESCES6401 | Dissertation | 0 | 0 | 10 | 60 | 40 | 100 | 5 |
| **Total** | | 11 | 0 | 18 | | | | 21 |
| **Total Teaching Hours** | | 29 | | | | | | |

# POORNIMA UNIVERSITY, JAIPUR

Faculty of Science & Humanities

**Name of Program : BSC Honors** **Duration: 4 years** **Total Credits: 174**

## Teaching Scheme for Batch 2024-28

### Semester-VII

| Course Code | Name of Course | Teaching Scheme | | | Marks Distribution | | | Credits |
|---|---|---|---|---|---|---|---|---|
| | | Lecture (L) | Tutorial (T) | Practical (P) | IE | ESE | Total | |
| **A.** | **Major (Core Courses)** | | | | | | | |
| **A.1** | Theory | | | | | | | |
| 25BESCES7101 | Research Methodology | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 25BESCES7102 | Writing & Presentation Skills | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **A.2** | Practical | | | | | | | |
| 25BESCES7201 | Data Analysis Using Statistical Package For Social Sciences (SPSS) | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| **B.** | **Minor Stream Courses/ Department Electives** | | | | | | | |
| **B.1** | Theory | | | | | | | |
| 25BESEES7101 | Environmental Biotechnology | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 25BESEES7102 | Stereo Chemistry | | | | | | | |
| 25BESEES7103 | Internet Technologies | | | | | | | |
| 25BESEES7104 | Solid and Hazardous Waste Management | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 25BESEES7105 | Bio- Chemistry | | | | | | | |
| 25BESEES7106 | E-Commerce | | | | | | | |
| **B.2** | Practical | | | | | | | |
| 25BESEES7201 | Environmental Science Lab-VII | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| 25BESEES7202 | Chemistry Lab-VII | | | | | | | |
| 25BESEES7203 | Python Programming Lab | | | | | | | |
| | Nil | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **C** | **Multidisciplinary Courses** | | | | | | | |
| | Nil | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **D** | **Ability Enhancement Courses (AEC)** | | | | | | | |
| | Nil | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | **Skill Enhancement Courses (SEC)** | | | | | | | |
| | Nil | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **F** | **Value Added Courses (VAC)** | | | | | | | |
| | Nil | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **G** | **Summer Internship / Research Project / Dissertation** | | | | | | | |
| 25BESCES7401 | Minor Project-I | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| **Total** | | 12 | 0 | 8 | | | | 16 |
| **Total Teaching Hours** | | **20** | | | | | | |

# POORNIMA UNIVERSITY, JAIPUR

Faculty of Science & Humanities

**Name of Program: BSC Honors** **Duration: 4 years** **Total Credits: 174**

## Teaching Scheme for Batch 2024-28

### Semester-VIII

| Course Code | Name of Course | Teaching Scheme | | | Marks Distribution | | | Credits |
|---|---|---|---|---|---|---|---|---|
| | | Lecture (L) | Tutorial (T) | Practical (P) | IE | ESE | Total | |
| **A.** | **Major (Core Courses)** | | | | | | | |
| **A.1** | Theory | | | | | | | |
| | Nil | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **A.2** | Practical | | | | | | | |
| | Nil | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **B.** | **Minor Stream Courses/ Department Electives** | | | | | | | |
| **B.1** | Theory | | | | | | | |
| 25BESEES8101 | Environmental Chemistry | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 25BESEES8102 | Organometallic Chemistry | | | | | | | |
| 25BESEES8103 | Computer Graphics | | | | | | | |
| 25BESEES8104 | Organismal and evolutionary biology | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| 25BESEES8105 | Analytical Chemistry | | | | | | | |
| 25BESEES8106 | Artificial Intelligence | | | | | | | |
| **B.2** | Practical | | | | | | | |
| | Nil | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **C** | **Multidisciplinary Courses** | | | | | | | |
| | Nil | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **D** | **Ability Enhancement Courses (AEC)** | | | | | | | |
| | Nil | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | **Skill Enhancement Courses (SEC)** | | | | | | | |
| | Nil | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **F** | **Value Added Courses (VAC)** | | | | | | | |
| | Nil | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **G** | **Summer Internship / Research Project / Dissertation** | | | | | | | |
| 25BESCES8401 | Research Project-II | 0 | 0 | 20 | 60 | 40 | 100 | 10 |
| **Total** | | 6 | 0 | 20 | | | | 16 |
| **Total Teaching Hours** | | **26** | | | | | | |

# Core Theory Subject

**Code: 25BESCES1101 FUNDAMENTALS OF ENVIRONMENTAL SCIENCE 3.0 Credits [LTP: 3-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | To explain the fundamental concepts of ecology and analyze the interactions between organisms and their environment, including the interrelationships among the earth's spheres and various ecological interactions. | Understand |
| CO2 | To identify different types of natural resources and explain methods of conservation, including soil profiling, watershed management, and traditional rainwater harvesting systems used in India. | Understand |
| CO3 | To explain the importance of biodiversity, identify the causes of its loss, and evaluate various conservation efforts, including national projects, the role of biotechnology, and international agreements like the Ramsar Convention. | Understand |
| CO4 | To describe the importance of wildlife, identify causes of its depletion, and explain conservation categories and efforts, with special reference to wildlife habitats and protected areas in Rajasthan. | Understand |
| CO5 | To identify the different sources and types of solid waste, understand the physical and chemical characteristics of solid waste, and evaluate various waste management and disposal methods | Understand |

## B. MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | **3** | - | - | - | – | – | **3** | - | – | – | - | **1** | - | - | - |
| **CO2** | **2** | **3** | - | **1** | – | **2** | **3** | **3** | **2** | **1** | **1** | **1** | **1** | - | **1** |
| **CO3** | **2** | - | - | **1** | – | – | **3** | - | – | – | - | **1** | - | - | - |
| **CO4** | **2** | - | - | **1** | – | – | **3** | - | – | – | - | **1** | - | - | - |
| **CO5** | **2** | **1** | - | **1** | – | **1** | **3** | **3** | – | **1** | **1** | **1** | **1** | - | - |
| **WT. AVG** | **2.2** | **2** | - | **1** | - | **1.5** | **3** | **3** | **2** | **1** | **1** | **1** | **1** | - | **1** |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the unit | Time required for the Unit (Hours) |
|---|---|---|
| **1.** | Introduction to Ecology | **9** |
| **2.** | Natural Resource and conservation | **9** |
| **3.** | Biodiversity and its conservation | **9** |
| **4.** | Wildlife and its Conservation | **9** |
| **5.** | Environmental Waste Management | **9** |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| **1.** | Introduction to Ecology |
| | • Introduction to ecology<br>• Earth's spheres and its components: Atmosphere, Hydrosphere, Lithosphere and Biosphere<br>• Interaction of all the components (Atmosphere, Hydrosphere, Lithosphere and Biosphere)<br>• Ecological Interactions (Mutualism, Commensalism, Amensalisam, Parasitism. Predation, Competition) |
| | • Conclusion of the unit |
| **2.** | Natural Resource and conservation |
| | • Introduction of natural resources<br>• Types of natural resources<br>• Soil and Soil Profile<br>• Watershed management<br>• Rain water Harvesting<br>• Rainwater harvesting (Paar system. Talab / Bandhis, Saza Kuva, Johad, Pat, Naada / Bandha, Chandela Tank, Bundela Tank, Kunds / Kundis, Kuis / Beris, Jhalaras, Nadis, Tobas)<br>• Conclusion of the Unit |
| **3.** | Biodiversity and its conservation |
| | • Introduction to biodiversity<br>• Causes for loss of biodiversity<br>• Conservation projects- Project Tiger, Lion, Elephant, Rhino, Hoolock gibbon.<br>• Role of biotechnology in biodiversity conservation<br>• Ramsar sites and Ramsar Convention<br>• Conclusion of the unit |
| **4.** | Wildlife and its Conservation |
| | • Introduction to wildlife<br>• Red Data Book and categories to evaluate-Extinct, Extinct in the wild, critically endangered, Endangered, Vulnerable, Near Threatened, least concerned, deficient and not Evaluated.<br>• Wildlife habitats-Ecozones and faunal diversity<br>• Causes of wildlife depletion<br>• Wild life in Rajasthan- Names and location of National Parks, tiger reserves and major sanctuaries.<br>• Conclusion of the unit |
| **5.** | Environmental Waste Management |
| | • Introduction to waste.<br>• Sources and types of solid wastes: Municipal, construction and demolition, biomedical, hazardous, E waste<br>• Physical and chemical characteristics of Solid Waste.<br>• Waste management process<br>• Waste treatment and Disposal methods (Landfilling, Incineration, Composting, Pyrolysis)<br>• Solid Waste Management Rules, 2016<br>• Conclusion of the unit |

## E. RECOMMENDED STUDY MATERIAL:

| S.No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Ecology and Environment. | Sharma, P. D. | 1996 | Meerut: Rastogi Publication |
| 2. | Ecology and environmental biology | Bhatia and Kohli | 2010-11 | Ramesh Book De Publication |
| 3. | Environmental studies | Erach Bharucha | Latest | UGC |
| 4. | Environmental studies | N.K. Oberoi | 2005 | Excel Books |
| 5 | Ecology and Environment | Joshi and Joshi | 2005 | Himalaya Publishing House |
| 6 | Wildlife conservation and management | Reena Mathur | 2018 | Rastogi Publication |
| 7 | An advanced textbook on biodiversity principles and practice | KV Krishnamurthi | 2018 | CBS Publisher and Distributors |
| 8 | Environmental Science | S. C . Santra | 2011 | New Central Book Agency |
| 9 | Essential environmental studies | Mishra and Pandey | 2016 | **Ane books pvt ltd** |

**Code: 25BESCES1102 ORGANIC CHEMISTRY 3.0 Credits [LTP: 3-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Identify the electronic displacements according to bonding, shapes, reactivity and energy consideration of reaction intermediate | Remember |
| CO2 | Classify Hydrocarbons and discuss the methods of preparation of Hydrocarbons. | Understand |
| CO3 | Predict the stability and reactivity of hydrocarbons as per bonding and structure of hydrocarbons. | Understand |
| CO4 | Compare the physical and chemical properties of Hydrocarbons. | Understand |
| CO5 | Describe the applications of various hydrocarbons and their derivatives. | Remember |

## B. MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 3 | - | - | - | - | - | - | - | - | 1 | 3 | - | - |
| CO2 | 1 | 2 | 3 | - | - | - | - | - | - | - | - | 1 | 3 | - | - |
| CO3 | 2 | 3 | - | - | - | - | - | - | - | - | - | 1 | 3 | - | - |
| CO4 | 1 | 2 | 3 | - | - | - | - | - | - | - | - | 1 | 3 | - | - |
| CO5 | 1 | 2 | 2 | - | - | - | - | - | - | - | - | 1 | 3 | - | - |
| WT. AVG | 1.4 | 2 | 2.7 | - | - | - | - | - | - | - | - | 1 | 3 | - | - |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | Fundamentals of Organic Chemistry | 9 |
| 2. | Alkanes | 9 |
| 3. | Alkenes | 9 |
| 4. | Alkynes | 9 |
| 5. | Cycloalkanes, Cycloalkenes & Dienes | 9 |

D. **DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| **1.** | **Fundamentals of Organic Chemistry** |
| | • Introduction of the Unit<br>• Electronic displacements: inductive effect, electromeric effect, resonance and hyperconjugation<br>• Cleavage of Bonds: homolysis and heterolysis<br>• Structure, shape and reactivity of organic molecules: nucleophiles and electrophiles<br>• Reactive Intermediates: carbocations, carbanions and free radicals , nitrene, carbene,benzyne, Assigning formal charge<br>• Types of organic reactions, energy considerations.<br>• Methods of determination of reaction mechanism (product analysis, intermediates, isotope effects, kinetic and stereochemical studies)<br>• Conclusion & Real life applications |
| **2.** | **Alkanes** |
| | • Introduction of the Unit<br>• Alkanes:(Upto 5 Carbons)<br>• IUPAC nomenclature of branched and unbranched alkyl group<br>• Classification of carbon atoms in alkanes, Physical properties<br>• Preparation: catalytic hydrogenation, Wurtz reaction, Kolbe synthesis, decarboxylation of carboxylic acid, Grignard reagent, Corey-house reaction<br>• Reactions: free radical substitution: halogenations<br>• Reactivity and selectivity<br>• Conclusion & Real life applications |
| **3.** | **Alkenes** |
| | • Introduction of the Unit<br>• Alkenes: (Upto 5 Carbons)Preparation: elimination reactions: dehydration of alcohols and dehydrohalogenation of alkyl halides (Saytzeff's rule); cis alkenes (partial catalytic hydrogenation) and trans alkenes (birch reduction), Hofmanns elimination<br>• Chemical reactions of alkenes –electrophilic and free radical additions. Epoxidation, mechanisms involved in hydrogenation, oxidation with KMn04, Substitution at the allylic and vinylic positions of alkenes, polymerization of alkenes<br>• Reactions: cis-addition (alk. KMnO4) and trans-addition (bromine), addition of HX (Markownikoff's and anti-Markownikoff's addition), hydration, ozonolysis, oxymecuration– demercuration, Hydroboration-oxidation.<br>• Industrial application of ethylene and propene<br>• Conclusion & Real life applications |
| 4. | **Alkynes** |
| | • Introduction of the Unit<br>• Alkynes: (Upto 5 Carbons)<br>• Preparation: Acetylene from $CaC_2$ and conversion into higher alkynes; by dehalogenationof tetra halides and dehydrohalogenation of vicinal-dihalides, acidity of alkynes<br>• Reactions: formation of metal acetylides, addition of bromine and alkaline $KMnO_4$,<br>• ozonolysis and oxidation with hot alkaline. $KMnO_4$, hydroboration- oxidation, metalammonia reduction, polymerization<br>• Conclusion & Real life applications |
| 5. | **Cycloalkanes, Cycloalkenes & Dienes** |

| | |
|---|---|
| | • Introduction of the Unit<br>• Cycloalkanes: Nomenclature, method of formation, chemical reactions<br>• Baeyer strain theory and its limitations<br>• Ring strain in small rings (cyclopropane and cyclobutane), theory of strainless rings, Mohrs Sachse theory<br>• The case of cyclopropane ring: banana bond<br>• Cycloalkenes: Nomenclature, method of formation, chemical reactions<br>• Dienes: Nomenclature and classification of dienes<br>• Structure of allenes and butadiene, methods of formation, polymerization, chemical reactions, 1,2and 1,4- additions, Diels-Alder reaction<br>• conjugated and cumulated dienes<br>• Conclusion & Real-life applications |

**E. RECOMMENDED STUDY MATERIAL:**

| Sr. No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1 | A Text Book of Organic Chemistry | O. P. Agarwal | Vol. I & II | Latest |
| 2. | A Text Book of Organic Chemistry | B. S. Bahl and Arun Bahl | Latest | S. Chand |
| 3. | Organic Chemistry | S. M. Mukherji, S. P. Singh and R. P. Kapoor | Vol. I, II &III | Wiley Eastern Ltd. (New Age International) |
| 4. | Organic Chemistry | Morrison & Boyd | Latest | Prentice Hall |

| Code: 25BESCES1103 | MS OFFICE | 3.0 Credits [LTP: 3-0-0] |
|---|---|---|

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Memorize the operating system functions, structures, services, and various OS types, focusing on protection, security, and real-life applications. | Remember |
| CO2 | Understand CPU scheduling algorithms, criteria, and real-time scheduling concepts. | Understand |
| CO3 | Determine Process concept, process scheduling, inter-process communication, synchronization, and deadlock handling. | Apply |
| CO4 | Analyze memory management principles including segmentation, paging, virtual memory, and page replacement algorithms, for optimized system performance. | Analyze |
| CO5 | Review mastering file system fundamentals and implementation techniques for efficient data storage, retrieval, access methods, directory structures, and file protection mechanisms. | Evaluate |

## B. MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | 2 | 1 | 1 |
| CO2 | 3 | 3 | 2 | 1 | - | - | - | - | - | - | - | - | 2 | 1 | 1 |
| CO3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | 1 | 1 | 1 |
| CO4 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | - | 1 | 1 | - |
| CO5 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | - | - | - | - |
| WT. AVG | 2 | 2 | 2 | 1 | 3 | | | | | | | | 2 | 1 | 1 |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the unit | Time required for the Unit (Hours) |
|---|---|---|
| 1 | Introduction to MS Office & Windows Environment | 9 |
| 2 | Word Processing using MS Word | 9 |
| 3 | Spreadsheet Management using MS Excel | 9 |
| 4 | Presentation Techniques using MS PowerPoint | 9 |
| 5 | Email & Collaboration using MS Outlook and OneDrive | 9 |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| 1. | Introduction to MS Office & Windows Environment |

| | |
|---|---|
| | • Introduction of Unit<br>• Overview of MS Office Suite: Word, Excel, PowerPoint, Outlook<br>• Importance of office productivity tools in various sectors<br>• Basics of Operating Systems: Windows Interface, Taskbar, Control Panel<br>• File and Folder Management: create, save, copy, rename, delete<br>• Shortcut keys and navigation techniques<br>• Conclusion & Real Life Application |
| **2.** | Word Processing using MS Word |
| | • Introduction of Unit<br>• creating and formatting professional documents<br>• Paragraph styles, page setup, headers/footers<br>• Inserting tables, images, and shapes<br>• Using templates and styles<br>• Mail merge and document review tools<br>• Conclusion & Real life Application |
| **3.** | Spreadsheet Management using MS Excel |
| | • Introduction of Unit<br>• reading and editing spreadsheets<br>• Cell formatting, merging, wrapping text<br>• Basic formulas and functions (SUM, AVERAGE, IF, COUNTIF)<br>• Charts and visualizations<br>• Sorting, filtering, and basic data analysis<br>• Conclusion & Real life Application |
| **4.** | Presentation Techniques using MS PowerPoint |
| | • Introduction of Unit<br>• Designing visually appealing slides<br>• Using themes, slide layouts, and design tips<br>• Adding images, charts, videos, and transitions<br>• Slide Master and animations<br>• Presentation tools and delivery tips<br>• Conclusion & Real life Application |
| **5.** | Email & Collaboration using MS Outlook and OneDrive |
| | • Introduction of Unit<br>• Setting up and managing email accounts in Outlook<br>• Sending, receiving, and organizing emails<br>• Calendar management and scheduling<br>• File sharing using OneDrive and Teams<br>• Email etiquette and cybersecurity best practices<br>• Conclusion & Real Life Application |

E. **COMMENDED STUDY MATERIAL**:

| Sr. No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Microsoft Office 2019 All-in-One For Dummies | Peter Weverka | 1st Edition | Wiley |
| 2. | Go! With Microsoft Office 365 | Shelley Gaskin, Alicia Vargas, Debra Geoghan, Nancy Graviett | 2021 | Pearson |

**Code: 25BESCES1104 OPERATING SYSTEMS 3.0Credits[LTP:3-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Memorize the operating system functions, structures, services, and various OS types, focusing on protection, security, and real-life applications. | Remember |
| CO2 | Understand CPU scheduling algorithms, criteria, and real-time scheduling concepts. | Understand |
| CO3 | Determine Process concept, process scheduling, inter-process communication, synchronization, and deadlock handling. | Apply |
| CO4 | Analyze memory management principles including segmentation, paging, virtual memory, and page replacement algorithms, for optimized system performance. | Analyze |
| CO5 | Review mastering file system fundamentals and implementation techniques for efficient data storage, retrieval, access methods, directory structures, and file protection mechanisms. | Evaluate |

## B. MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | 2 | 1 | 1 |
| CO2 | 3 | 3 | 2 | 1 | - | - | - | - | - | - | - | - | 2 | 1 | 1 |
| CO3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | 1 | 1 | 1 |
| CO4 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | - | 1 | 1 | - |
| CO5 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | - | - | - | - |
| WT. AVG | 2.6 | 2 | 1.6 | 1 | 1 | | | | | | | | 1.5 | 1 | 1 |

## C. OUTLINEOFTHECOURSE

| Unit No. | Title of the unit | Time required for the Unit (Hours) |
|---|---|---|
| 1 | **Introduction of Operating System** | 9 |
| 2 | **Scheduling** | 9 |
| 3 | **Process and Threads** | 9 |
| 4 | **Memory Management** | 9 |
| 5 | **File System Interface** | 9 |

## D. DETAILEDSYLLABUS

| Unit | Unit Details |
|---|---|
| 1. | **Introduction of Operating System** |

| | |
|---|---|
| | • Introduction of Unit<br>• Operating System: Operating Systems Overview- Overview and Functions of operating systems<br>• Protection and security, operating Systems structures<br>• Services, system calls and their working, Batch, multiprogramming<br>• Multitasking, timesharing, parallel, distributed & real-time O.S.<br>• Conclusion & Real Life Application |
| **2.** | **Scheduling** |
| | • Introduction of Unit<br>• Basic concepts of CPU scheduling, Scheduling criteria, Scheduling algorithms<br>• Algorithms comparison)<br>• Real time scheduling I/0 devices organization<br>• I/0 devices organization, I/0 devices organization, I/0 buffering<br>• Conclusion & Real Life Application |
| **3.** | **Process and Threads** |
| | • Introduction of Unit<br>• Process concept, process scheduling, operations on processes<br>• Threads, inter-process communication, critical section problem<br>• Semaphores, Deadlock problem, deadlock characterization<br>• Deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock<br>• Conclusion &Real Life Application |
| **4.** | **Memory Management** |
| | • Introduction of Unit<br>• Concepts of memory management, logical and physical address space, swapping<br>• Contiguous and non-contiguous allocation, paging, segmentation,<br>• Conclusion& Real Life Application |
| **5.** | **File System Interface** |
| | • Introduction of Unit<br>• File system Interface- the concept of a file, Access Methods.<br>• Directory Structure. File system mounting, file protection and sharing mechanism.<br>• File System implementation-File system structure, file/directory implementation<br>• Conclusion & Real Life Application |

E. **COMMENDED STUDY MATERIAL**:

| Sr.No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Operating System Concepts | Abraham Silberchatz, Peter B.Galvin, Greg Gagne | 8thedition. | CBH, Jaipur |
| 2. | Operating Systems - Internals and Design Principles | Stallings | 6thEdition | Pearson education. |
| 3. | Operating Systems: A Concept-Based Approach | D.M. Dhamdhere | 3rdEdition | TMH, Delhi |
| 4 | Modern Operating Systems | AndrewS Tanenbaum | 3rd edition | PHI |
| 5 | Principles of Operating Systems | B.L.Stuart | Latest | Cengage learning, India Edition |
| 6 | Operating Systems. | A.S.Godboie | 2nd Edition | TMH |

**Code: 25BESEES1101 INORGANIC CHEMISTRY 3.0 Credits [LTP: 3-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Understand the atomic structure and periodic properties in explaining the behavior of elements and compounds. | Understand |
| CO2 | Identify the properties, interaction and energies of compounds with respect to their chemical bonding. | Remember |
| CO3 | Predict the anomalous change in geometry of molecules on account of valence bond theory, VSEPR theory and Molecular orbital Theory. | Understand |
| CO4 | Compare the trends in characteristic properties and synthesis of hydrides of s block and p block elements. | Understand |
| CO5 | Categorize the properties of noble gasses and its compounds with use in daily life applications. | Understand |

## B. MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 3 | - | - | - | - | - | - | - | - | - | 3 | - | - |
| CO2 | 1 | 2 | 3 | - | - | - | - | - | - | - | - | - | 3 | - | - |
| CO3 | 2 | 3 | - | - | - | - | - | - | - | - | - | - | 3 | - | - |
| CO4 | 1 | 2 | 3 | - | - | - | - | - | - | - | - | - | 3 | - | - |
| CO5 | 1 | - | 3 | - | - | - | - | - | - | - | - | - | 3 | - | - |
| WT. AVG | 1.4 | 2 | 3 | - | - | - | - | - | - | - | - | - | 3 | - | - |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the unit | Time required for the Unit (Hours) |
|---|---|---|
| 1 | Atomic Structure & Periodic Properties | 9 |
| 2 | Ionic Bond, Metallic Bond & Weak Interactions | 9 |
| 3 | Covalent Bond | 9 |
| 4 | s-Block Elements & p-Block Elements | 9 |
| 5 | Chemistry of Noble Gases | 9 |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| **1.** | **Atomic Structure & Periodic Properties** |
| | ● Introduction of the Unit<br>● Bohrs Theory and its limitation<br>● Heisenberg uncertainty principle<br>● Quantum number and its Significance<br>● Aufbau Principle, Hund's multiplicity rule and Pauli's exclusion principle<br>● Electronic configuration of elements |

| | |
|---|---|
| | ● Effective nuclear charge and shielding<br>● Atomic and ionic radii<br>● Ionization energy<br>● Electron affinity and electro negativity evaluation<br>● Conclusion & Real life applications |
| **2.** | **Ionic Bond, Metallic Bond &Weak Interactions** |
| | ● Introduction of the Unit<br>● Ionic bond-General characteristics<br>● Radius ratio effect and coordination number<br>● Lattice defects, lattice energy and Born-Haber cycle<br>● Polarizing power and polarizability<br>● Fajan's rules<br>● Conclusion & Real life applications |
| **3.** | **Covalent Bond** |
| | ● Introduction of the Unit<br>● Valence bond theory and its limitations<br>● Valence shell electron pair repulsion (VSEPR) theory with suitable examples<br>● Molecular orbital theory<br>● Bonding, nonbonding and antibonding molecular orbital's<br>● Linear combination of atomic orbital's (LCAO)-homonuclear and heteronuclear (CO and NO) diatomic molecules.<br>● Bond strength and bond energy<br>● Percentage ionic character from dipole moment and electro negativity difference<br>● Conclusion & Real life applications |
| **4.** | **s-Block Elements & p-Block Elements** |
| | ● Introduction of the Unit<br>● **s-Block Elements -**Comparative study, diagonal relationships<br>● Solvation and complexation tendencies including their function in biosystems<br>● Hydride- classification, preparation and characteristics<br>● **p-Block elements-**Comparative study in periodicity, diagonal relationship<br>● Hydrides of boron, borazine, carbides,<br>● Basic properties of halogens, interhalogens and polyhalides<br>● Conclusion & Real life applications |
| **5.** | **Chemistry of Noble Gases** |
| | ● Introduction of the Unit<br>● Chemical properties of Noble gases<br>● Chemistry of Xenon<br>● Structure and bonding in Xenon compound<br>● Theories of Bonding in noble gases compound<br>● Conclusion & Real life applications |

## E. RECOMMENDED STUDY MATERIAL:

| S. No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1 | A New Concise Inorganic Chemistry | J. D. Lee | Latest | Chapman & Hall, London |
| 2 | Modern Inorganic Chemistry | R. C. Aggarwal | Latest | Kitab Mahal, Allahabad |
| 3 | Basic Inorganic Chemistry | F. A. Cotton, G. Wilkinson, and Paul L. Gaus | Latest | John Wiley & Sons, New York |

**Code: 24BESCES1105 COMPUTER FUNDAMENTALS & C PROGRAMMING 3.0 Credits [LTP: 3-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Understand the features and structure of C programs, including tokens, keywords, and data types. | Remember |
| CO2 | Understand the features and structure of C programs, including tokens, keywords, and data types. | Understand |
| CO3 | Apply knowledge of C operators, expressions, type conversions, and I/O operations in programming. | Apply |
| CO4 | Analyze conditional and unconditional control statements, their syntax, flowcharts, and applications. | Analyze |
| CO5 | Evaluate array, string, and function concepts, including parameter passing, recursion, and real-life applications. | Evaluate |

## B. MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 3 | 1 | 1 | - | - | - | - | - | - | - | 2 | 2 | 1 |
| CO2 | 3 | 3 | 2 | 1 | - | - | - | - | - | - | - | - | 1 | 1 | - |
| CO3 | 2 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | 1 | 1 | - |
| CO4 | 2 | 1 | 1 | 1 | - | - | - | - | - | - | - | - | 1 | - | - |
| CO5 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | - | - | - | - |
| WT. AVG | 2.4 | 1.8 | 1.8 | 1 | 1 | | | | | | | | 1.2 | 1.3 | 1 |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | Introduction of Computer Systems | 9 |
| 2. | Introduction of C | 9 |
| 3. | Operators and Expressions | 9 |
| 4. | Control Structures | 9 |
| 5. | Arrays, Strings and Functions | 9 |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| **1.** | **Introduction of Computer Systems** |
| | • Introduction of Unit<br>• Definition of a Computer, History of Computers, Generations of Computers<br>• Types of computer – based on size and working principle, Block diagram of a Computer with functional units (explanation)<br>• Parts of a computer system, Information processing Cycle.<br>• Definition of software and hardware, types of programming languages, assembler, compiler, interpreter, linker, loader (Definitions only)<br>• Number system – decimal, binary, octal and hexadecimal number, inter conversion of decimal to binary and vice versa.<br>• ASCII codes. Algorithm- definition, Characteristics, notations.<br>• Flowchart-definition, Symbols used in writing the flow-chart<br>• Writing an algorithm and flow-chart of simple problems<br>• Conclusion & Real Life Application |
| **2.** | **Introduction of C** |
| | • Introduction of Unit<br>• Features of C, basic C program structure, character set,<br>• Tokens, keywords and identifiers.Constants, variables<br>• Data types, variable declaration, symbolic constant definition<br>• Conclusion & Real Life Application |
| **3.** | **Operators and Expressions** |
| | • Introduction of Unit<br>• C operators- arithmetic, relational, logical, bitwise, assignment, increment and decrement<br>• Conditional (?:) and special operators, Arithmetic expressions<br>• Precedence of operators and associatively. Type conversions, mathematical functions<br>• Definition of macro and pre-processor directives<br>• Managing I/O operation – reading and writing a character<br>• Formatted and unformatted/O functions<br>• Conclusion & Real Life Application |
| **4.** | **Control Structures** |
| | • Introduction of Unit<br>• Conditional control statements- if, if-else, nested-if, switch, go to statement,<br>• While, do-while and for statements<br>• Unconditional control statements- break, continue and return statements(definition and explanationwith syntax, flowchart and examples)<br>• Conclusion & Real Life Application |
| **5.** | **Arrays, Strings and Functions** |
| | • Introduction of Unit<br>• Definitions of an array, types-one and two dimensional array<br>• Strings–definition, declaration and initialization of string variable,<br>• string handling functions<br>• Functions – definition, need, syntax for function declaration, function prototype<br>• category of functions, nestingof functions, function with arrays, scope of variables<br>• Parameter passing mechanism- call by value and call byreference. Recursion and Recursive function<br>• Conclusion & Real Life Application |

## E. RECOMMENDED STUDY MATERIAL:

| Sr. No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Let us C | Yashwant Kanetkar | 6th edition | PBH, Jaipur |
| 2. | The C programming Language | Richie and Kenninghan | 2004 | Pearson education. |
| 3. | Programming in ANSI C | Balaguruswamy | 3rd Edition, 2005 | TMH, Delhi |

| Code: 25BESEES1201 | ENVIRONMENT LAB-I | 1.0 Credits [LTP: 0-0-2] |
|---|---|---|

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Identify vegetation of local area/University campus and Herbarium preparation. | Understand |
| CO2 | Qualitative and quantitative analysis of plant leaves with the different instruments. | Analyze |
| CO3 | Analyze the physiological and ecological status of plants using tools like leaf area index, chlorophyll content, and percent leaf injury. | Analyze |
| CO4 | Evaluate the physicochemical properties of soil and water to understand their environmental quality. | Evaluate |
| CO5 | Demonstrate competency in field data collection, environmental monitoring, and laboratory-based analysis for ecological research and reporting. | Apply |

## B. MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 1 | - | - | 1 | 3 | 3 | 1 | 1 | - | 1 | 2 | - | - |
| CO2 | 3 | 1 | 1 | 1 | - | 1 | 3 | - | - | - | - | 1 | 2 | - | - |
| CO3 | 2 | - | 1 | - | - | - | 3 | - | - | - | - | 1 | 3 | - | - |
| CO4 | 2 | 2 | 2 | 1 | - | - | 3 | 3 | - | - | - | 1 | 2 | - | 2 |
| CO5 | 2 | 1 | 1 | 1 | - | - | 3 | 1 | - | - | - | 1 | 1 | - | 2 |
| WT. AVG | 2.4 | 1.2 | 1.2 | 1 | - | 1 | 3 | 2.3 | 1 | 1 | - | 1 | 2 | - | 2 |

## C. LIST OF EXPERIMENTS

| Sr. No. | Experiments |
|---|---|
| 1. | Study of vegetation of local area/University campus and Herbarium preparation |
| 2. | To find out minimum size and number of the quadrat for vegetation study |
| 3. | Study of vegetation density, frequency and abundance by quadrat method |
| 4. | Study of dominance of plant species by quadrat method |
| 5. | To calculate the leaf area index and percent leaf injury |
| 6. | Estimation of chlorophyll content in leaves |
| 7. | Estimation of pH in the water sample |
| 8. | Estimation of conductivity of the water sample. |
| 9. | Estimation of temperature in water sample |
| 10. | Determination of pH of in soil |
| 11 | Determination of conductivity of soil |
| 12 | Determination of porosity in soil |

| Code: 25BESEES1202 | CHEMISTRY LAB-I | 1.0 Credit [LTP: 0-0-2] |
|---|---|---|

## 1. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Recall the principles of qualitative analysis for acidic and basic radicals. | Remember |
| CO2 | Perform the chemical tests on given organic compounds to identify the presence of specific functional groups. | Apply |
| CO3 | Interpret the obtained melting and boiling point data to draw conclusions about the purity and identity of the organic compounds. | Apply |
| CO4 | Conduct the titration experiment accurately following the procedural steps. | Understand |
| CO5 | Summarized the experimental method used for estimation. | Understand |

## 2. Mapping matrix of CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 1 | 3 | 2 | - | - | - | - | - | - | - | - | 1 | 1 | - | 3 |
| **CO2** | 1 | 2 | 3 | - | - | - | - | - | - | - | - | 1 | 1 | - | 3 |
| **CO3** | 1 | 3 | 2 | - | - | - | - | - | - | - | - | 1 | 1 | - | 3 |
| **CO4** | 1 | 3 | 2 | - | - | - | - | - | - | - | - | 1 | 1 | - | 3 |
| **CO5** | - | 3 | 2 | 1 | - | - | - | - | - | - | - | 1 | 1 | - | 3 |
| **WT. AVG** | 1.0 | 2.8 | 2.2 | 1 | - | - | - | - | - | - | - | 1 | 1 | - | 3 |

## 3. LIST OF EXPERIMENTS

| **Inorganic Chemistry** | |
|---|---|
| **1** | To analyze mixture contains two acidic and two basic radicals in a given mixture. |
| **2** | To analyze mixture contains two acidic and two basic radicals in a given mixture. |
| **3** | To analyze mixture containing three acidic and three basic radicals. |
| | To analyze mixture containing three acidic and three basic radicals. |
| **5** | To analyze mixture containing three acidic and three basic radicals. |
| **6** | Estimation of $KMnO_4$ by oxalic acid. |
| **Organic Chemistry** | |
| **7** | To detect the functional group from the given organic compound (Alcohol/carbonyl Compound). |
| **8** | To detect the functional group from the given organic compound (Nitrogen containing Compound). |
| **9** | To determine the melting point of given organic compound (Naphthalene). |
| **10** | To determine the melting point of given organic compound (Urea). |
| **11** | To determine the boiling point of given organic compound (Ethanol). |
| **12** | To determine the boiling point of given organic compound (Benzene). |

| Code: 25BESEES1203 | MS OFFICE LAB-I | 1.0 Credits [LTP: 0-0-2] |
|---|---|---|

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Recall basic features and functionalities of MS Word, Excel, and PowerPoint applications. | Remembering |
| CO2 | Explain the use of text formatting, layout, and data representation tools in office software. | Understanding |
| CO3 | Use formatting tools, formulas, and functions to create professional documents and spreadsheets. | Applying |
| CO4 | Analyze structured data using sorting, filtering, charts, and conditional formatting in Excel. | Analyzing |
| CO5 | Evaluate and improve the effectiveness of presentations using multimedia and design tools. | Evaluating |

## B. MAPPING MATRIX OF CO, PO & PSO

| Course Outcomes | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | - | - | 2 | - | - | - | - | - | - | 2 | 2 | - | - |
| CO2 | 3 | - | - | 2 | 2 | - | - | - | - | 2 | - | 2 | 2 | - | - |
| CO3 | 3 | 2 | - | 2 | 3 | - | - | - | - | 2 | 2 | 3 | 2 | 3 | - |
| CO4 | 3 | 3 | 2 | 3 | 3 | - | - | - | - | 2 | 2 | 2 | 2 | 2 | 3 |
| CO5 | 2 | - | - | 2 | 3 | - | - | 2 | 2 | 3 | 2 | 2 | - | 3 | 3 |
| WT AVG | 2.8 | 2.5 | 2.0 | 2.25 | 2.60 | - | - | 2 | 2 | 2.25 | 2.0 | 2.20 | 2.0 | 2.67 | 3 |

## C. LIST OF PROGRAMS

| Sr. No | List of Experiments |
|---|---|
| 1 | Create and format a formal business letter using text alignment, fonts, and spacing. |
| 2 | Insert a table, image, and chart into a document to present employee data visually. |
| 3 | Use Mail Merge to generate personalized letters from an Excel data source. |
| 4 | Apply paragraph formatting, page layout, headers, and footers in a multi-page document |
| 5 | Create a professional document using a built-in MS Word template (e.g., resume or report). |
| 6 | Create and format a sales data sheet using borders, colors, and number formatting. |
| 7 | Apply basic formulas and functions like SUM, AVERAGE, and IF to calculate results. |
| 8 | Sort and filter student marks and apply conditional formatting to highlight top scorers. |
| 9 | Generate bar, pie, and line charts to visually represent monthly sales or attendance data. |
| 10 | Use data validation to create dropdown lists and restrict user input in specific cells. |
| 12 | Create a 5-slide presentation with title, content, and conclusion using different slide layouts. |
| 12 | Insert images, charts, and videos into slides to enhance the presentation visually. |
| 13 | Apply transitions, animations, and Slide Master for a professional and consistent design. |

**Code: 25BESCMC1121 ELEMENTYARY & VEDIC MATHEMATICS 2.0 Credit [LTP: 0-0-2]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Understand and apply the properties of number systems and perform conversions between various systems with real-life applications. | Understand |
| CO2 | Analyze and manipulate different types of sets and relations to model and solve mathematical problems. | Analyze |
| CO3 | **Analyze and manipulate different types of relations to model and solve mathematical problems** | Apply |
| CO4 | Utilize Vedic techniques to perform basic arithmetic operations efficiently and with speed. | Apply |
| CO5 | Apply Vedic mathematics strategies to solve complex numerical problems, including squaring and finding roots rapidly. | Apply |

## B. Mapping matrix of CO, PO & PSO

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | - | 1 | - | - | - | - | - | - | - | 2 | 3 | - | 2 |
| CO2 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | 1 | 3 | 3 | - | 2 |
| CO3 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 3 | 3 | - | 3 |
| CO4 | 3 | 2 | 3 | 3 | - | - | - | - | - | - | 2 | 3 | 3 | - | 2 |
| CO5 | 3 | 2 | 3 | 3 | - | - | - | - | - | - | 2 | 3 | 3 | - | 3 |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | Number System | 6 |
| 2. | Sets | 6 |
| 3. | Relations | 6 |
| 4. | Vedic Mathematics – I | 6 |
| 5. | Vedic Mathematics – II | 6 |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| **1.** | **Number System** |
| | • Introduction of Unit<br>• Integers, rational numbers, and real numbers: Definitions, properties, and examples<br>• Number systems: Decimal, Binary, Octal, Hexadecimal<br>• Conclusion &Real-Life Application |

| | |
|---|---|
| **2.** | **Sets** |
| | • Introduction of the Unit<br>• Definition and types of sets<br>• Set operations: Union, Intersection,<br>• Difference, Ring Sum, Complement<br>• Conclusion &Real-Life Application |
| **3.** | **Relations** |
| | • Introduction of the Unit<br>• Relations: Definitions, properties, and examples<br>• Types of Relations with simple examples<br>• Injective, Surjective, Bijective functions and compositions<br>• Conclusion &Real-Life Application |
| **4.** | **Vedic Mathematics – I** |
| | • Introduction of the Unit<br>• Addition, Subtraction, Multiplication using Vedic patterns<br>• Techniques for quick mental calculations<br>• Conclusion &Real-Life Application |
| **5.** | **Vedic Mathematics – II** |
| | • Introduction of Unit<br>• Squaring numbers using patterns<br>• Squaring numbers with any number of digits<br>• Calculating square roots and cubes using Vedic methods<br>• Conclusion &Real-Life Application |

**E. RECOMMENDED STUDY MATERIAL**

| **S. No** | **Text Books:** | **Author** | **Edition** | **Publication** |
|---|---|---|---|---|
| 1. | Discrete Mathematics and Its Applications | Kenneth H. Rosen | Latest | McGraw Hill Education |
| 2. | Vedic Mathematics | Thakur Rajesh Kumar | Latest | Unicorn Books |
| 3. | How To Become A Human Calculator with themagic of Vedic Mathematics | Dr. Aditi Singhal | 3rd Edition | S Chand |
| **Reference Book** | | | | |
| 1. | Bhatiya Dhaval, Vedic Mathematics Made Easy, Jaico Publishing House | | | |
| 2. | V. G. Unkalkar, Magical World of Mathematics (Vedic Mathematics), Vandana Publishers, Bangalore | | | |

**Code: 25BEACHM1205 APPLIED ENGLISH COMMUNICATION SKILLS-I 1.0 Credits [LTP: 1-0-2]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| **CO1** | Develop critical and creative thinking by solving hypothetical problems using limited resources. | Create |
| **CO2** | Exhibit persuasive communication and reasoning in debates and decision-making tasks. | Evaluate |
| **CO3** | Demonstrate collaboration and interpersonal skills through group-based storytelling and enactments. | Apply |
| **CO4** | Enhance public speaking confidence through extempore and stage-based activities. | Apply |
| **CO5** | Present innovative ideas and concepts effectively in front of an audience. | Create |

## B. MAPPING OF COURSE OUTCOMES WITH PROGRAMME OUTCOMES

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | 3 | - | 1 | 3 |
| CO2 | - | 3 | 3 | 3 | - | - | - | 2 | - | 3 | - | 2 | - | 1 | 3 |
| CO3 | - | - | - | - | - | 3 | - | 2 | 3 | 3 | - | - | - | 1 | 3 |
| CO4 | - | - | - | - | - | - | - | - | - | 3 | - | 3 | - | 1 | 3 |
| CO5 | 3 | 3 | - | 3 | 3 | - | - | - | - | 3 | - | 3 | - | 1 | 3 |
| Wt. Avg | 3 | 3 | 3 | 3 | 3 | 3 | - | 2 | 3 | 3 | - | 2.7 | - | 1 | 3 |

## C. COUTLINE OF THE COURSE

| Unit No. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1 | Collaborative Thinking and Problem-Solving Skills | 3 |
| 2 | Narration, Dialogue, and Group Presentation Skills | 3 |
| 3 | Formal and Impromptu Public Speaking | 3 |
| 4 | Functional and Contextual English Communication | 3 |
| 5 | Creativity, Ideation, and Visual Interpretation | 3 |

## D. LIST OF EXPERIMENTS

| LIST OF LABS | |
|---|---|
| | **UNIT 1: Critical Thinking and Survival Communication** |
| 1 | Team vs Wild – Scenario-based survival task emphasizing teamwork and critical thinking. |

| | |
|---|---|
| 2 | Who Gets the Heart? – Ethical dilemma debate for persuasive speaking and reasoning. |
| | **UNIT 2: Stage Communication and Public Speaking** |
| 3 | Debate – Structured argumentative speaking to enhance critical thinking and leadership. |
| 4 | Extempore – Impromptu individual speeches to build spontaneity and stage confidence. |
| 5 | **Theatrix** – Paired roleplays to practice situational dialogues and collaborative speaking. |
| | **UNIT 3: Storytelling and Visual Communication** |
| 6 | Story Mason – Group storytelling for stage interaction and creativity. |
| 7 | Picture Connector – Visual storytelling by linking images to construct and narrate a cohesive idea. |
| 8 | Insane Inventor – Solo presentation of imaginative products to foster innovation and clarity. |
| | **UNIT 4: Real-life English and Functional Conversation** |
| 9 | Shopping Roleplay – Day-to-day dialogue practice in a simulated shopping scenario. |
| 10 | Tourism Pitch – Team-based promotion of a location to enhance descriptive and persuasive communication. |
| 11 | Interpersonal Interaction Practice – Real-life communication drills for fluent and functional English usage. |
| | **UNIT 5: Creative Dialogue and Team Presentation** |

**Code: 25BELCSE1201 SKILL ENHANCEMENT COURSES-I 1 Credit [LTP: 0-0-2]**

**Course: Soft Skills 1**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Demonstrate professionalism through effective use of body language, impression management, and personal branding in academic and workplace settings. | Demonstrate |
| CO2 | Apply skills of habit formation, goal setting, and time management to enhance productivity and achieve personal and professional growth. | Apply |
| CO3 | Collaborate and communicate effectively within teams using convincing skills, ethical reasoning, and awareness of professional responsibilities. | Understand |
| CO4 | Use appropriate grammar structures such as tenses, direct/indirect speech, and voice to construct clear and impactful communication. | Understand |
| CO5 | Enhance written and spoken language using idioms, phrasal verbs, collocations, gerunds, infinitives, and correct punctuation. | Understand |

## B. MAPPING MATRIX OF CO, PO & PSO

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 1 | 2 | 1 | 2 | - | 2 | 3 | 3 | 2 | 2 | - | 2 | 3 |
| CO2 | 2 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 2 | 3 | 3 | - | 2 | 3 |
| CO3 | 2 | 2 | 2 | 3 | 1 | 3 | 1 | 3 | 3 | 3 | 2 | 3 | - | 2 | 3 |
| CO4 | 1 | 1 | 1 | 2 | 2 | 1 | - | 1 | 1 | 3 | 1 | 2 | - | 2 | 3 |
| CO5 | 1 | 1 | 1 | 2 | 2 | 1 | - | 1 | 1 | 3 | 1 | 2 | - | 2 | 3 |
| WT AVG | 2 | 1.4 | 1.4 | 2.2 | 1.4 | 1.8 | 1 | 1.8 | 2 | 2.8 | 1.8 | 2.4 | - | 2 | 3 |

## C. LIST OF EXPERIMENTS

| S. No. | Topic | Sub Topic |
|---|---|---|
| 1 | Body Language and Professionalism | Understanding body language helps students communicate more effectively and professionally. This skill enhances their ability to build trust, make positive impressions, and navigate workplace environments with confidence. |
| 2 | Habit Formation | By understanding how habits are formed, students can create positive routines that boost productivity and success. This topic empowers them to adopt habits that support their personal and academic growth, while also learning how to break negative habits. |
| 3 | Goal Setting | Goal setting helps students stay focused and motivated. By teaching them to set clear, achievable goals, we ensure they have a roadmap for success, whether in their education, career, or personal life. |
| 4 | Impression Management | Impression management enables students to present themselves effectively in various social and professional settings. This skill is vital for building strong professional relationships, gaining trust, and achieving career |

| | | |
|---|---|---|
| | | success. |
| 5 | Team Building | Team building helps students understand the dynamics of effective collaboration. This topic teaches them how to work together, share responsibilities, and achieve common goals, which are essential skills in almost every workplace. |
| 6 | Time Management | Time management skills are essential for students to balance academic workloads, personal life, and professional responsibilities. By teaching them how to prioritize tasks and manage their time effectively, we help them reduce stress and increase productivity. |
| 7 | Convincing Skills | Intrapreneurship encourages students to think creatively within an organization, driving innovation and problem-solving. This skill fosters an entrepreneurial mindset that can lead to new opportunities and contributions in any workplace. |
| 8 | Ethical Awareness | This module encourages students to recognize and navigate ethical dilemmas in professional settings. It strengthens decision-making with integrity, a quality employers highly value in responsible team members and future leaders. |
| 9 | Curiosity and Continuous Learning | Fostering a mindset of curiosity helps students stay relevant in a fast-changing world. This session encourages lifelong learning and adaptability—skills that are vital for growth in any career path. |
| 10 | Networking and Personal Branding | Students learn how to build professional relationships and present themselves effectively in-person and online. These skills are essential for career development, visibility, and accessing new opportunities. |
| 11 | Tenses | Tense is the skeleton of English language and proper usage of tense forms ensures proper meaning conveyed. |
| 12 | Forms and Speech and Voice | Use of direct and indirect speech is essential for speaking ability in English. Voices help in writing convincing and diplomatic sentence/paragraphs. |
| 13 | Idioms and Phrasal Verbs | Idioms add flavour and richness to the English language. The author/speakers will sound savvy if idioms and phrasal verbs are appropriately used. |
| 14 | Collocations, Gerund and Infinitives | Company of words are called collocations and proper use of collocations brings finesse in one's language. Gerund and infinitives usage helps fine-tune one's language. |
| 15 | Punctuations | Improper punctuations in written scripts convey meanings different than the intended one. Writing ability is greatly enhanced by proper usage of punctuations. |

**Code: 25BUVCVA1201 PERFORMING ARTS (Global Moves: A Practice Course in Dance) 1 Credit [LTP: 0-0-2]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Gain practical exposure to Indian and international dance styles, fostering cultural appreciation and diversity. | Demonstrate |
| CO2 | Develop physical awareness, rhythm, coordination, and stamina through structured training. | Create |
| CO3 | Learn and perform choreographies across diverse genres, enhancing versatility and adaptability. | Understand |
| CO4 | Enhance stage presence, group dynamics, and body confidence, crucial for performing arts. | Understand |
| CO5 | Create original dance compositions using acquired vocabularies, culminating in a final polished performance and a comprehensive video portfolio. | Create |

## B. MAPPING MATRIX OF CO, PO & PSO

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 1 | 2 | 1 | 2 | - | 2 | 3 | 3 | 2 | 2 | - | 2 | 3 |
| CO2 | 2 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 2 | 3 | 3 | - | 2 | 3 |
| CO3 | 2 | 2 | 2 | 3 | 1 | 3 | 1 | 3 | 3 | 3 | 2 | 3 | - | 2 | 3 |
| CO4 | 1 | 1 | 1 | 2 | 2 | 1 | - | 1 | 1 | 3 | 1 | 2 | - | 2 | 3 |
| CO5 | 1 | 1 | 1 | 2 | 2 | 1 | - | 1 | 1 | 3 | 1 | 2 | - | 2 | 3 |
| WT AVG | 2 | 1.4 | 1.4 | 2.2 | 1.4 | 1.8 | 1 | 1.8 | 2 | 2.8 | 1.8 | 2.4 | - | 2 | 3 |

## C. LIST OF EXPERIMENTS

| S.No. | Activity |
|---|---|
| 1 | Foundations of Movement<br>• Introduction to body alignment, posture, balance, and rhythm<br>• Daily warm-ups, isolations, strength-building, and flexibility training<br>• Introduction to breath and movement synchrony<br>Music and tempo awareness |
| 2 | Indian Folk Dance Practices I (dance styles such as Garba, Ghoomar, Bhangra, Kalbeliya) |
| 3 | Indian Folk Dance Practices II (dance styles such as Garba, Ghoomar, Bhangra, Kalbeliya) |
| 4 | Classical and Semi-Classical Basics I (Bharatanatyam, Kathak, Odissi) |

| | |
|---|---|
| **5** | Classical and Semi-Classical Basics II (Bharatanatyam, Kathak, Odissi) |
| **6** | International Groove Sessions I (Basics of Ballroom, Latin Dances, such as Salsa and Cumbia, Bacchata, Contemporary dance, Hip-Hop) |
| **7** | International Groove Sessions II (Basics of Ballroom, Latin Dances, such as Salsa and Cumbia, Bacchata, Contemporary dance, Hip-Hop) |
| **8** | International Groove Sessions III (Basics of Ballroom, Latin Dances, such as Salsa and Cumbia, Bacchata, Contemporary dance, Hip-Hop) |
| **9** | Choreography Lab 1<br>• Small group choreographies using Indian and global movement vocabularies<br>• Music selection, improvisation games, transitions<br>Peer-to-peer feedback and refinement |
| **10** | Choreography Lab 2 + Performance Skills<br>• Full choreography creation (3–5 min group piece)<br>• Focus on stage presence, projection, entrances/exits<br>Styling, costumes, and syncing with music |
| **11** | Rehearsals and Filming<br>• Rehearsal with stage lighting and mock performance runs<br>On-camera performance practice and professional video shoot |
| **12** | Final Showcase<br>• Public showing or campus performance<br>• Reflection circle and feedback<br>Video portfolio handed over to students |

**Code: 25BUVCVH1201** **UNIVERSAL HUMAN VALUES AND PROFESSIONAL ETHICS LAB** **1 Credit [LTP: 0-0-2]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Identify what is valuable to human beings and what are the aspirations of life. | Understand |
| CO2 | Identify what is valuable to human beings and what are the aspirations of life | Understand |
| CO3 | Apply the understanding of value education in solving various problems. | Apply |
| CO4 | Describe physical and mental fitness. | Understand |
| CO5 | Apply the knowledge to their own self and in day-to-day life. | Apply |

## B. MAPPING MATRIX OF CO, PO & PSO

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 1 | 2 | 1 | 2 | - | 2 | 3 | 3 | 2 | 2 | - | 2 | 3 |
| CO2 | 2 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 2 | 3 | 3 | - | 2 | 3 |
| CO3 | 2 | 2 | 2 | 3 | 1 | 3 | 1 | 3 | 3 | 3 | 2 | 3 | - | 2 | 3 |
| CO4 | 1 | 1 | 1 | 2 | 2 | 1 | - | 1 | 1 | 3 | 1 | 2 | - | 2 | 3 |
| CO5 | 1 | 1 | 1 | 2 | 2 | 1 | - | 1 | 1 | 3 | 1 | 2 | - | 2 | 3 |
| WT AVG | 2 | 1.4 | 1.4 | 2.2 | 1.4 | 1.8 | 1 | 1.8 | 2 | 2.8 | 1.8 | 2.4 | - | 2 | 3 |

## C. LIST OF EXPERIMENTS

| | |
|---|---|
| 1 | Introduce yourself in detail. What are the goals in your life? How do you set your goals in your life? How do you differentiate between right and wrong? What have been your salient achievements and shortcomings in your life? Observe and analyze them. |
| 2 | Now-a-days, there is a lot of talk about many techno-genic maladies such as energy and material resource depletion, environmental pollution, global warming, ozone depletion, deforestation, soil degradation, etc. - all these seem to be manmade problems, threatening the survival of life Earth - What is the root cause of these maladies & what is the way out in opinion?<br><br>On the other hand, there is rapidly growing danger because of nuclear proliferation, arms race, terrorism, breakdown of relationships, generation gap, depression & suicidal attempts etc. - what do you think, is the root cause of these threats to human happiness |

| | |
|---|---|
| | and peace - what could be the way out in your opinion? |
| 3 | Observe that each of us has the faculty of „Natural Acceptance", based on which one can verify what is right or not right for him. (As such we are not properly trained to listen to our „Natural Acceptance" and may a time it is also clouded by our strong pre-conditioning and sensory attractions).<br><br>Explore the following:<br><br>What is Naturally Acceptable" to you in a relationship the feeling of respect or disrespect for yourself and for others?<br><br>What is „naturally Acceptable" to you - to nurture or to exploit others? Is your living in accordance with your natural acceptance or different from it?<br><br>2. Out of the three basic requirements for fulfillment of your aspirations - right understanding, relationship and physical facilities - observe how the problems in your family are related to each. Also, observe how much time & effort you devote to each in your daily routine. |
| 4 | 1. a. Observe that any physical facility you use, follows the given sequence with time:<br><br>Necessary and tasteful - unnecessary but still tasteful - unnecessary and tasteless - intolerable<br><br>b. In contrast, observe that any feeling in you is either naturally acceptable or not acceptable at all. If not acceptable, you want it continuously and if not acceptable, you do not want it any moment!<br><br>2. List down all your important activities. Observe whether the activity is of „I" or of Body or with the participation of both or with the participation of both „I" and Body.<br><br>Observe the activities within „ I". Identify the object of your attention for different moments (over a period of say 5 to 10 minutes) and draw a line diagram connecting these points. Try to observe the link between any two nodes. |
| 5 | 1. Write a narration in the form of a story, poem, skit, or essay to clarify a salient Human Value to the children.<br>2. Recollect and narrate an incident in your life where you were able to exhibit willful adherence to values in a difficult situation. |
| 6 | List down some common units (things) of Nature which you come across in your daily life and classify them in the four orders of Nature.<br>Analysis and explain the aspect of mutual fulfillment of each unit with other orders. |
| 7 | Identify any two important problems being faced by the society today and analyze the root cause of these problems. Can these be solved on the basic of natural acceptance of human values? If so, how should one proceed in this direction from the present situation? |
| 8 | 1. Suggest ways in which you can use your knowledge of Science/Technology/Management etc. for moving towards a universal human order.<br>2. Propose a broad outline for humanistic Constitution at the level of Nation. |
| 9 | **Project:** |

| | |
|---|---|
| | Every student required to take-up a social project e.g. educating children in needy/weaker section; services in hospitals, NGO's and other such work i.e. social work at villages adopted by respective institute/ college. |

**Code: 25BESCES2101** **Geospatial Techniques-I** **3.0 Credits [LTP: 3-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Understand the fundamental principles and components of remote sensing, including electromagnetic radiation and its interactions with the atmosphere and Earth's surface. | Understand |
| CO2 | Classify different satellite platforms, sensors, and types of spatial, spectral, temporal, and radiometric resolutions in remote sensing systems. | Analyze |
| CO3 | Apply the principles of thermal and microwave remote sensing for analyzing surface temperature, roughness, and dielectric properties of various materials. | Apply |
| CO4 | Utilize digital image processing techniques such as image rectification, enhancement, and classification for satellite image interpretation. | Apply |
| CO5 | Analyze the applications of remote sensing in urban planning, disaster management, forest monitoring, water resource management, and climate change studies. | Analyze |

## B. MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | **2** | **1** | **1** | **-** | **1** | **–** | **3** | **-** | **–** | **–** | **–** | **1** | **1** | **1** | **2** |
| **CO2** | 2 | 1 | 2 | **-** | 2 | – | 3 | **-** | – | – | – | 1 | 1 | 1 | 2 |
| **CO3** | **2** | **1** | **2** | **–** | **2** | **–** | **3** | **-** | **–** | **–** | **–** | **1** | **1** | **1** | **2** |
| **CO4** | **2** | **1** | **2** | **-** | **2** | **–** | **3** | **-** | **–** | **–** | **–** | **1** | **1** | **1** | **2** |
| **CO5** | **2** | **1** | **2** | **-** | **2** | **–** | **3** | **-** | **–** | **–** | **–** | **1** | **1** | **1** | **2** |
| **WT. AVG** | **2** | **1** | **1.8** | **-** | **1.8** | **-** | **3** | **-** | | | | **1** | **1** | **1** | **2** |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| **1.** | **Introduction to Remote Sensing** | **9** |
| **2.** | **Satellite Remote Sensing** | **10** |
| **3.** | **Thermal and Microwave Remote Sensing** | **9** |
| **4.** | **Digital image processing** | **8** |
| **5.** | **Application areas of Remote Sensing** | **9** |

### b. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| **1.** | **Introduction to Remote Sensing** |

| | |
|---|---|
| | • Introduction of unit<br>• Definition and basic concepts of Remote Sensing– components of remote sensing- energy sensor, interacting body– active and passive remote sensing<br>• Electromagnetic radiation (EMR), EMR spectrum, visible, infrared (IR) near IR, middle IR, thermal IR, Microwave, black body radiation, Plancks Law, Stefan, Boltzman law.<br>• Physical quantities: radiance, irradiance, incident, reflected, absorbed and transmitted energy, reflectance, specular and diffused reflection surfaces<br>• Atmospheric characteristics –scattering of EMR, Raliegh, Mie, Non-selective and Raman scattering.<br>• EMR interaction with water vapor and ozone, atmospheric window, significance.<br>• EMR interaction with earth surface material(water, soil and earth surface), spectral signature, spectral signature curves, |
| **2.** | **Satellite Remote Sensing** |
| | • Introduction of unit<br>• Platforms – aerial and space platforms, balloons. Helicopters, aircrafts and satellites,<br>• Different types of resolutions associated with satellite images: spatial, spectral, radiometric and temporal<br>• Satellites : classification based on orbits, sun synchronous and geo synchronous, based on purpose – earth resources satellites, communication satellites, weather satellites, spy-satellites,<br>• Satellite sensors: Description of multi-spectral scanning –along and across track scanners<br>• Description of sensors in IRS series, LANDSAT series<br>• Radiometric and Geometric errors associated with remote sensing images |
| **3.** | **Thermal and Microwave Remote Sensing** |
| | • Introduction of unit<br>• Principles of thermal remote sensing<br>• Thermal Properties of Earth surface features: Kinetic heat, Temperature, Thermal Capacity, Thermal conductivity, Thermal Inertia, , Thermal IR multispectral spectral scanner<br>• Principles of microwave remote sensing<br>• Basic concepts: wavelength range, different bands with pentration power, Advantage of microwave remote sensing over optical remote sensing<br>• Backscattering, Range Direction, Azimuth Direction, Incident Angle, Depression Angle, Polarization, Dielectric Properties, Surface Roughness and Interpretation<br>• Current satellites, radar, speckle, back scattering, side looking air borne radar, synthetic aperture radar – radiometer radar, |
| **4.** | **Digital image processing** |
| | • Introduction of unit<br>• FCC composites<br>• Interpretation of satellite images, Elements of interpretation – visual interpretation,<br>• Digital image processing techniques: Image rectification; Geometric and atmospheric correction<br>• Image enhancement: Radiometric (Contrast enhancement techniques), spatial (Filtering) and spectral enhancement (Band ratios and PCA)<br>• Image classification: Supervised and unsupervised |
| **5.** | **Application areas of Remote Sensing** |
| | • Urban applications – water resources, Urban analysis, watershed management, resources information system<br>• Application of Remote sensing in Disaster monitoring and mitigation; extreme rainfall induced flooding, landslide,<br>• Application of Remote sensing in forest studies: Phenological changes, biomass estimation etc<br>• Application of Remote sensing in monitoring climate change |

**c. RECOMMENDED STUDY MATERIAL:**

| Sr. No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Fundamentals of Remote Sensing", 3rd Edition | Joseph, George and Jeganathan, C. | 2017 | Universities Press. |
| 2. | Introduction to Remote Sensing | Campbell, J.B., and Wynne, R. | 2011 | The Guilford Press |
| 3. | Remote Sensing of the Environment – An Earth Resources Perspective | Jensen, J.R. | 2006 | Pearson Education, Inc. (Singapore) Pvt. Ltd., Indian edition, Delhi. |
| 4 | Remote sensing geology. | R.P. Gupta | 2003 | New York, Springer. |
| 5 | Introductory Digital Image Processing A remote sensing perspective | Jensen, J.R. | 1996 | Prentice Hall Seies in GIS , USA |
| 6 | Remote Sensing and Image Interpretation | Lillesand, Thomas M. and Kiefer, Ralph, W. | 2007 | 4th Edition, John Wiley and Sons, New York |

**Code: 25BESCES2102 ENVIRONMENTAL POLLUTION AND CONTROL-I 3.0 Credits [LTP: 3-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Explain the nature and types of air pollutants and their major sources and effects on environment and human health | Understand |
| CO2 | Assess the various control methods of air pollution and equipment to control air pollution. | Evaluate |
| CO3 | Categorize the nature and types of water pollutants and their effects on environment and human health. | Analyze |
| CO4 | Illustrate the different treatment and control methods for water pollution. | Apply |
| CO5 | Explain the nature and types of noise pollutants their sources and effects on environment and human health. | Understand |

## B. MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 1 | - | - | - | 3 | 2 | - | - | - | 2 | - | - | - |
| **CO2** | 3 | 2 | 3 | 2 | - | - | 3 | 2 | - | - | - | 2 | 3 | 2 | 2 |
| **CO3** | 3 | 1 | 1 | 1 | - | - | 3 | 2 | - | - | - | 2 | - | - | - |
| **CO4** | 3 | 2 | 3 | 1 | - | - | 3 | 2 | - | - | 2 | 2 | 3 | - | 2 |
| **CO5** | 3 | 1 | - | - | - | - | 3 | 2 | - | - | - | 2 | 1 | - | - |
| **WT. AVG** | 3 | 1.6 | 2 | 1.3 | - | - | 3 | 2 | - | - | 2 | 2 | 2.3 | 2 | 2 |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | Air Pollution and its Effects | 9 |
| 2. | Air Pollution Control Methods | 9 |
| 3. | Water Pollution and its Effects | 9 |
| 4. | Drinking Water & its Treatment Methods | 9 |
| 5. | Noise Pollution and its Control | 9 |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| **1.** | **Air Pollution and its Effects** |
| | • Nature of pollutants: Biological, Chemical and Physical<br>• Types of air pollutants; their characteristics and sources<br>• Effects of major air pollutants (SOx, NOx, $CO_2$, $O_3$ PAN, $PM_{10}$ & PM $_{2.5}$) |
| **2.** | **Air Pollution Control Methods** |
| | • Basic methods of air pollution control (Reduction at source, change of process)<br>• Equipment used to control air pollution & their working principles<br>• Cyclones,<br>• ESP<br>• fabric filters<br>• Wet scrubbers |
| **3.** | **Water Pollution and its Effects** |
| | • Sources and types of water pollutants (Inorganic, organic, $O_2$ demanding, thermal, plant nutrients, sediments, radioactive and infectious agents)<br>• Effects of water pollutants on human health and environment |
| **4.** | **Drinking Water & its Treatment Methods** |
| | • Potable drinking water<br>• Treatment methods<br>• Coagulation<br>• Flocculation,<br>• Filtration and<br>• Disinfection |
| **5.** | **Noise Pollution and its Control** |
| | • Major sources of Noise pollution<br>• Effects of noise pollution on human health<br>• Control of noise pollution |

**E. RECOMMENDED STUDY MATERIAL:**

| Sr.No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Environmental Chemistry | Kaur, H. | 2014 | *(8th Ed.).* Meerut: Pragati Prakashan. |
| 2 | Water Pollution | P. K. Goel | 2006 | New age international pvt ltd Publisher |
| 2. | Air Pollution. | Rao, M.N., H. R. | 1989 | New Delhi: Tata Mcgraw Hill Publishing Company Limited |
| 4. | Environmental chemistry | A.K. De | 2010 | New age international pvt ltd Publisher |
| 5. | Environmental Pollution And Control | C.S. Rao | 2006 | New age international pvt ltd Publisher |
| 6. | Chemistry and Environmental Engineering | Telang, Saxena and Sharma | 2014 | New age international pvt ltd Publisher |
| 7 | Chemistry and Environmental Engineering | Gupta and Rani | 2013 | Ashirwad Publication |
| 8 | Environmental Science | S.C. Santra | 2011 | New Central Book Agency |

**Code: BESCES2103 ORGANIC CHEMISTRY 3.0 Credits [LTP: 3-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Distinguish between aromatic and antiaromatic compounds by comparing their structures along with their electrophilic aromatic substitution reactions. | Understand |
| CO2 | Explain basic principles of stereochemistry as well as differentiate configuration and conformation, Flying wedge and Fischer projection formula | Remember |
| CO3 | Categorize Nucleophilic Substitution ($SN^1$, $SN^2$ and $SN^i$) reactions with energy profile diagram. | Understand |
| CO4 | Explain the addition-elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reaction, relative reactivities of alkyl, allyl, vinyl and aryl halides. | Understand |
| CO5 | Classify and prepare 1°, 2° and 3° alcohols and demonstrate their reaction. | Understand |

## B. Mapping matrix of CO, PO & PSO

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 1 | 3 | - | - | - | - | - | - | - | - | - | 3 | - | - |
| **CO2** | 2 | 3 | 1 | - | - | - | - | - | - | - | - | - | 3 | - | - |
| **CO3** | 2 | 3 | 1 | - | - | - | - | - | - | - | - | - | 3 | - | - |
| **CO4** | 1 | 2 | 3 | - | - | - | - | - | - | - | - | - | 3 | - | - |
| **CO5** | 1 | 2 | 3 | - | - | - | - | - | - | - | - | - | 3 | - | - |
| **WT. AVG** | 1.6 | 2.2 | 2.2 | - | - | - | - | - | - | - | - | - | 3 | - | - |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the unit | Time required for the Unit (Hours) |
|---|---|---|
| **1.** | **Aromaticity** | **9** |
| **2** | **Stereochemistry** | **9** |
| **3.** | **Alkyl Halides** | **9** |
| **4.** | **Aryl Halides** | **9** |
| **5.** | **Alcohols** | **9** |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| **1.** | **Aromaticity** |
| | ● Introduction of the Unit<br>● Aromaticity: Nomenclature of benzene derivatives. The aryl group, aromatic nucleus and side chain.<br>● Structure of benzene: Kekule structure.<br>● Stability and carbon-carbon bond lengths of benzene, resonance structure<br>● Hückel's rule, aromatic character of arenes, cyclic carbocations/carbanions and heterocyclic compounds with suitable examples<br>● Electrophilic aromatic substitution: mechanism, role of sigma and pi-complexes.<br>● Halogenation, sulphonation, mercuration, Friedel-Crafts reactions and Mechanism of nitration, chloromethylation.<br>● Energy profile diagrams. Activating and dectivating substituents.<br>● Directive influence - orientation and ortho/para ratio.<br>● Conclusion & Real life applications |
| **2.** | **Stereochemistry** |
| | ● Introduction of the Unit<br>● Concept of isomerism<br>● Types of isomerism<br>● Difference between configuration and conformation<br>● Flying wedge and Fischer projection formula<br>● Properties of enantiomers, chiral and achiral molecules with two stereogeniccentre<br>● Diastereomers,threo and erythro isomers<br>● Mesocompounds<br>● Relative and absolute configuration, sequence rules D and L and R/S system of nomenclature.<br>● Geometric isomerism-Determination of configuration of geometrical isomers, ; *cis– trans* and E<br>/ Z nomenclature<br>● Geometric isomerism in oximes<br>● Conformational isomerism-Newman projection and saw house formula<br>● Conformational analysis of ethane, n butane and cyclo hexane<br>● Conclusion & Real life applications |
| **3.** | **Alkyl Halides** |
| | ● Introduction of the Unit<br>● (Upto 5 Carbons) Nomenclature<br>● Preparation*:* from alkenes *and* alcohols, methods of formation of alkyl halides.<br>● Reactions: hydrolysis, nitrile &isonitrile formation. Williamson's ether synthesis: Elimination versus substitution<br>● Types of Nucleophilic Substitution (SN1, SN2 and SNi) reactions with energy profile diagram<br>● Polyhalogen compounds: Chloroform, carbon tetrachloride, DDT, BHC<br>Conclusion & Real life application |

| | |
|---|---|
| **4.** | **Aryl Halides** |

| | |
|---|---|
| | ● Introduction of the Unit<br>● Aryl Halides Preparation:(Chloro, bromo and iodo-benzene case): from phenol, Sandmeyer & Gattermann reactions<br>● Methods of formation of aryl halides, nuclear and side chain reactions. The addition-elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions.<br>● Reactions *(*Chlorobenzene*):* Aromatic nucleophilic substitution (replacement by –OH group) and effect of nitro substituent. Benzyne Mechanism: KNH2/NH3 (or NaNH2/NH3).<br>● Conclusion & Real life applications |
| **5.** | **Alcohols** |
| | ● Introduction of the Unit<br>● Alcohols: Classification and Nomenclature**.**<br>● Monohydric Alcohols-Preparation*:* Preparation of 1º, 2º and 3º alcohols: using Grignard reagent, Ester hydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters, Hydogen bonding, Acidic Nature<br>● Reactions*:* With sodium, HX (Lucas test), esterification, oxidation (with PCC, alk. KMnO4, acidic dichromate, conc. HNO3), Oppeneauer oxidation<br>● Conclusion & Real life applications |

## E. RECOMMENDED STUDY MATERIAL:

| Sr. No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1 | A Text Book of Organic Chemistry | K. S. Tiwari, S. N. Mehrotra and N. K. Vishnoi | Latest | Vikas Publishing House |
| 2. | Modern Principles of Organic Chemistry | M. K. Jain & S. C. Sharma | 2015 | Vishal Publishing Co |
| 3 | A Text Book of Organic Chemistry | B. S. Bahl and ArunBahl | Latest | S. Chand |
| 4 | Organic Chemistry | S. M. Mukherji, S. P. Singh and R. P. Kapoor | Vol. I, II & III | Wiley Eastern Ltd. (New Age International) |
| 5 | Organic Chemistry | Morrison & Boyd | Latest | Prentice Hall |

**Code: BESCES2104 WEB DEVELOPMENT 3.0 Credits[LTP:3-0-0]**

## A. COURSEOUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Recall internet history and protocols, understand web architectures, and HTML, CSS, and JS for web development. | Remember |
| CO2 | Understand HTML and CSS basics, apply tags and styles, and create simple web pages. | Understand |
| CO3 | Apply XML and HTML5/CSS3 features, DOM manipulation, and analyze browser rendering stages. | Apply |
| CO4 | Analyze PHP syntax, apply server-side scripting, and manage HTTP requests and sessions. | Analyze |
| CO5 | Evaluate web servers, setup, domain management, and apply web authoring tools for website maintenance and traffic generation. | Evaluate |

## B. MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | 2 | 1 | 1 |
| CO2 | 3 | 3 | 2 | 1 | - | - | - | - | - | - | - | - | 2 | 1 | - |
| CO3 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | 1 | 1 | - |
| CO4 | 3 | 2 | 1 | - | - | - | - | - | - | - | - | - | - | - | - |
| CO5 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | - | - | - | - |
| WT. AVG | 2.8 | 2.2 | 1.4 | 1 | 1 | - | - | - | - | - | - | - | 1.8 | 1 | 1 |

## C. OUTLINEOFTHECOURSE

| Unit No. | Title of the unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | Introduction to the Internet and the World Wide Web | 9 |
| 2. | HTML & CSS | 9 |
| 3. | XML and HTML5, CSS3 | 9 |
| 4. | PHP Server Side Scripting | 9 |
| 5. | Practical Website Development | 9 |

## D. DETAILEDSYLLABUS

| Unit | Unit Details |
|---|---|
| 1. | Introduction to the Internet and the World Wide Web |

| | |
|---|---|
| | • Introduction of the Unit<br>• History of internet, Internet Design Principles, Internet Protocols - FTP, TCP/IP, SMTP, Telnet, etc., Client Server Communication, Web System architecture<br>• Evolution of the Web, Web architectures, Web clients and servers, Static and Dynamic Web Applications, Front end and backend web development.<br>• HTML, CSS, JS, XML; HTTP, secure HTTP, etc; URL, Web Services–SOAP, REST<br>• Conclusion of the Unit |
| 2. | **HTML& CSS** |
| | • Introduction of the Unit<br>• Introduction to Html, Html Document structure, Html Editors, Html element/tag & attributes, Designings implepage-Htmltag,Headtag,Bodytag;<br>• More Html tags - Anchor tag, Image tag, Table tag, List tag, Frame tag, Div tag ;Html forms - Input type, Textarea, Select, Button, Images.<br>• Introduction to CSS,Syntax, Selectors, Embedding CSS to Html, Formatting fonts, Text &background color,Inline styles, External and Internal StyleSheets, Borders &boxing<br>• Conclusion of the Unit |
| 3. | **XMLandHTML5,CSS3** |
| | • Introduction of the Unit<br>• Introduction to XML, Differenceb/wHtml& XML,XMLeditors, XMLElements & Attributes XML DTD, XMLSchema, XMLParser, Document Object Model(DOM),XMLDOM.<br>• Introduction to HTML5, CSS3, New features, Local storage stages. Serviceworkers |
| **4.** | **PHPServerSide Scripting** |
| | • Introduction of the Unit<br>• Introduction to PHP, Basic Syntax, Variables, constants and operators, Loops, Arrays Strings,<br>• Environment & environment variables, responding, Files, Cookies, Sessions, Examples.<br>• Conclusion of the Unit |
| **5** | **PracticalWebsiteDevelopment** |
| | • Introduction of the Unit<br>• Commonly used Web Servers and browsers, Setting up a server and domain name, website types and structures,<br>• Web authoring tools, Webhosting, website maintenance, generating traffic to your website.<br>• Conclusion of the Unit |

E. **RECOMMENDED STUDY MATERIAL:**

| Sr. No | Reference Book | Author | Publication |
|---|---|---|---|
| **1.** | Practical Web Design for Absolute Beginners | Adrian W. West | Apress2016 |
| **2.** | Introducing Web Development | Jorg Krause | Apress2017 |
| **3.** | HTML & CSS: The Complete Reference | Thomas Powell | Mc GrawHill, FifthEdition,2010 |
| **4.** | Creating a Website: The Missing Manual | Mathew Macdonald. O'Reilly | 3rdEdition |

| CODE: 25BESCES2204 | EXPLORATORY PROJECT-I | 1.0 Credits |
|---|---|---|

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Organize their content into a logical structure with an introduction, main points, and conclusion. | Apply |
| CO2 | Rehearse their presentation multiple times to become familiar with the material and improve your delivery. | Apply |
| CO3 | Analyze UV spectroscopy results and decide its band gap | Analyze |
| CO4 | To understand the writing structure of research paper/ article | Understand |

## B. MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | - | - | - | - | - | - | - | - | - | 3 | - | - |
| **CO2** | 3 | 2 | 2 | - | - | - | - | - | 2 | 2 | - | - | 3 | - | - |
| **CO3** | 2 | 2 | 3 | - | - | 3 | - | 1 | - | - | - | - | 3 | - | - |
| **CO4** | 3 | 2 | 1 | - | 3 | - | - | - | - | - | 1 | - | 2 | - | - |
| **CO5** | 2 | 2 | 2 | 2 | 2 | 1 | - | - | - | 2 | - | - | - | - | - |
| **WT. AVG** | 2.7 | 2.5 | 2.5 | 2 | 2.5 | 2 | - | 1 | 2 | 2 | 1 | - | 2.7 | - | - |

## C. LIST OF ACTIVITY

| | |
|---|---|
| 1 | Allocation of groups Max. 2 Members & guide |
| 2 | Black board presentation on topics as per the choice & feasibility |
| 3 | Submission of abstract & synopsis of the project |
| 4 | Procurement of the components |
| 5 | 2D/3D figure or model |
| 6 | Paper work like any circuit diagram and tentative cost |
| 7 | Final project report submission |
| 8 | Final presentation |

**Code: 25BESEES2201 ENVIRONMENT LAB-II 1.0 Credits [LTP: 0-0-2]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Evaluate key physico-chemical properties of water to assess its quality for environmental and public health purposes. | Evaluate |
| CO2 | Assess environmental noise levels using field instrumentation and understand the implications for urban planning and human health. | Evaluate |
| CO3 | Demonstrate proficiency in using QGIS software for spatial data visualization, management, and analysis. | Apply |
| CO4 | Apply geospatial techniques such as georeferencing and reprojection to integrate and analyze spatial data in environmental studies. | Apply |
| CO5 | Integrate environmental monitoring data with GIS tools for spatial interpretation and decision-making in environmental management. | Apply |

## B. MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 3 | 1 | - | - | 3 | 1 | 1 | 1 | 1 | 2 | 3 | - | 2 |
| CO2 | 2 | 3 | 2 | - | - | - | 3 | 1 | 1 | - | 1 | 1 | 3 | - | 2 |
| CO3 | 2 | 3 | 3 | 1 | 3 | - | 3 | - | - | - | 1 | 1 | 3 | - | 2 |
| CO4 | 2 | 3 | 3 | 1 | 3 | - | 3 | - | - | - | 1 | 1 | 3 | - | 2 |
| CO5 | 2 | 3 | 3 | 1 | 3 | - | 3 | - | - | - | 1 | 1 | 3 | - | 2 |
| WT. AVG | 2 | 3 | 2.8 | 1 | 3 | - | 3 | 1 | 1 | 1 | 1 | 1.2 | 3 | - | 2 |

## C. LIST OF EXPERIMENTS

| | |
|---|---|
| 1. | Estimation of Acidity in the water sample |
| 2 | Estimation of Alkalinity in the water sample |
| 3. | Estimation of Chloride in the water sample |
| 4 | Estimation of Free $CO_2$ in the water sample |
| 5 | Estimation of Total Hardness in the water sample. |
| 6. | Estimation of Total Dissolved Solids in the water sample |
| 7. | Measurement of Noise inside the university campus using Sound Level Meter (Field Practical). |
| 8. | Getting familiar with QGIS interface & Installing and updating plugins |
| 9 | Adding Vector and Raster data layers to QGIS map Canvas |
| 10 | To georeference a satellite image using a georeferenced toposheet |
| 11 | Projection and reprojection of vector and raster data sets by using Quantum GIS |
| 12 | Getting familiar with QGIS interface & Installing and updating plugins |

**Code: 25BESEES2202 CHEMISTRY LAB-II 1.0 Credits [LTP: 0-0-2]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Describe the physical and chemical properties of common organic functional groups | Understand |
| CO2 | Understand the concept of separating the mixture. | Understand |
| CO3 | Demonstrate instrumental analysis technique in chemistry. | Apply |
| CO4 | Understand the concept of surface tension and viscosity. | Understand |
| CO5 | Understand the states of matter | Understand |

## B. MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 2 | - | - | - | - | - | - | - | - | 1 | 3 | - | - |
| CO2 | 2 | 3 | 3 | - | - | - | - | - | - | - | - | 1 | 3 | - | - |
| CO3 | 2 | 3 | 3 | - | - | - | - | - | - | - | - | 1 | 3 | - | - |
| CO4 | 2 | 3 | 2 | - | - | - | - | - | - | - | - | 1 | 3 | - | - |
| CO5 | 2 | 2 | 3 | - | - | - | - | - | - | - | - | 1 | 3 | - | - |
| WT. AVG | 2 | 3 | 2.6 | | | | | | | | | 1 | 3 | - | - |

## C. LIST OF EXPERIMENTS

| | |
|---|---|
| **Organic Chemistry** | |
| 1 | To determine the functional group and identify the given organic compound. |
| 2 | To determine the functional group and identify the given organic compound. |
| 3 | To determine the functional group and identify the given organic compound. |
| 4 | To crystallize s acetanilide from hot water |
| 5 | To purify the given organic mixture by Sublimation |
| 6 | To separate the mixture (1 solid+1 liquid) by distillation. |
| **Physical Chemistry** | |
| 7 | To determine the surface tension of the pure liquid (alcohol etc.) with the help of Stalagmometer. |
| 8 | To determine the viscosity of the given liquid with the help of viscometer. |
| 9 | To determine critical solution temperature and composition of phenol water system. |
| 10 | To determine the percentage composition of a given mixture (non-interacting system) by viscosity method/ surface tension method. |
| 11 | Estimation of Fe(II) with $K_2Cr_2O_7$ using internal indicator (diphenylamine, N-phenylanthranilic acid) and discussion of external indicator. |
| 12 | Estimation of sodium carbonate using standardized HCl. |

| Code: 25BEEES2203 | WEB DEVELOPMENT LAB-II | 1.0 Credit [LTP: 0-0-2] |
|---|---|---|

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Recall fundamental HTML, CSS, and PHP concepts to create basic web pages and server configurations. | Remember |
| CO2 | Understand web technologies, including HTML elements, CSS properties, and PHP scripting for dynamic content. | Understand |
| CO3 | Apply HTML, CSS, and PHP techniques to design functional and interactive web pages with forms, tables, media players, and geolocation features. | Apply |
| CO4 | Analyze the integration of different web technologies to create dynamic, user-interactive content such as XML Http Requests and data retrieval. | Analyze |
| CO5 | Evaluate the effectiveness of web pages through practical exercises involving session tracking, file manipulation, and creating static and dynamic websites. | Evaluate |

## B. MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | **2** | **3** | **3** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **3** | **-** | **-** |
| **CO2** | **2** | **3** | **2** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **3** | **-** | **-** |
| **CO3** | **2** | **3** | **3** | **1** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **3** | **-** | **-** |
| **CO4** | **2** | **3** | **3** | **1** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **3** | **-** | **-** |
| **CO5** | **1** | **2** | **3** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **3** | **-** | **-** |
| **WT. AVG** | **1.8** | **2.8** | **2.8** | **1** | | | | | | | | | **3** | | |

## C. LIST OF EXPERIMENTS:

| Part A | |
|---|---|
| | 1. 1. Hello World Web Page<br>a) Create a web page using basic HTML features like tags, attributes, elements and page title.<br>b) How to install, and configure a web server<br>2. Create a My Profile Page<br>a) A more functional web page by making use of headings, paragraphs, lists, images and links.<br>b) Design a web page using CSS include the following:<br>i. Use different font styles.<br>ii. Set background image for both the page and single elements on the page.<br>3. Create a My Profile Page<br>a) Using textboxes, check boxes, radio buttons and submit buttons.<br>b) Design a web page using CSS include the following:<br>i. Control the repetition of image with background-repeat property.<br>ii. Define style for links as a: link, b: active, c: hover, d: visited.<br>iii. Add customized cursors for links.<br>4. Create XMLHttpRequest and retrieve data from a text file and an XML file.<br>5. Create the following webpage:<br>a) Show the class timetable in a tabular format.<br>b) Create a webpage using HTML to show your geolocation.<br>6. Create a webpage using HTML for audio and video player. |

| Part B | |
|---|---|
| | 7. Create a login registration form using PHP.<br>8. Develop a PHP webpage to manipulating files such as creating, writing, reading and uploading.<br>9. Create a dynamic webpage by using PHP conditional operators, loops and strings to create an dynamic timetable page.<br>10. Develop a PHP web application track the user as how many times visited and last visited time<br>11. Develop a static website – I.<br>12. Develop a dynamic website –II |

**Code: 25BEACHM2211 Applied English Communication Skills- II Credits: 1 (1-0-2)**

A. **COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING**

| Course Outcomes | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| **CO1** | Demonstrate effective verbal and written communication in professional contexts. | Analyze |
| **CO2** | Create impactful visual and written content using digital tools. | Create |
| **CO3** | Apply business vocabulary and networking strategies in professional interactions. | Understand |
| **CO4** | analyze and respond to organizational and marketing communication challenges. | Evaluate |
| **CO5** | Demonstrate competence in client-facing, freelance, and personal branding skills. | Evaluate |

B. **MAPPING MATRIX OF CO, PO & PSO**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 1 | 2 | 1 | 1 | - | 2 | 2 | 3 | 2 | 2 | - | 1 | 1 |
| CO2 | 1 | 1 | 1 | 2 | 3 | 1 | - | 2 | 2 | 3 | 2 | 2 | - | 1 | 1 |
| CO3 | 1 | 2 | 1 | 2 | 2 | 2 | - | 2 | 2 | 3 | 2 | 2 | - | 1 | 1 |
| CO4 | 2 | 2 | 2 | 3 | 2 | 2 | 1 | 2 | 2 | 3 | 2 | 2 | - | 1 | 1 |
| CO5 | 1 | 2 | 1 | 2 | 2 | 2 | - | 3 | 3 | 3 | 2 | 2 | - | 1 | 1 |
| Wt. AVG | 1.4 | 1.6 | 1.2 | 2.2 | 2 | 1.6 | 1 | 2.2 | 2.2 | 3 | 2 | 2 | - | 1 | 1 |

C. **OUTLINE OF THE COURSE**

| Unit No. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| **1** | Foundations of Professional Communication | 3 |
| **2** | Communication through Visual Tools | 3 |
| **3** | Professional Writing and Market Communication | 3 |
| **4** | Organizational Communication and Events | 3 |
| **5** | Personal Branding and Freelance Communication | 3 |

D. **DETAILED SYLLABUS**

| **LIST OF LABS** | |
|---|---|
| | **Unit I – Foundations of Professional Communication** |
| 1 | **Introduction to the Course & Getting Started**<br>– Overview, expectations, engagement strategies. |
| 2 | **Semantics for Professional Speech**<br>– Word choice, tone, clarity, and context in communication. |
| 3 | **Business Vocabulary – Part 1**<br>– Workplace terms, expressions, and professional tone. |
| | **Unit II – Communication through Visual Tools** |
| 4 | **Design Essentials – Canva**<br>– Basics of visual content creation using Canva. |
| 5 | **Design Essentials – Microsoft PowerPoint**<br>– Effective slide design, animation, and multimedia use. |
| 6 | **Design Essentials – Paste, Prezi & Other Tools**<br>– Exploration of dynamic and interactive presentation platforms. |
| | **Unit III – Professional Writing and Market Communication** |

| | |
|---|---|
| 7 | **Report Writing**<br>– Structure, clarity, and objectivity in professional reporting. |
| 8 | **Proposal Writing**<br>– Persuasive writing for project and funding proposals. |
| 9 | **Digital Marketing – Email Newsletters & social media**<br>– Targeted communication, platform-specific strategies. |
| | **Unit IV – Organizational Communication and Events** |
| 10 | **Networking 101**<br>– Building professional relationships and connections. |
| 11 | **Event Management**<br>– Planning, coordination, and execution of events. |
| 12 | **Intra-Organization Communication – Case Studies**<br>– Internal communication systems, case-based analysis. |
| | **Unit V – Personal Branding and Freelance Communication** |
| 13 | **Personal Branding & Impression Management**<br>– Crafting a personal image for career and social platforms. |
| 14 | **Nuts and Bolts of Freelance Work**<br>– Contracts, client management, freelance structures. |
| 15 | **Nuts and Bolts of Client-facing Work**<br>– Etiquette, service professionalism, and conflict handling. |

**CODE: 25BELCSE2201 SKILL ENHANCEMENT COURSES-II 1 Credit [LTP: 0-0-2]**

**Course: Soft Skills -2**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcomes | At the end of this course, Student will be able to: | Bloom Level |
|---|---|---|
| CO1 | Prepare a strong professional profile including resume writing, personal branding, and mock interview practices to enhance employability. | Understand |
| CO2 | Apply research, analytical, and critical thinking skills for informed decision-making and effective problem-solving in academic and professional contexts. | Apply |
| CO3 | Design and evaluate business models through idea generation, product planning, marketing strategies, and financial planning. | Apply |
| CO4 | Present business ideas effectively using structured business plans and pitching techniques in simulated or real entrepreneurial settings. | Understand |

## B. MAPPING MATRIX OF CO, PO, & PSO

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | P08 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 1 | 1 | 1 | 2 | 2 | - | 2 | 3 | 3 | 2 | 3 | - | 1 | 3 |
| **CO2** | 2 | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 3 | - | 1 | 3 |
| **CO3** | 2 | 2 | 2 | 3 | 2 | 2 | 1 | 2 | 3 | 2 | 3 | 3 | - | 1 | 3 |
| **CO4** | 2 | 2 | 2 | 2 | 2 | 2 | - | 2 | 3 | 3 | 3 | 2 | - | 1 | 3 |
| **WT. AVG** | 2 | 2 | 2 | 2.2 | 2 | 1.75 | 1 | 2 | 2.75 | 2.5 | 2.5 | 2.75 | - | 1 | 3 |

## C. DETAILED SYLLABUS

| | Topic | Sub Topic |
|---|---|---|
| 1 | Group discussion | Importance of GD<br>Dos and Don'ts<br>GD topic types<br>Idea generation techniques<br>One mock GD with 12 volunteers, facilitated by the trainer |
| 2 | Personal Interview | Self-introduction – Practice<br>Body language for interviews<br>FAQ discussion |
| 3 | Resume writing | Important aspects of a good resume<br>Sample template and formatting ideas |
| 4 | Group discussion – Mock | Mock GDs – 5 GDs with 12 members in a GD<br>Each GD for 15 minutes<br>Detailed feedback after each GD by the trainer |
| 5 | Personal interview – Mock | A snapshot of what happens in a 3 hour session –<br>The process detailed below is repeated for every session with students shuffling between trainers 1 and 2.<br><br>Personal interview mock (for 15 students) by trainer 1:<br>· Mock PI for each candidate<br>· Individual feedback and areas of improvement<br>· Simulation of an actual interview experience<br><br>Personal interview practice (for the remaining 45 students) by trainer 2:<br>· Students made to perfect their answers to FAQs<br>· Interview-role play activity<br>· Extempore |

| | | |
|---|---|---|
| 6 | Research Skills and Information Literacy | This session equips students with tools to find, evaluate, and use information critically. In an era of information overload, these skills are vital for academic success, innovation, and informed decision-making. |
| 7 | Social Awareness & Relationship Management | This module builds emotional intelligence, helping students understand others' perspectives and manage interactions constructively. It enhances teamwork, leadership, and conflict resolution—core components of professional effectiveness. |
| 8 | Spotting a Business Opportunity | Introduction to entrepreneurship<br>Idea generation<br>Ideas to opportunities<br>Innovation in entrepreneurship<br>Case studies |
| 9 | Planning Your Product and Company | Creating thorough market research<br>Product Conceptualization and Development Plan<br>Case studies |
| 10 | Exploring Business Model | Types of Business Models<br>Value Proposition<br>Revenue Streams and Cost Structure<br>Channels and Distribution |
| 11 | Marketing and Branding | Sales, Marketing and Branding<br>Marketing mix<br>Target segmentation<br>Types of marketing used<br>CRM<br>Case studies |
| 12 | Financial Planning and Budgeting | Financing the business<br>Fundraising techniques<br>Investors and stages |
| 13 | Business Plan and Pitching | Creating a business plan<br>Pitching<br>Types of pitching and how to do them |
| 14 | Pitch Event and Product Launch | Final pitch event where participants present their business ideas to a panel of judges, investors, or potential customers. |
| 15 | Email Writing | Helps participants write clear and professional emails with the right tone and structure. Covers greetings, body, closings, and common errors to avoid. Includes real-life practice for confident workplace communication. |

**Code: 25BUVCVE2102 ENVIRONMENT AND SUSTAINABILITY 2.0 Credits [LTP: 2-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Understanding of the concept of sustainable development | Understand |
| CO2 | Classification of energy resources depending upon their origin and their conservation | Understand |
| CO3 | Understanding of the Disaster Management | Understand |
| CO4 | Summarize social issues related to population, resettlement and rehabilitation of project affected persons | Understand |
| CO5 | Understanding of the local environmental assets with simple ecosystems and identify local flora and fauna. | Understand |

## B. MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 1 | – | – | – | – | 3 | 2 | – | – | - | 1 | – | – | - |
| **CO2** | 2 | 3 | 2 | – | – | – | 3 | 2 | – | – | 1 | 1 | – | – | 1 |
| **CO3** | 1 | 2 | – | – | – | – | 2 | 3 | – | – | - | 1 | – | | 1 |
| **CO4** | 1 | 2 | – | – | 2 | – | 3 | 2 | – | – | - | 1 | – | – | - |
| **CO5** | 1 | – | 2 | 2 | – | – | 2 | 1 | – | – | - | 1 | – | | 1 |
| **WT. AVG** | 1.4 | 2 | 2 | 2 | 2 | - | 2.6 | 2 | - | - | 1 | 1 | - | – | 1 |

## C. OUTLINEOFTHECOURSE

| Unit No. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | Introduction of Sustainable Development Concept | 6 |
| 2. | Energy Resources and Conservation | 6 |
| 3. | Disaster Management | 6 |
| 4. | Role of Environment in Human Society | 6 |
| 5. | Field Work | 6 |

## D. DETAILEDSYLLABUS

| Unit | Unit Details |
|---|---|
| 1. | **Introduction of Sustainable development concept** |
| | • Introduction of Unit<br>• Concept of sustainability and sustainable development.<br>• Ecosystem: Structure and function of ecosystem<br>• Energy flow in an ecosystem: food chains, food webs and ecological succession.<br>• Case studies of the following ecosystems: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems<br>• Biodiversity and Conservation<br>• Conclusion & Real Life Application |
| 2. | **Energy Resources and Conservation** |
| | • Introduction of Unit<br>• Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies. |

| | |
|---|---|
| | • Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act.<br>• International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD)<br>• Conclusion & Real Life Application |
| **3.** | **Disaster Management** |
| | • Introduction of the Unit<br>• Disaster management: floods, earthquake, cyclones and landslides.<br>• Climate change, global warming, ozone layer depletion<br>• Acid rain and impacts on human communities and agriculture<br>• Conclusion & Real Life Application |
| 4. | **Role of Environment in Human Society** |
| | • Introduction of Unit<br>• Human population growth: Impacts on environment, human health and welfare.<br>• Resettlement and rehabilitation of project affected persons; case studies.<br>• Disaster management: floods, earthquake, cyclones and landslides.<br>• Conclusion & Real Life Application |
| 5. | **Field Work** |
| | • Introduction of Unit<br>• Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc.<br>• Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.<br>• Study of common plants, insects, birds and basic principles of identification.<br>• Study of simple ecosystems-pond, river, dissert etc.<br>• Conclusion & Real Life Application |

**E. RECOMMENDEDSTUDYMATERIAL:**

| Sr. No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1 | Natural Resource Conservation – Management for Sustainable Future | Owen, O.S, Chiras, D.D, &Reganold, J.P. | 1998 | Prentice Hall. |
| 2. | Fundamentals of Materials for Energy and Environmental Sustainability. | Ginley, D.S. &Cahen, D | 2011 | Cambridge University Press. |
| 3. | Environmental Science. | Miller, T.G. | 2012 | Wadsworth Publishing Co |
| 4. | Conservation of Natural Resources | Klee, G.A | 2001 | Prentice Hall Publication. |

| Code: 25BUVCVH2104 | YOGA FOR LIFE | 2.0 Credits [LTP: 2-0- |
|---|---|---|

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Understanding ways to harmonize the body and mind through Yoga | understand |
| CO2 | Disciplining the traditional yoga texts | Remember |
| CO3 | Understanding of Beginner exercises in yoga | Understand |
| CO4 | Understand the value of traditional surya namaskar | Understand |
| CO5 | Understand the value of Yoga for holistic living, Personality Development | Understand |

## B. MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | **1** | - | - | - | - | - | - | **1** | - | - | - | **3** | - | - | **2** |
| **CO2** | **1** | - | - | - | - | - | - | **1** | - | - | - | **3** | - | - | **2** |
| **CO3** | **1** | - | - | - | - | - | - | **1** | - | - | - | **3** | - | - | **2** |
| **CO4** | **1** | - | - | - | - | - | - | **1** | - | - | - | **3** | - | - | **2** |
| **CO5** | **1** | - | - | - | - | - | - | **1** | - | - | - | **3** | - | - | **2** |
| **WT. AVG** | **1** | - | - | - | - | - | - | **1** | - | - | - | **3** | - | - | **2** |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| **1.** | **Introduction to Yoga** | **6** |
| **2.** | **Introduction to Yogic texts** | **6** |
| **3.** | **Yogic Sukshma Vyayama** | **6** |
| **4.** | **Yogic Sthula Vyayama & Surya Namaskar** | **6** |
| **5.** | **Yogasana & Pranayama** | **6** |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| **1.** | **Introduction to Yoga** |
| | • Introduction of the Unit<br>• Yoga Etymology, definition, Aim, Objective<br>• Misconception Significance of Asana<br>• Yoga its origin , History & Development<br>• Conclusion & Real-life application |

| | |
|---|---|
| **2.** | **Introduction to Yogic texts** |
| | • Introduction of the Unit<br>• Patanjali's Yogasutra<br>• Hatha Pradeepika<br>• Conclusion & Real life applications |
| **3.** | **Yogic Sukshma Vyayama** |
| | • Introduction of the Unit<br>• Basics of Sukshma vyayama<br>• Types of Sukshma Vyayama<br>• Benefits of Sukshma Vyayama<br>• Conclusion & Real life applications |
| 4. | **Yogic Sthula Vyayama & Surya Namaskar** |
| | • Introduction of the Unit<br>• Types of Sthula vyayama<br>• Introduction to surya namaskar<br>• Surya namaskar with Mantra<br>• Conclusion & Real life applications |
| 5. | **Yogasana & Pranayama** |
| | • Introduction of the Unit<br>• Introduction to Asana<br>• Common Asana for memory growth, Physical fitness & Mental Health<br>• Prnayma for immunity boost<br>• Conclusion & Real life applications |

## E. RECOMMENDED STUDY MATERIAL:

| Sr. No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1 | Quality Council oflndia | Yoga professionals Official Guidebook for Level 2 | 2016 | Excel Books, New Delhi |
| 2. | Patanjali Yogasutras | Commentry by Swami Vivekanand | 2015 | Rajyoga |
| 3. | Hatha Pradeepika | Sahay G. S. | 2013 | MDNIY, New Delhi, |
| 4. | Yogic Suksma Vyayama, | Brahmachari Swami Dhirendra | 1986 | Dhirendra Yoga Publications, New Delhi, |
| 5. | Quality Council oflndia | Yoga professionals Official Guidebook for Level 2 | 2016 | Excel Books, New Delhi |
| 6. | Asanas, Pranayamaand Mudra Bandh | Swami Dayanand Saraswati | 2004 | Yoga Publications Trust, Munger-Bihar |

**Code: 25BESCES3101 ENVIRONMENTAL POLLUTION AND CONTROL-II 3.0Credits [LTP: 3-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Explain the types, sources, effects and control of soil pollution. | Understand |
| CO2 | Explain the nature and types of radiation pollution and their effects on environment and human health | Understand |
| CO3 | Classify the different types of thermal pollution and their effects on environment and human health | Analyze |
| CO4 | Assess the information about the Sewage composition and different types of and aerobic treatment System. | Evaluation |
| CO5 | Illustrate the different types of aerobic sewage treatment systems | Apply |

## B. MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | 1 | - | - | - | 2 | 1 | - | - | - | 1 | - | - | - |
| **CO2** | 2 | 2 | - | - | - | - | 2 | 1 | - | - | - | 1 | - | - | - |
| **CO3** | 2 | 2 | - | - | - | - | 2 | 1 | - | - | - | 1 | - | - | - |
| **CO4** | 2 | 3 | 3 | 1 | - | - | 3 | 1 | - | - | - | 1 | 3 | - | 1 |
| **CO5** | 2 | 3 | 2 | 1 | - | - | 3 | 1 | - | - | - | 1 | 3 | - | 1 |
| **WT. AVG** | **2** | **2.4** | **2** | **1** | | | **2.4** | 1 | | | | **1** | **3** | **-** | **1** |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the unit | Time required for the Unit (Hours) |
|---|---|---|
| **1.** | **Soil/Land pollution and its control** | **9** |
| **2.** | **Radiation pollution and its control** | **9** |
| **3.** | **Thermal pollution and its control** | **9** |
| **4.** | **Sewage & its Treatment-I** | **9** |
| **5.** | **Sewage & its Treatment-II** | **9** |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| **1.** | **Soil/Land pollution and its control** |

| | |
|---|---|
| | • Introduction of Unit<br>• Major sources of soil pollution<br>• Types and effects of soil pollutants (domestic and municipal waste, industrial and mining waste, agricultural waste, radioactive and chemical waste)<br>• Control of soil pollution<br>• Conclusion and real life application |
| **2.** | **Radiation pollution and its control** |
| | • Introduction of Unit<br>• Major sources of radiation pollution<br>• Effects of radiation pollution<br>• Conclusion and real life application |
| **3.** | **Thermal pollution and its control** |
| | • Introduction of Unit<br>• Sources and effects of thermal pollution<br>• Control of radiation and thermal pollution<br>• Conclusion and real life application |
| **4.** | **Sewage & its Treatment-I** |
| | • Introduction of Unit<br>• Sewage composition and characteristics<br>• Primary treatment, secondary treatment & tertiary treatment<br>• Anaerobic Treatment System: Upflow anaerobic sludge blanket reactor (UASB), Anaerobic fluidized bed reactor (AFB)<br>• Conclusion and real life application |
| **5.** | **Sewage & its Treatment-II** |
| | • Introduction of Unit<br>• Aerobic Treatment Systems:<br>• Activated sludge process<br>• Trickling filters<br>• Rotating biological contactors<br>• Moving Bed Biofilm Reactor MBBR<br>• Sequencing batch reactor(SBR)<br>• Conclusion and real life application |

## E. RECOMMENDED STUDY MATERIAL:

| Sr.No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Environmental Pollution And Control | Pierce, J., R. E. | 1998 | Usa: Butterworth-Heinemann (Elsevier) |
| 2. | Air Pollution | Rao, M.N., H. R. | 1989 | New Delhi: Tata Mcgraw Hill Publishing Company Limited |
| 3. | Environmental Pollution And Control | C.S. Rao | 2006 | New age international pvt ltd Publisher |
| 4. | Environmental Engineering | K.N. Duggal | 2012 | S. Chand |
| 5. | Environmental Engineering | D. Srinivasan | 2009 | PHI learning pvt ltd |

| Code: 25BESCES3102 | INORGANIC CHEMISTRY | 3.0 Credits [LTP: 3-0- |
|---|---|---|

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Describe the unique properties, coordination behavior, and oxidation states of d-block elements | Understand |
| CO2 | Analyze the chemistry of coordination compounds | Understand |
| CO3 | Describe the electronic configuration, atomic radii, ionic radii, oxidation state of lanthanides and their separation | Apply |
| CO4 | Describe Actinides; learn the separation techniques of trans- uranium elements. | Analyze |
| CO5 | Understand the basic principle of crystallization, distillation, solvent extraction, TLC and column chromatography | Remember |

### B. Mapping matrix of CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | 3 | - | - |
| CO2 | 3 | 3 | 2 | - | - | - | - | - | - | - | - | - | 3 | - | - |
| CO3 | 2 | 3 | 2 | 1 | - | - | - | - | - | - | - | - | 3 | - | - |
| CO4 | 2 | 3 | 2 | 1 | - | - | - | - | - | - | - | - | 3 | - | - |
| CO5 | 3 | 2 | | - | - | - | - | - | - | - | - | - | 3 | - | - |
| WT. AVG | 2.6 | 2.6 | 2.0 | 1.3 | - | - | - | - | - | - | - | - | 3 | - | - |

## C.OUTLINE OF THE COURSE

| Unit No. | Title of the unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | Transition Metals | 9 |
| 2. | Coordination Compounds | 9 |
| 3. | Lanthanides | 9 |
| 4. | Actinide | 9 |
| 5. | Separation Techniques and Chromatography | 9 |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| 1. | Transition Metals |

| | |
|---|---|
| | • Introduction to the Unit<br>• Characteristic Properties of d-Block Elements<br>• Properties of the Elements of the First Transition series<br>• Relative Stability of their Oxidation States<br>• Coordination number and Geometry<br>• Conclusion & real life application |
| **2.** | **Coordination Compounds** |
| | • Introduction to the Unit<br>• Coordination Compounds: Werner's theory, nomenclature, chelates, stereo-chemistry of coordination numbers 4, 5 and 6.<br>• Nomenclature and isomerism in coordination complexes.<br>• Important applications of coordination compounds.<br>• Theories of metal-ligand bonding in transition metal complexes- Sidgwick effective atomic number concept,<br>• valence bond theory of coordination compounds<br>• Conclusion & real life application |
| **3.** | **Lanthanides** |
| | • Introduction to the Unit<br>• **Lanthanides:** Comparative study of lanthanide elements with respect to electronic configuration, atomic and ionic radii, oxidation state and complex formation.<br>• Lanthanide contraction. Occurrence and principles of separation of lanthanides.<br>• General features and chemistry of Lanthanides<br>• Conclusion & real life application |
| **4.** | **Actinides** |
| | • Introduction to the Unit<br>• Actinides: Comparative study of actinide elements with respect to electronic configuration, atomic and ionic radii, oxidation states and complex formation;<br>• Occurrence and principles of separation.<br>• General features and chemistry of actinides, principles of separation of Np, Pu and Am from<br>• U. Trans-Uranium elements<br>• Comparison of Lanthanides and Actinides<br>• Conclusion & real life application |
| **5.** | **Separation Techniques and Chromatography** |
| | • Introduction to the Unit<br>• Separation Techniques: Principles and process of solvent extraction<br>• the distribution law and partition coefficient, batch extraction, continuous extraction and counter current distribution<br>• Gravimetric methods, theory of precipitation, co-precipitation, post precipitation, theory of purifying the precipitates<br>• Chromatography: Classification of chromatographic methods, Ion-exchange, thin layer and paper chromatography<br>• Conclusion & real life application |

## E. RECOMMENDED STUDY MATERIAL

| Sr. No. | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | A New Concise Inorganic Chemistry | J. D. Lee | 5th Edition | Chapman & Hall, London |
| 2. | Modern Inorganic Chemistry | R. C. Aggarwal | 1st Edition | KitabMahal, Allahabad |
| 3. | Basic Inorganic Chemistry | F. A. Cotton, G. Wilkinson, and Paul L. Gaus | 3rd Edition | John Wiley & Sons, New York |

**Code: 25BESCES3103 PHYSICAL CHEMISTRY 3.0 Credits [LTP: 3-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Determine structure of compounds by X ray diffraction methods and compare the chemical behavior and physical properties of common substances. | Understand |
| CO2 | Apply the concept of liquid crystals in applications of advanced technologies. | Apply |
| CO3 | Differentiate real gases from ideal gases at different temperature and pressure and explain methods of liquefaction of gases. | Apply |
| CO4 | Interpret the stability regions using Phase diagrams of one component and two component system and compounds with congruent and incongruent melting point. | Evaluate |
| CO5 | Understanding colloids and adsorption for chemical, biological, industrial applications. | Understand |

## B. Mapping matrix of CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 3 | - | - | - | - | - | - | - | - | - | 3 | - | - |
| CO2 | 2 | 1 | 3 | 1 | - | - | - | - | - | - | - | - | 3 | - | - |
| CO3 | 3 | 1 | 2 | 1 | - | - | - | - | - | - | - | - | 3 | - | - |
| CO4 | 3 | - | 2 | - | - | - | - | - | - | - | - | 1 | 3 | - | - |
| CO5 | 2 | 2 | 3 | - | - | - | - | - | - | - | - | 1 | 3 | - | - |
| WT. AVG | 2.6 | 1.5 | 2.6 | 1 | - | - | - | - | - | - | - | 1 | 3 | - | - |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | Solid State | 9 |
| 2. | Liquid State | 9 |
| 3. | Gaseous State | 9 |
| 4. | Phase Equilibrium | 9 |
| 5. | Colloids and Surface Chemistry | 9 |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| 1. | **Solid State** |
| | • Introduction of the Unit<br>• Solid state: Definition o fspace lattice, Unit cell.<br>• Laws of crystallography (i) law of constancy of interfacial angles (ii) law of rationality of indices (iii)law of symmetry.<br>• Symmetry elements in crystals. X ray diffraction by crystals<br>• Derivation of Braggs equation |

| | |
|---|---|
| | ● Determination of crystal structure of NaCl, KCl and CsCl<br>● Conclusion of the Unit |
| **2.** | **Liquid State** |
| | ● Introduction of the Unit<br>● Liquid State: Surface tension of liquids, capillary action, surface tension and temperature, interfacial tension<br>● Viscosity of liquids, experimental determination of viscosity coefficient, its variation with temperature.<br>● Intermolecular forces, structure of liquids (a qualitative description).<br>● Structural difference between solid, liquid and gases<br>● Liquid crystals: Difference between liquid crystal, solid and liquid. Classification, structure of nematic and cholestric phases. Thermography and seven-segment cell.<br>● Conclusion of the Unit |
| **3.** | **Gaseous State** |
| | ● Introduction of the Unit<br>● Gaseous State :Kinetic theory of gases, ideal gas laws<br>● Behavior of real gases - the Vander Waal's equation<br>● PV isotherms of real gases, continuity of state, Vander Waals equation and critical state.<br>● Principle of corresponding states, reduced equation of state.<br>● Molecular velocities- Root mean square, average and most probable velocities.<br>● Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter.<br>● Conclusion of the Unit |
| **4.** | **Phase Equilibrium** |
| | ● Introduction of the Unit<br>● Phase Equilibrium:Phases, components and degrees of freedom of a system.<br>● Gibbs Phase Rule and its thermodynamic derivation.<br>● Phase diagrams of one-component systems (water and sulphur) and two component systems involving eutectics.<br>● Bi-Cd system, Pb- Ag system, desilverisation of Pb.<br>● Solid Solutions-congruent and incongruent melting points .<br>● Conclusion of the Unit |
| **5.** | **Colloids and Surface Chemistry** |
| | ● Introduction of the Unit<br>● Colloidal state and colloidal systems, characteristics of true solutions<br>● Colloidal solutions and suspensions.<br>● Classification, preparation and purification of colloidal solutions,<br>● properties of colloidal solutions: Tyndal effect, Brownian motion.<br>● Adsorption- Physisorption and chemisorption – Freundlich adsorption isotherm – Langmuir adsorption isotherm.<br>● Conclusion of the Unit |

## E. RECOMMENDED STUDY MATERIAL:

| Sr.No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Physical Chemistry | G.M. Barrow | International student edition | McGraw Hill |
| 2. | Physical Chemistry | Barrow, G.M. | latest | Tata McGraw-Hill (2007). |

**Code: 25 BESCES3104 DATABASE MANAGEMENT SYSTEMS 3.0 Credits [LTP: 3-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Remember DBMS concepts and architecture, understand data independence, analyze database mappings and users | Remember |
| CO2 | Understand E-R model basics, apply design processes, analyze constraints, and extend E-R features. | Understand |
| CO3 | Apply relational model structures and algebra, analyze SQL concepts, queries, and transaction control commands. | Apply |
| CO4 | Analyze functional dependencies, apply normalization techniques, and evaluate database design implications. | Analyze |
| CO5 | Evaluate SQL query programming, analyze advanced SQL operations, and assess triggers in database applications. | Evaluate |

## B. MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | 1 | 2 | 1 | 1 |
| CO2 | 3 | 3 | 2 | 1 | - | - | - | - | - | - | - | 1 | 2 | 1 | - |
| CO3 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | 1 | 1 | 1 | - |
| CO4 | 3 | 2 | 1 | - | - | - | - | - | - | - | - | 1 | - | - | - |
| CO5 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | 1 | - | - | - |
| WT. AVG | 2.8 | 2.2 | 1.4 | 1 | 1 | - | - | - | - | - | - | 1 | 1.8 | 1 | 1 |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | Introduction of Database Management System | 9 |
| 2. | E-R Model | 9 |
| 3. | Relational Model | 9 |
| 4. | Database Design | 9 |
| 5. | SQL | 9 |

## D. **DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| **1.** | **Introduction of Database Management System** |
| | • Introduction of the unit<br>• Introductory concepts of DBMS : Introduction and applications of DBMS<br>• Purpose of data base, Data, Independence, Database System architecture- levels<br>• Mappings, Database, users and DBA<br>• Conclusion and real life application |
| **2.** | **E-R Model** |
| | • Introduction of the unit<br>• Entity-Relationship model : Basic concepts, Design process, constraints, Keys<br>• Design issues, E-R diagrams, weak entity sets, extended E-R features – generalization<br>• Specialization, aggregation, reduction to E-R database schema Conclusion and real life application<br>• Conclusion and real life application |
| **3.** | **Relational Model** |
| | • Introduction of the unit<br>• Relational Model : Structure of relational databases, Domains, Relations<br>• Relational algebra – fundamental operators and syntax, relational algebra queries, tuple relational calculus SQL Concepts : Basics of SQL, DDL,DML,DCL, structure – creation, alteration<br>• Defining constraints – Primary key, foreign key, unique, not null, check, IN operator, Functions - aggregate functions, Built-in functions – numeric, date<br>• String functions, set operations, Use of group by, having, order by, join and its types, Exist, Any, All , view and its types. transaction control commands – Commit, Rollback, Savepoint, Conclusion and real life application<br>• Conclusion and real life application |
| **4.** | Database Design |
| | • Introduction of the unit<br>• Relational Database design : Functional Dependency – definition, trivial and non-trivial FD<br>• Closure of FD set,closure of attributes, irreducible set of FD, Normalization – 1Nf, 2NF, 3NF, Decomposition using FD- dependency preservation, BCNF<br>• Multivalued dependency, 4NF, Join dependency and 5NF, Conclusion and real life application<br>• Conclusion and real life application |
| **5.** | **SQL** |
| | • Introduction of the unit<br>• SQL queries programming and Triggers: The Forms of a Basic SQL Query<br>• Union, and Intersection and Except, Nested Queries, Correlated Nested Queries<br>• Set-Comparison Operations, Null Values and Embedded SQL, Dynamic SQL, ODBC and JDBC, Triggers and Active Databases<br>• Conclusion and real life application |

E. **RECOMMENDED STUDY MATERIAL:**

| S.No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| **1.** | Database System Concepts | Abraham Silberschatz, Henry F. Korth, S. Sudharshan | 5th | McGraw-Hill Higher Education |
| **2.** | An Introduction to Database Systems | Bipin C Desai | Latest | Galgotia Publications |
| **3.** | Fundamentals of database Systems | Elmasri, Navathe | 3rd | Addison Wesley |
| **4.** | A First Course in Database Systems | Jefrey D. Ulman, Jenifer Widom | Latest | Pearson Education Asia |
| **5.** | Modern Database Management | Fred R Mc Fadden, Jeffery A Hoffer,v Mary B. Prescott | 5th | Addison Wesley |

**Code: 25BESEES3101 ENVIRONMENTAL IMPACT ASSESSMEN T 3.0 Credits [LTP: 3-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Explain environmental impact assessments. | Understand |
| CO2 | Describe the Major Steps to conduct an EIA | Understand |
| CO3 | Implement the various approaches employed in environmental impact assessments | Apply |
| CO4 | Describe the fundamentals of drafting an EIS. | Understand |
| CO5 | Discuss the mechanism of environmental auditing. | Understand |

## B. MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | - | 1 | - | - | 3 | 2 | - | - | - | 1 | - | - | - |
| CO2 | 3 | 2 | 2 | 2 | - | - | 2 | - | - | - | - | 1 | 1 | - | 3 |
| CO3 | 3 | 3 | 3 | 2 | - | - | 2 | - | - | - | 2 | 1 | 1 | - | 3 |
| CO4 | 3 | 3 | 3 | 2 | - | - | 2 | - | - | - | 2 | 1 | - | | 3 |
| CO5 | 3 | 3 | 3 | 2 | - | - | 3 | - | - | - | 2 | 1 | - | | 3 |
| WT. AVG | 3 | 2.6 | 2.7 | 1.8 | - | - | 2.4 | 2 | - | - | 2 | 1 | 1 | | 3 |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | **Introduction to EIA** | 9 |
| 2. | **Process of EIA** | 9 |
| 3. | **Methods used in EIA** | 9 |
| 4. | **Preparation of Environmental Impact Statement** | 9 |
| 5. | **Environmental Auditing** | 9 |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| 1. | **Introduction to EIA** |
| | • Introduction of unit<br>• Definition of EIA<br>• EIA and sustainable development<br>• Need for EIA<br>• EIA Notification 2006 |

| | |
|---|---|
| **2.** | **Process of EIA** |
| | • Introduction of unit<br>• Major Steps of EIA<br>• Screening<br>• Scoping<br>• Collection of baseline information<br>• Identification<br>• Prediction<br>• Evaluation |
| **3.** | **Methods used in EIA** |
| | • Introduction of unit<br>• Adhoc approach<br>• Overlay method<br>• Questionnaire method<br>• Checklist method<br>• Network method<br>• Matrix method |
| **4.** | **Preparation of Environmental Impact Statement** |
| | • Basic principles of writing an EIS<br>• Phases of writing EIS: Initial planning phase,<br>• Detailed planning phase and writing phase |
| | • |
| **5.** | **Environmental Auditing** |
| | • Introduction of unit<br>• Objectives of Environmental auditing<br>• Importance of Environmental auditing<br>• Steps of EA (outline) |

## E. RECOMMENDED STUDY MATERIAL:

| Sr.No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Ecology and Environment. | Sharma, P. D. | 2008 | Rastogi Publications |
| 2. | Environmental Impact Assessment | Canter, L. | 1995 | McGraw Hill |
| 3. | Environmental Impact Assessment | Caulier, Larry, W | 1st edition | TMH |
| 4. | Essential environmental studies | Mishra and Pandey | 2016 | Ane books pvt ltd |

**Code: 25BESEES3102** **ENVIRONMENT MANAGEMENT** **3.0 Credits [LTP: 3-0-**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Discuss the Energy Auditing Techniques, methods of conducting energy audit and energy audit report | Understand |
| CO2 | Explain the concept of Basic Electrical Systems, Bill Analysis, Lighting Systems and Transformers and Electric Distribution | Understand |
| CO3 | Differentiate various Electric Motors with Motor characteristic, Motor Efficiency, losses in induction motors, factor affecting motor performance. and Compressed Air Systems | Analyze |
| CO4 | Describe Environment pollution, global warming and climate change: Air pollution (local, regional and global); Water pollution problems; Land pollution and food chain contaminations. | Understand |
| CO5 | Define the chart of natural resources, Agricultural, industrial systems and environment, Energy technologies and environment | Remember |

## B. MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | - | - | 1 | - | - | - | - | 1 | 3 | - | 2 |
| CO2 | 2 | 3 | 2 | 3 | - | - | 1 | - | - | - | - | 1 | 3 | 2 | 2 |
| CO3 | 3 | 3 | 2 | - | - | - | 1 | - | - | - | - | 1 | 3 | - | 2 |
| CO4 | 3 | 2 | 3 | 2 | - | - | 1 | - | - | - | - | 1 | 3 | 2 | 2 |
| CO5 | 2 | 3 | 2 | 3 | - | - | 1 | - | - | - | - | 1 | 3 | - | 2 |
| WT. AVG | 2.6 | 2.8 | 2.4 | 2.5 | - | - | 1 | - | - | - | - | 1 | 3 | 2 | 2 |

## C. OUTLINE OF THECOURSE:

| Unit No. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | **Energy Auditing Techniques** | 9 |
| 2. | **Basic Electrical Systems** | 9 |
| 3. | **Electric Motors: ECO** | 9 |
| 4. | **Environment Pollution, Global Warming and Climate** | 9 |
| 5. | **Energy Technologies and Environment** | 9 |

**D. DETAILED SYLLABUS:**

| Unit | Unit Details |
|---|---|
| **1.** | **Energy Auditing Techniques** |
| | • Introduction of Unit<br>• Energy Auditing Techniques: Definition, Energy audit-need, Types of energy audit, Energy management (audit) approach- understanding energy costs, Bench marking, Energy performance, Matching energy use to Requirement, Maximizing system efficiencies, optimizing the input energy requirements, Fuel and energy substitution, Energy audit instruments. ,<br>• Methodologies of Conducting Energy Audit: Preliminary & Detailed Energy Audit Methodology: Preliminary Questionnaire, Review of Previous Records, Introductory Meeting, Walk through Tour, Flow Chart Construction for Detail Energy Audit, Identification of Required Audit Instruments, Finalization of Audit Schedule with the Company, Getting Detailed Data.<br>• Energy Audit Report: Outlines of Energy Audit Report Format Identification and Techno economic<br>• Analysis of Energy Conservation Measures, Classification of Energy Conservation Measures<br>• Conclusion and Summary of Unit |
| **2.** | **Basic Electrical Systems** |
| | • Introduction of Unit<br>• Basic Electrical Systems: Basis of Energy and its various forms: Electrical Basis-DC & AC, currents active power, reactive power and apparent power, star, delta connection.<br>• Bill Analysis: ECO (Energy Conservation Opportunities) Electricity tariff and components, load Management & Demand Side Control, power factor improvement & its benefit, selection and location of capacitors, Performance Assessment of capacitors & Capacitor Bank.<br>• Lighting Systems: Light source, Choice of Lighting, Luminance requirements, Energy conservation avenues.<br>• Transformers and Electric Distribution: Types of transformers, Transformer losses, Energy efficient transformers, Factor affecting the performance of transformers and Energy Conservation Opportunities, Cables, Switch Gears, Distribution Losses, and energy conservation opportunities in-house electrical distribution system.<br>• Conclusion and Summary of Unit |
| **3.** | **Electric Motors: ECO** |
| | • Introduction of Unit<br>• Electric Motors: ECO Introduction, Types, Motor characteristic, Motor Efficiency, losses in induction motors, factor affecting motor performance, Motor Load Survey: Methodology, Rewinding motor and replacement issues, Energy Saving Opportunities in Motors, Motor Selection, Energy Efficient Motors, Speed Control of AC Induction Motors, Soft starter with energy savers, Variable Speed Drives (VFD).<br>• Compressed Air Systems: ECO Introduction, Types of air compressors, compressor efficiency, efficient compressor operation, compressed air systems components, capacity assessment, and leakage test, factors affecting the performance and Efficiency, energy savings opportunities.<br>• Conclusion and Summary of Unit |
| **4** | **Environment pollution, global warming and climate change** |
| | • Introduction of Unit<br>• Environment pollution, global warming and climate change: Air pollution (local, regional and global); Water pollution problems; Land pollution and food chain contaminations; Carbon cycle, greenhouse gases and global warming; Climate change–causes and consequences; Carbon footprint; Management of greenhouse gases at the source and at the sinks Ecology,<br>• Structureandfunctioningofnaturalecosystems:Ecology,ecosystemsandtheirstructure,functioninga nddyn amics; Energy flow in ecosystems; Biogeochemical cycles and climate; Population and communities<br>• Conclusion and Summary of Unit |
| **5.** | **Energy technologies and environment** |

| | |
|---|---|
| | • Introduction of Unit<br>• Natural resources: Human settlements and resource consumption; Biological, mineral and energy resources; Land, water and air; Natural resources vis-à-vishuman resources and technological resources; Concept of sustainability; Sustainable use of natural resources<br>• Agricultural, industrial systems and environment: Agricultural and industrial systems visà-vis natural eco systems; Agricultural systems, and environment and natural resources; Industrial systems and environment<br>• Energy technologies and environment: Electrical energy and steam energy; Fossil fuels, hydro power and nuclear energy; Solar energy, wind energy and biofuels; Wave, ocean thermal, tidal energy and ocean currents; Geothermal energy; Future energy sources; Hydrogen fuels; Sustainable energy<br>• Conclusion and Summary of Unit |

## E. RECOMMENDED STUDYMATERIAL

| Sr.No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Ecology-Principles and Application | Chapman, J.L. and Reiss, M.J | 1st | Cambridge University Press(LPE) |
| 2. | Environmental Studies | Joseph,B | 1st | TataMc Graw-Hill |
| 3. | D.R.Energy Efficiency for Engineers and Technologists | Eastop, T.P. andCroft | 2nd | Longman and Harow |
| 4. | Environmental Science | Miller ,G.T | 2nd | Thomson |
| 5. | Energy Management | O'Callagan | 3rd | Mc Graw Hill Book Co. |
| 6. | Generation Of Electrical Energy Edition 2005 | B.R. Gupta | 1st | Eurasia Publishing House(PVT.) LTD. |

**Code: 25BESEES3201 ENVIRONMENTAL SCIENCE LAB-III 1.0 Credit [LTP: 0-0-2]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Analyze key physicochemical parameters of water and wastewater to assess pollution levels and water quality standards. | Analyze |
| CO2 | Estimate and interpret air quality by quantifying particulate matter ($PM_{10}$ and $PM_{2.5}$) using gravimetric methods. | Evaluate |
| CO3 | Examine critical physical and chemical properties of soil that influence fertility, structure, and water retention capacity. | Apply |
| CO4 | Apply skills in environmental sampling, laboratory analysis, and data interpretation following standard protocols. | Apply |
| CO5 | Evaluate environmental health indicators across water, air, and soil mediums for sustainable resource management and pollution control. | Evaluate |

## B. MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | **2** | **3** | **2** | **1** | **-** | **-** | **3** | **-** | **-** | **-** | **-** | **1** | **3** | **-** | **2** |
| **CO2** | **2** | **2** | **3** | **1** | **1** | **-** | **3** | **-** | **-** | **-** | **-** | **1** | **3** | **-** | **2** |
| **CO3** | **2** | **3** | **2** | **1** | **-** | **-** | **3** | **-** | **-** | **-** | **-** | **1** | **3** | **-** | **2** |
| **CO4** | **2** | **3** | **2** | **1** | **-** | **-** | **3** | **-** | **-** | **-** | **-** | **1** | **3** | **-** | **2** |
| **CO5** | **2** | **3** | **2** | **1** | **-** | **-** | **3** | **-** | **-** | **-** | **-** | **1** | **3** | **-** | **2** |
| **WT. AVG** | **2** | **2.8** | **2.2** | **1** | **1** | **-** | **3** | **-** | **-** | **-** | **-** | **1** | **3** | | **2** |

**CLIST O. F EXPERIMENTS**

| Sr. No | List of Experiments |
|---|---|
| 1 | Estimation of Dissolved oxygen in the water sample |
| 2 | Determination of B.O.D. of Wastewater Sample |
| 3 | Determination of COD in Water |
| 4 | Determination of Fluoride in Water |
| 5 | Determination of total solids, settable solids and suspended solids. |
| 6 | Determination of Particulate Matter (PM10) in ambient air (Gravimetric Method) |
| 7 | Determination of PM2.5 in ambient air (Gravimetric Method) |
| 8 | Determination of bulk density in soil |
| 9 | Determination of water holding capacity in soil |
| 10 | Determination of moisture percentage in soil |
| 11 | Determination of calcium and magnesium in soil |
| 12 | Determination of organic carbon in soil |

**Code: 25BESEES3202 CHEMISTRY LAB-III 1.0 Credit [LTP: 0-0-**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Understand chemical and molecular processes that take place in inorganic chemical reactions in synthesis. | Understand |
| CO2 | Analyze and present experimental results and draw sound conclusions based on experimental evidence. | Analyze |
| CO3 | Demonstrate instrumental techniques for chemical analysis | Apply |
| CO4 | Applying subject knowledge and skill to solve complex problems with defined solutions | Apply |
| CO5 | Understand the different factors that contribute to the adsorption. | Understand |

## B. Mapping matrix of CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | **2** | **3** | **3** | - | - | - | - | - | - | - | - | **1** | **3** | - | - |
| **CO2** | **2** | **3** | **2** | - | - | - | - | - | - | - | - | **1** | **3** | - | - |
| **CO3** | **2** | **3** | **3** | **1** | - | - | - | - | - | - | - | **1** | **3** | - | - |
| **CO4** | **2** | **3** | **3** | **1** | - | - | - | - | - | - | - | **1** | **3** | - | - |
| **CO5** | **1** | **2** | **3** | - | - | - | - | - | - | - | - | **1** | **3** | - | - |
| **WT. AVG** | **2** | **2.8** | **2.8** | **1** | - | - | - | - | - | - | - | **1** | **3** | - | - |

## C. LIST OF EXPERIMENTS

| **Inorganic Chemistry** | |
|---|---|
| 1 | Preparation of sodium trioxalatoferrate(III). |
| 2 | Estimation of Mg2+ and Zn2+ using complexometric titration |
| 3 | Preparation of copper tetra-ammine complex. |
| 4 | Preparation of cis- Potassium dioxalatodiaquachromate(III). |
| 5 | Preparation of Trans- Potassium dioxalatodiaquachromate(III). |
| 6 | Colorimetric determination of metal ions (Iron). |
| **Physical Chemistry** | |
| 7 | To determine the relative strength of two acids(HCl& $H_2SO_4$) |
| 8 | To verify Beer Lamberts law $KMnO_4$/$K_2Cr_2O_7$ and determine the concentration of the given solution. |
| 9 | To determine the strength of Na and K in a given sample by Flame photometer |
| 10 | To titrate potentiometrically the given ferrous ammonium sulphate solution using $K_2Cr_2O_7$ and calculate theredox potential of $Fe^{+2}/Fe^{+3}$ system |
| 11 | To determine the dissociation constant of a weak acid Conductometrically and verify ostwalds dilution law. |
| 12 | Adsorption of acetic acid on charcoal |

| Code: 25BESEES3203 | DBMS LAB-III | 1.0Credit [LTP: 0-0-2] |
|---|---|---|

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Define the basic SQL syntax and database design principles. | Remember |
| CO2 | Create database using database design principles | Understand |
| CO3 | Construct SQL statements to insert, retrieve and update data in a database | Apply |
| CO4 | Use access control mechanisms | Analyze |
| CO5 | Use synonym sequence, index and views, PL/SQL triggers, procedures & functions | Evaluate |

## B. MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | 2 | 1 | 1 |
| CO2 | 3 | 3 | 2 | 1 | - | - | - | - | - | - | - | - | 2 | 1 | - |
| CO3 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | 1 | 1 | - |
| CO4 | 3 | 2 | 1 | - | - | - | - | - | - | - | - | - | - | - | - |
| CO5 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | - | - | - | - |
| WT. AVG | 2.8 | 2.2 | 1.4 | 1 | 1 | - | - | - | - | - | - | - | 1.8 | 1 | 1 |

## C. LIST OF EXPERIMENTS:

| | |
|---|---|
| 1. | Design a Database and create required tables. For e.g. Bank, College Database |
| 2. | Apply the constraints like Primary Key, Foreign key, NOT NULL to the tables. |
| 3. | Write a SQL statement for implementing ALTER, UPDATE and DELETE. |
| 4. | Write the queries to implement the joins. |
| 5. | Write the query for implementing the following functions: MAX (), MIN (), AVG () and COUNT (). |
| 6. | Write the query to implement the concept of Integrity constrains. |
| 7. | Write the query to create the views. |
| 8 | Perform the queries for triggers. |
| 9 | Perform the following operation for demonstrating the insertion, updation and deletion |
| 10. | Write the query for creating the users and their role Query multiple tables using JOIN operation. Grouping |
| 11. | the result of query - GROUP BY clause and HAVING clause |
| 12. | Query multiple tables using NATURAL and OUTER JOIN operation. |

**Code: 25BEACHM3218 Quantitative and Verbal Aptitude Training Credits: 1 (1-0-2)**

A. **COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING**

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Understand concepts of number systems, percentages, and interest to solve quantitative problems. | Understand |
| CO2 | Analyze data from tables, pie charts, and bar graphs to derive conclusions and evaluate the sufficiency of information. | Analyze |
| CO3 | Demonstrate accuracy in solving logical reasoning problems involving arrangements, blood relations, and visual patterns. | Apply |
| CO4 | Apply grammatical rules and sentence structures to identify and correct errors in English usage. | Apply |
| CO5 | Develop effective reading, comprehension, and vocabulary skills to enhance verbal aptitude and communication. | Create |

B. **MAPPING MATRIX OF CO, PO, & PSO**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 2 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | - | 1 | 3 |
| CO2 | 3 | 3 | 3 | 2 | 3 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | - | 1 | 3 |
| CO3 | 2 | 3 | 3 | 3 | 2 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | - | 1 | 3 |
| CO4 | 2 | 2 | 1 | 2 | 2 | 1 | 0 | 2 | 2 | 3 | 1 | 2 | - | 1 | 3 |
| CO5 | 2 | 2 | 1 | 2 | 2 | 2 | 0 | 2 | 2 | 3 | 1 | 3 | - | 1 | 3 |
| WT. AVG | 2.4 | 2.6 | 2 | 2.2 | 2.2 | 1.3 | 1 | 1.4 | 1.6 | 2.4 | 1.6 | 2.2 | - | 1 | 3 |

C. **OUTLINE OF THE COURSE**

| Unit No. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| **1** | Foundations of Quantitative Reasoning | 3 |
| **2** | Applied Arithmetic and Data Analysis | 3 |
| **3** | Logical and Analytical Reasoning | 3 |
| **4** | Verbal Mastery and Grammar Essentials | 3 |
| **5.** | Reading, Vocabulary & Data Interpretation | 3 |

| **LIST OF LABS** | |
|---|---|
| 1. | **Foundations of Quantitative Reasoning** |
| 2. | Number System – I Number system, Power cycle |
| 3. | Number System – II Remainder cycle, Factors, Multiples, HCF & LCM |
| 4. | Reading Comprehension Speed Reading Strategies, RC types, Tackling Strategies |
| 5. | **Applied Arithmetic and Data Analysis** |
| 6. | Data Arrangement – I Linear and Circular Arrangements |

| | |
|---|---|
| 7. | Data Arrangement – II Multi-dimensional Arrangement, Blood Relations |
| 8. | Time and Work – I Work with efficiencies, Pipes and Cisterns |
| 9. | **Logical and Analytical Reasoning** |
| 7. | Time and Work – II Work equivalence, Division of wages |
| 8. | Sentence Correction – I Subject-Verb Agreement, Modifiers, Parallelism |
| | **Verbal Mastery and Grammar Essentials** |
| 9. | Sentence Correction – II Pronoun Agreement, Verb Tenses, Comparisons |
| 10. | Sentence Correction – III Prepositions, Determiners |
| | **Reading, Vocabulary & Data Interpretation** |
| 11. | Reasoning – I Coding-Decoding, Series |
| 12. | Reasoning – II Analogy, Odd Man Out, Visual Reasoning |
| 13. | Percentage & Interest – I Percentages, Percentage Change, S.I. |
| 14. | Percentage & Interest – II C.I., Relation between S.I. and C.I. |
| 15. | Verbal & DI Sentence Completion, Para-jumbles, Vocabulary, DI & DS |

| Code:25BULCSE3201 | SKILL ENHANCEMENT COURSES-III | 1.0 Credit [LTP: 0-0-2] |
|---|---|---|

**Course: MATLAB**

**A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING**

| Course Outcomes (CO): | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Understand and navigate the MATLAB user interface. | Understand |
| CO2 | Perform basic arithmetic and variable operations in MATLAB. | Understand |
| CO3 | Create and manipulate vectors and matrices. | Analyze |
| CO4 | Write and execute simple scripts using built-in functions. | Understand |
| CO5 | Plot and interpret basic 2D graphs to visualize data. | Apply |

**B. CO-PO MAPPING MATRIX**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 1 | 2 | - | - | 1 | 1 | 2 | 1 | 2 | 1 | - | - |
| CO2 | 2 | 3 | 3 | 2 | 2 | - | - | 1 | 1 | 2 | 2 | 3 | 1 | - | - |
| CO3 | 3 | 3 | 3 | 2 | 2 | - | - | 1 | 1 | 2 | 2 | 3 | 1 | - | - |
| CO4 | 3 | 3 | 3 | 3 | 3 | - | - | 1 | 2 | 3 | 2 | 3 | 1 | - | - |
| CO5 | 2 | 3 | 2 | 2 | 3 | - | 1 | 1 | 1 | 3 | 1 | 2 | 1 | - | - |
| Wt. AVG | 2.6 | 2.8 | 2.6 | 2.0 | 2.4 | - | 1 | 1 | 1.2 | 2.4 | 1.6 | 2.6 | 1 | - | - |

C. DETAILED SYLLABUS

| Sr. No. | LIST OF ACTIVITES |
|---|---|
| **1** | Introduction to MATLAB Interface (Command Window, Editor, Workspace) |
| **2** | Basic Arithmetic Operations (+, -, *, /, ^ in MATLAB) |
| **3** | Working with Variables (Creating, assigning, naming variables) |
| **4** | Introduction to Arrays and Vectors (Row and column vectors) |
| **5** | Introduction to Matrices (Matrix creation and display) |
| **6** | Basic Matrix Operations (Addition, subtraction, transpose) |
| **7** | Writing and Running Simple Scripts (Save and run .m files) |
| **8** | Using Built-in Functions (sqrt, sum, mean, max, min) |
| **9** | Simple 2D Plotting (plot (), labels, title) |
| **10** | Simple 3D Plotting (plot(), labels, title) |

**Code: 25BUVCVA3104 BHARATVARSHA: A LAND OF RARE NATURAL ENDOWMENTS 2.0 Credits [LTP: 2-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Understand the unique geographical and strategic features of Bharata Varsha and their impact on its historical development | Understand |
| CO2 | Remember the major river systems of India and understand their importance in the country's cultural and economic life. | Remember |
| CO3 | Remember the key natural resources and climatic features of India that contributed to its sustainability. | Remember |
| CO4 | Understand the demographic strengths and historical economic prosperity of India in relation to the global context. | Understand |
| CO5 | Understand how India's geography supported the rise of a self-sustaining culture and contributed to its civilizational ethos. | Understand |

## B.MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | **1** | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| CO2 | **1** | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| CO3 | **1** | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| CO4 | **1** | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| CO5 | **1** | - | - | - | - | **3** | - | - | - | - | - | - | - | - | - |
| WT. AVG | **1** | - | - | - | - | **3** | - | - | - | - | - | - | - | - | - |

## C.OUTLINE OF THECOURSE

| Unit No. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| **1.** | Geographical Grandeur of BharataVarsha | **6** |
| **2.** | The Fertile Plains and River Systems | **6** |
| **3.** | Climatic Bounty and Natural Wealth | **6** |
| **4.** | Demographic and Civilizational Significance | **6** |
| **5.** | Cultural Uniqueness Rooted in Geography | **6** |

## D. DETAILED SYLLABUS

| SN | Unit Details |
|---|---|
| **1.** | **Geographical Grandeur of Bharatavarsha** |

| | |
|---|---|
| | • Introduction of the Unit<br>• India as one of the largest cultivable regions in the world<br>• The natural protection by the Himalayas<br>• Unique geographical positioning and isolation<br>• Conclusion of the unit |
| **2.** | **The Fertile Plains and River Systems** |

| | |
|---|---|
| | ● Introduction of the Unit<br>● The Sindhu-Ganga river system<br>● The coastal plains and their agricultural productivity<br>● Major rivers: Ganga, Yamuna, Brahmaputra, Godavari, Narmada, Krishna, Kaveri, etc.<br>● River-based civilizations and cultural significance<br>● Conclusion of the unit |
| **3.** | **Climatic Bounty and Natural Wealth** |
| | ● Introduction of the Unit<br>● Abundant rainfall, sunshine, vegetation, and biodiversity<br>● Flora and fauna richness<br>● Mineral resources and their traditional uses<br>● India's agricultural diversity due to its climate<br>● Conclusion of the unit |
| 4. | **Demographic and Civilizational Significance** |
| | ● Introduction of the Unit<br>● India as the most populous land historically and in modern times<br>● Prosperity and richness that fascinated global civilizations<br>● India's contribution to world trade through textiles, spices, and metals<br>● Conclusion of the unit |
| 5. | **Cultural Uniqueness Rooted in Geography** |
| | ● Introduction of the Unit<br>● Geographical isolation and cultural continuity<br>● Harmony between nature and civilization<br>● Development of a self-contained, rich, and spiritual culture<br>● Preservation of traditions due to natural boundaries<br>● Conclusion of the unit |

**E. RECOMMENDED STUDY MATERIAL:**

| Sr. No. | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1 | A selection of India Folktales | A.K Ramanujan | 2009 | Penguin India |
| 2 | Folktales of India: A selection of oral tales from 22 languages | Brenda Beck, A.K Ramanujan | 1999 | University of Chicago Press |

**Code: 25BESCES4101** **Geospatial Techniques-II** **3.0 Credits [LTP: 3-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Explain the fundamental concepts, components, and historical evolution of GIS and its relevance in spatial analysis. | Understand |
| CO2 | Differentiate between spatial and attribute data types, and apply methods for input, georeferencing, and coordinate systems within a GIS environment. | Apply |
| CO3 | Manage and analyze spatial data using vector and raster data models, topological relationships, and database management systems in GIS. | Apply / Analyze |
| CO4 | Design and produce thematic maps using appropriate classification methods, symbols, and cartographic principles. | Create |
| CO5 | Evaluate the use of GIS in real-world environmental applications such as watershed analysis, EIA, land use planning, and climate vulnerability mapping. | Evaluate |

## B. MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 2 | – | 2 | – | 3 | - | – | – | – | 1 | 1 | 1 | 2 |
| CO2 | 2 | 1 | 2 | – | 2 | – | 3 | - | – | – | – | 1 | 1 | 1 | 2 |
| CO3 | 2 | 1 | 2 | – | 2 | – | 3 | - | – | – | – | 1 | 1 | 1 | 2 |
| CO4 | 2 | 1 | 2 | – | 2 | – | 3 | - | – | – | – | 1 | 1 | 1 | 2 |
| CO5 | 2 | 1 | 2 | – | 2 | – | 3 | - | – | – | – | 1 | 1 | 1 | 2 |
| WT. AVG | 2 | 1 | 2 | - | 2 | - | 3 | - | - | - | - | 1 | 1 | 1 | 2 |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | Introduction to GIS | 9 |
| 2. | Spatial and Attribute Data | 10 |
| 3. | Data Management and Analysis | 9 |
| 4. | Thematic Mapping and Cartography | 8 |
| 5. | GIS in Environmental Applications | 9 |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| 1. | Introduction to GIS |

| | |
|---|---|
| | • Introduction of unit<br>• Definition and relevance of GIS<br>• History and evolution of GIS<br>• Components of GIS: Hardware and software requirements<br>• Concept of scale and maps |
| **2.** | Spatial and Attribute Data |
| | • Introduction of unit<br>• Spatial data types: vector and raster<br>• Attribute data and their types<br>• Sources of GIS data (topographic maps, GPS, RS images)<br>• Method of input data in GIS environment<br>• Coordinate systems Georeferencing<br>• RMS errors<br>• Spatial data accuracy |
| **3.** | Data Management and Analysis |
| | • Introduction of unit<br>• Raster data structure and compression techniques<br>• Vector data structure and Topology (spatial relationships)<br>• Topological errors for line and polygons<br>• Relevance of DBMS in GIS<br>• Linkage of spatial and non-spatial data<br>• Vector data analysis: Data querying and attribute table operations, and spatial joins ,Overlay analysis, buffer analysis<br>• Raster analysis techniques |
| **4.** | Thematic Mapping and Cartography |
| | • Introduction of unit<br>• Map design principles<br>• Indian(SOI toposheets) and International numbering systems of maps(UTM zones)<br>• Classification methods: equal interval, quantile, natural breaks<br>• Map compilation: Symbolization, scale, and color schemes<br>• Creating thematic maps for land use, population, pollution |
| **5.** | GIS in Environmental Applications |
| | • Introduction of unit<br>• Watershed and groundwater mapping<br>• Environmental impact assessment<br>• Urban and rural land planning<br>• Biodiversity and wildlife habitat mapping<br>• Climate change vulnerability analysis |

**E. RECOMMENDED STUDY MATERIAL:**

| Sr. No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1.. | Introduction to Geographic Information Systems | 1. Kang-tsung Chang, | 2007 | Tata McGraw Hill, New Delhi. |
| 2. | Concepts and Techniques of Geographic Information Systems" | C.P.Lo and Albert K.W.Yeung | 2006 | Prentice Hall of India,New Delhi |

| | | | | |
|---|---|---|---|---|
| 3. | Principles of Geographical Information Systems | Burrough, Peter A. and Rachael McDonnell, | 1998 | Oxford University Press, New York. |
| 4. | Textbook of Remote sensing, GIS and GNSS | Dr Shailesh Sharma | 2023 | Notion Press |

**Code: BESCES4102 ORGANIC CHEMISTRY 3.0 Credits [LTP: 3-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcomes (COs) | **At the end of this course, learners will able to:** | **Bloom level** |
|---|---|---|
| CO1 | Describe the nomenclature, structure, bonding and characteristic reactions of Phenols and Ethers | Understand |
| CO2 | Analyze chemical behavior of aldehyde and ketones and discuss name reactions of synthesis. | Analyze |
| CO3 | Describe physical and chemical properties of Carboxylic acids. | Understand |
| CO4 | Compare physical and chemical properties of carboxylic acid derivatives. | Analyze |
| CO5 | Discuss chemical behavior and nucleophilic substitution reactions of amines and diazonium salts. | Understand |

## B. Mapping matrix of CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | 3 | - | - |
| CO2 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | 3 | - | - |
| CO3 | 3 | 3 | 1 | 1 | - | - | - | - | - | - | - | - | 3 | - | - |
| CO4 | 2 | 3 | 1 | 2 | - | - | - | - | - | - | - | - | 3 | - | - |
| CO5 | 2 | 3 | 2 | 2 | - | - | - | - | - | - | - | - | 3 | - | - |
| Wt. Avg | 2.6 | 2.6 | 1.2 | 1.4 | - | - | - | - | - | - | - | - | 3 | - | - |

## C. OUTLINE OF THE COURSE

| **Unit No.** | **Title of the Unit** | **Time required for the Unit (Hours)** |
|---|---|---|
| **1.** | **Phenols and Ethers** | **9** |
| **2.** | **Aldehydes and Ketones** | **9** |
| **3.** | **Carboxylic Acids** | **9** |
| **4.** | **Carboxylic Acid Derivatives** | **9** |
| **5.** | **Amines and Nitro compounds** | **9** |

## D. DETAILED SYLLABUS

| **Unit** | **Unit Details** |
|---|---|
| **1** | **Phenols and Ethers** |

| | |
|---|---|
| | • Introduction of the Unit.<br>• Phenols: (Phenol case) Nomenclature, Structure and Bonding, Preparation: Cumenehydroperoxide method, from diazonium salts.<br>• Physical Properties and acidic character. Comparative acidic Strengths of Alcohols and Phenols. resonance stabilization of phenoxide ion.<br>• Reactions: Electrophilic substitution: Nitration, halogenation and sulphonation. Reimer- Tiemann Reaction, Gattermann-Koch Reaction, Schotten – Baumann Reaction, Fries Rearrangement,Claisen Rearrangement, Ethers (aliphatic and aromatic): Cleavage of ethers with HI.<br>• Nomenclature of Ethers, Method of Formation, Chemical Reactions – Cleavage and autooxidation, Ziesel's Method.<br>• Synthesis of epoxide, Acid and base-catalyzed ring opening of Epoxide ,<br>• Conclusion of the Unit |
| **2** | **Aldehydes and Ketones** |
| | • Introduction of the Unit.<br>• Nomenclature and Structure of Carbonyl Group.<br>• Aldehydes and ketones (aliphatic and aromatic)<br>• Preparation: from acid chlorides and from nitriles.<br>• Reactions – Reaction with HCN, ROH, NaHSO3, NH2-G derivatives. Iodoform test. Aldol Condensation, Cannizzaro's reaction, Wittig reaction, Benzoin condensation. Clemensen reduction and Wolff Kishner reduction. Meerwein-PondorffVerley reduction, Perkin and KnoevenAgel Condensation, Mannich Reaction..<br>• Conclusion of the Unit |
| **3** | **Carboxylic acids** |
| | • Introduction of the Unit.<br>• Carboxylic acids (aliphatic and aromatic), Nomenclature.<br>• Carboxylic Acids Structure and bonding, physical properties. acidity of carboxylic acids, effects of substituents on acid strength., mechanism of decarboxylation. Methods of formation and chemical reactions of halo acids. Hydroxy acids - malic, tartaric and citric acids.<br>• Reactions: Hell – Vohlard–Zelinsky, reaction, Synthesis of acid chlorides, esters, amides,<br>• Preparation: Acidic and Alkaline hydrolysis of esters.<br>• Dicarboxylic acid- Method Formation and effect of heat and dehydrating agents, succinic, glutaric acid and adipic acid.<br>• Conclusion of the Unit |
| **4** | **Carboxylic acid** |
| | • Introduction of the Unit.<br>• Carboxylic acid derivatives (aliphatic): (Upto 5 carbons)<br>• Preparation: Acid chlorides, Anhydrides, Esters and Amides from acids and their interconversion.<br>• Reactions: Comparative study of nucleophilicity of acyl derivatives. Reformatsky Reaction, Perkin condensation.<br>• Carboxylic Acid Derivatives : Nomenclature Relative stability of acyl derivatives.. Preparation of carboxylic acid derivatives. chemical reactions, mechanisms of esterification and hydrolysis (acidic and basic<br>• Conclusion of the Unit |
| **5** | **Amines and Nitro compounds** |

| | |
|---|---|
| | • Introduction of the Unit.<br>• Preparation of nitroalkanes and nitroarencs. Chemical reactions of nitroalkanes. Mechanisms of nucleophilic substitution in nitroarcncs and their reductions in acidic, neutral and alkaline media. Picric acid.seperation of $1^{0,}$ $2^{0}$ ,$3^{0}$.<br>• **Amines:** Amines (Aliphatic and Aromatic): (Upto 5 carbons)<br>• *Preparation*: from alkyl halides, Gabriel's Phthalimide synthesis, HofmannBromamide reaction.<br>• *Reactions:* Hofmann vs. Saytzeff elimination, Carbylamine test, Hinsberg test, with HNO2, Schotten – Baumann Reaction. Electrophilic substitution (case aniline): nitration, bromination, sulphonation<br>• *Reactions:* conversion to benzene, phenol, dyes<br>• Conclusion of the Unit |

**E. RECOMMENDED STUDY MATERIAL:**

| Sr. No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1 | Organic Chemistry | Morrison and Boyd | Latest | Prentice Hall |
| 2. | Organic Reaction and Their Mechanisms | P. S. Kalsi | Latest | New Age Science |
| 3. | Organic Chemistry | P. L. Soni | Latest | S. Chand & Sons |

**Code: 25BESCES4103 PYTHON PROGRAMMING 3 credits [LTP: 3-0-**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Explain the basics of Python Programming. | Remember |
| CO2 | Use various data structures for solving real world problems. | Understand |
| CO3 | Understand basic data structure of given problem in python programming | Understand |
| CO4 | Dissect the data transformation from one format to another format. | Analyze |
| CO5 | Understand web services and consume the web services using REST API call | Understand |

## B. MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | 2 | 1 | 1 |
| CO2 | 3 | 3 | 2 | 1 | - | - | - | - | - | - | - | - | 2 | 1 | - |
| CO3 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | 1 | 1 | - |
| CO4 | 3 | 2 | 1 | - | - | - | - | - | - | - | - | - | - | - | - |
| CO5 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | - | - | - | - |
| WT. AVG | 2.8 | 2.2 | 1.4 | 1 | 1 | - | - | - | - | - | - | - | 1.8 | 1 | 1 |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | Introduction to Python Environment | 9 |
| 2. | Data Structures, Looping and Branching | 9 |
| 3. | List, Tuple, Dictionary and sets | 9 |
| 4. | File Handling using Python | 9 |
| 5. | Python for statistics and Data Management | 9 |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| **1.** | **Introduction to Python Environment** |
| | • Introduction of unit<br>• History and development of Python<br>• Working with Python : Getting the language, Understanding the need for indentation, Working at the command line taste or in the IDE,<br>• Compiler vs. Interpreter level languages<br>• Installing python on Windows, Linux and MAC<br>• Conclusion of Unit |
| **2.** | **Data Structures, Looping and Branching** |
| | • Introduction of Unit<br>• Working with Numbers and Logic, Performing variable assignments, Doing arithmetic, Comparing data using Boolean expressions,<br>• Creating and Using Strings,<br>• Creating and Using Functions, Calling functions in a variety of ways,<br>• Using Conditional and Loop Statements, Making decisions using the if statement, Choosing between multiple options using nested decisions, Performing repetitive tasks using for, Using the while statement,<br>• Conclusion of Unit |
| **.** | **List, Tuple, Dictionary and sets** |
| | • Introduction of Unit<br>• Storing Data Using Sets, Lists, and Tuples : Performing operations on sets,<br>• Working with lists, Creating and using Tuples, Defining Useful Iterators, Indexing Data Using Dictionaries<br>• Pre-built functions of List, Tuple, Dictionary and Set<br>• Conclusion of Unit |
| **4.** | **File Handling using Python** |
| | • Introduction of Unit<br>• Python File Operation :Reading config files in python -Writing log files in python<br>• Understanding read functions, read(), readline() and readlines()<br>• Understanding write functions, write() and writelines() –<br>• Manipulating file pointer using seek -Programming using file operations<br>• Conclusion of Unit |
| **5.** | **Python for statistics and Data Management** |
| | • Introduction to the unit<br>• Reading CSV files and Excel files. Reading excel files sheets<br>• Finding Mean, Median, Mode and its importance in data analysis.<br>• Numpy and Pandas. Creating arrays and using array functions<br>• Creating Data frames and using data frame functions,<br>• Creating data frame using dictionary<br>• Conclusion of Unit |

## E. RECOMMENDED STUDY MATERIAL

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Python for Data Science for Dummies | Luca Massaron and John Paul Mueller | First Edition | John Wiley& Sons, Inc. |
| 2. | Python for Data Analysis | Wes McKinney | First Edition | O'Reilly Media, Inc. |

| Code: 25BESCES4104 | Introduction to Data Science | 3 credits [LTP: 3-0-0] |
|---|---|---|

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Understand the basic concepts, scope, and applications of Data Science in various fields. | Remember |
| CO2 | Apply data cleaning and preprocessing techniques using basic Python libraries. | Understand |
| CO3 | Create and interpret basic data visualizations to extract insights. | Understand |
| CO4 | Perform basic exploratory data analysis to uncover meaningful patterns and trends in datasets. | Analyze |
| CO5 | Understand the role of big data and cloud platforms in modern data science workflows. | Understand |

## B. MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | **3** | **3** | **2** | **1** | **1** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **2** | **1** | **1** |
| **CO2** | **3** | **3** | **2** | **1** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **2** | **1** | **-** |
| **CO3** | **3** | **2** | **1** | **1** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **1** | **1** | **-** |
| **CO4** | **3** | **2** | **1** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| **CO5** | **2** | **1** | **1** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| **WT. AVG** | **2.8** | **2.2** | **1.4** | **1** | **1** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **1.8** | **1** | **1** |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| **1.** | Introduction to Data Science | **9** |
| **2.** | Data Handling and Preprocessing | **9** |
| **3.** | Data Visualization | **9** |
| **4.** | Exploratory Data Analysis (EDA) | **9** |
| **5.** | Understand the role of big data and cloud platforms in modern data science workflows. | **9** |

D. **DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| **1.** | Introduction to Data Science |
| | • Introduction of unit<br>• What is Data Science?<br>• Importance and real-world applications<br>• Components: Data, Algorithms, Tools<br>• Roles in a Data Science team (Data Engineer, Analyst, Scientist)<br>• Conclusion of Unit |
| **2.** | Data Handling and Preprocessing |
| | • Introduction of Unit<br>• Types of data (structured, unstructured, semi-structured)<br>• Data collection methods<br>• Data cleaning and pre-processing (handling missing values, encoding)<br>• Introduction to Pandas and NumPy (basic functions)<br>• Conclusion of Unit |
| **3** | Data Visualization |
| | • Introduction of Unit<br>• Importance of visualization<br>• Tools: Matplotlib, Seaborn (basic charts)<br>• Interpretation of graphs<br>• Dashboard concepts (intro only)<br>• Conclusion of Unit |
| **4.** | Exploratory Data Analysis (EDA) |
| | • Introduction of Unit<br>• What is EDA and why is it important?<br>• Descriptive statistics: mean, median, mode, standard deviation<br>• Detecting patterns, outliers, and trends<br>• Tools: Pandas profiling, basic visual EDA with Seaborn<br>• Conclusion of Unit |
| **5.** | Introduction to Big Data and Cloud in Data Science |
| | • Introduction to the unit<br>• What is Big Data? (Volume, Variety, Velocity)<br>• Role of Big Data in Data Science<br>• Basics of cloud platforms (AWS, Google Cloud, Azure – overview only)<br>• Introduction to cloud-based data tools (like Google Colab, BigQuery – basic awareness)<br>• Conclusion of Unit |

E. **RECOMMENDED STUDY MATERIAL**

| S. No | Text Books: | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Doing Data Science | Cathy O'Neil and Rachel Schutt | 1st Edition | O'Reilly Media |
| 2. | Python for Data Analysis | Wes McKinney | 2nd Edition | O'Reilly Media |
| **3** | Data Visualization with Python and JavaScript | Kyran Dale | 1st Edition | O'Reilly Media |
| **4** | Big Data Fundamentals: Concepts, Drivers & Techniques | Thomas Erl, Wajid Khattak, Paul Buhler | 1st Edition | Pearson Education |

**Code: BESEES4101 PHYSICAL CHEMISTRY 3.0 Credits [LTP: 3-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Apply Raoult's law on colligative properties, abnormal molar mass, degree of dissociation/association | Apply |
| CO2 | Describe the kinetics of zero order, first order, second order and third order reaction by differential and integration | Understand |
| CO3 | Analyze the order of reaction, Arhenius equation, Simple collision theory and Transition state theory. | Analyze |
| CO4 | Explain fundamental thermodynamic concepts and laws, apply them to analyze energy changes in physical and chemical processes | Understand |
| CO5 | Apply thermodynamic principles including the Carnot cycle, entropy, and thermodynamic functions | Apply |

## B. Mapping matrix of CO, PO & PSO

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO1 1 | PO1 2 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | - | 2 | 1 | - | - | - | - | - | - | - | - | 3 | - | - |
| **CO2** | 3 | - | 2 | - | - | - | - | - | - | - | - | - | 3 | - | - |
| **CO3** | 2 | 3 | - | - | - | - | - | - | - | - | - | - | 3 | - | - |
| **CO4** | 2 | 3 | 1 | 1 | - | - | - | - | - | - | - | - | 3 | - | - |
| **CO5** | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | 3 | - | - |
| **WT. AVG** | 2.6 | 2.6 | 1.5 | 1 | - | - | - | - | - | - | - | - | 3 | - | - |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | Solutions | 9 |
| 2. | Chemical Kinetics I | 9 |
| 3. | Chemical Kinetics II | 9 |
| 4. | Thermodynamic-I | 9 |
| 5. | Thermodynamic-II | 9 |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| **1.** | **Solution** |
| | ● Introduction of the Unit<br>● Ideal and non ideal solutions<br>● Methods of expressing concentrations<br>● Dilute solutions-colligative properties, Raoults law<br>● Relative lowering of vapour pressure, Molecular weight determination<br>● Osmosis, Law of osmotic pressure and its determination, determination of molecular weight from osmotic pressure<br>● Elevation of boiling point and depression in freezing point<br>● Conclusion of the Unit |
| **2.** | **Chemical Kinetics I** |
| | ● Introduction to the Unit.<br>● Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction-concentrations, temperature, pressure, solvent, light, catalyst, concentration dependence of rates<br>● Mathematical characteristics of simple chemical reaction- zero order, first order, second order, pseudo order, half-life and mean life.<br>● Determinations of the order of reaction- differential method, method of integration, method of half-life period and isolation method<br>● Radioactive decay as a first order phenomenon<br>● Conclusion & real life application |
| **3.** | **Chemical Kinetics II** |
| | ● Introduction of the Unit<br>● Experimental methods of chemical kinetics: conductometric, potentiometric, optical methods, polarimetry and spectrophotometery.<br>● Theories of chemical kinetics, Effect of temperature on rate of reaction,<br>● Arrhenius Equation, concepts of activation energy<br>● Simple collision theory based on hard sphere model, transition state theory (equilibrium hypothesis)<br>● Conclusion of the Unit |
| **4.** | **Thermodynamic-I** |
| | ● Introduction of the Unit<br>● Thermodynamics terms: systems, surroundings etc. Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamics process. Concept of heat and work.<br>● First law of thermodynamics: statement, definition of internal energy and enthalpy. Heat capacity. Heat capacities at constant volume and pressure and their relationship.<br>● Joule law-Joule Thomson co-efficient and inversion temperature.<br>● Thermochemistry: Standard state, standard enthalpy of formation, Hess's law of heat summation and its applications. Heat of reaction at constant pressure and at constant volume.<br>● Conclusion of the Unit |
| **5.** | **Thermodynamic-II** |

| | |
|---|---|
| | • Introduction of the Unit<br>• Second law of thermodynamics: Carnot cycle and its efficiency. Carnot theorem. Thermodynamic scale of temperature.<br>• Concept of entropy: Entropy as a state function, entropy as a function of Volume and temperature, entropy as a function of pressure and temperature, entropy change in physical change.<br>• hird law of thermodynamics: Statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz functions: Gibbs function<br>• T (G) and Helmholtz function (A) asthermodynamic quantities.<br>• Conclusion of the Unit |

**E. RECOMMENDED STUDY MATERIAL:**

| Sr.No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Physical Chemistry | Castellan, G.W. | 4th Ed. | Narosa (2004). |
| 2. | Physical Chemistry | Barrow, G.M. | latest | Tata McGraw-Hill (2007). |

**Code: 24BESEES4102 RENEWABLE AND ALTERNATE ENERGY 3.0 Credits [LTP: 3-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Explain the importance and scope of non-conventional and alternate energy resources. | Understand |
| CO2 | Illustrate the significance of solar energy and its applications | Apply |
| CO3 | Assess the Wind Energy Conversion System | Evaluate |
| CO4 | Describe the role of ocean energy in the Energy Generation. | Understand |
| CO5 | Understand the basic knowledge of biogas and geothermal energy | Understand |

## B. MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | - | - | - | - | 3 | 2 | - | - | - | 1 | 3 | - | 1 |
| CO2 | 3 | 3 | - | - | - | - | 3 | 2 | - | - | - | 1 | 3 | - | 1 |
| CO3 | 3 | 1 | - | - | - | - | 3 | 2 | - | - | - | 1 | 3 | - | 1 |
| CO4 | 3 | 2 | - | - | - | - | 3 | 2 | - | - | - | 1 | 3 | - | 1 |
| CO5 | 3 | 2 | - | - | - | - | 3 | 2 | - | - | - | 1 | 3 | - | 1 |
| WT. AVG | 3 | 2.2 | - | - | - | - | 3 | 2 | - | - | - | 1 | 3 | -- | 1 |

## C. OUTLINE OF THECOURSE

| Unit No. | Title of the Unit | Time required for the Unit(Hours) |
|---|---|---|
| 1. | **Solar Energy** | **9** |
| 2. | **Wind Energy** | **9** |
| 3. | **Ocean Energy** | **9** |
| 4. | **Bio-Mass** | **9** |
| 5. | **Geothermal Energy & Energy Conservation** | **9** |

## D. DETAILEDSYLLABUS

| Unit | Unit Details |
|---|---|
| **1.** | **Solar Energy** |
| | • Introduction of Unit<br>• Solar Radiation, Measurements of Solar Radiation, Flat Plate And Concentrating Collectors, Solar Direct Thermal Applications, Solar Thermal Power Generation, Fundamentals of Solar Photo Voltaic Conversion, Solar Cells, Solar PV Power Generation, Solar PV Applications..<br>• Conclusion and Summary of Unit |
| **2.** | **Wind Energy** |
| | • Introduction of Unit<br>• Wind Energy Estimation, Types of Wind Energy Systems, Performance, Site Selection, Details of Wind Turbine Generator.<br>• Conclusion and Summary of Unit |
| **3.** | **Ocean Energy** |
| | • Introduction of Unit<br>• Ocean Thermal Energy Conversion (OTEC), Principle of operation, development of OTEC plants, Tidal and wave energy, Potential and conversion techniques, mini-hydel power plants.<br>• Conclusion and Summary of Unit |
| **4.** | **Bio-Mass** |
| | • Introduction of Unit<br>• Principles of Bio-Conversion, Anaerobic/aerobic digestion,<br>• Types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking.<br>• Conclusion and Summary of Unit |
| **5.** | **Geothermal energy& Energy conservation** |
| | • Introduction of Unit<br>• Resources, types of wells, methods of harnessing the energy, scope in India. Principles of energy conservation,<br>• Different energy conservation appliances, cooking stoves, Benefits of improved cooking stoves over the traditional cooking stoves<br>• Conclusion and Summary of Unit |

## E. RECOMMENDED STUDY MATERIAL:

| Sr. No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1 | Ecology and Environment. | Sharma, P. D. | **2008** | Rastogi Publications |
| 2 | Ecology and Environmental Biology | Bhatia and Kohli | 2010 | RBD Publishing house |
| 3 | Environmental studies | N.K Oberoi | 2005 | Excel Books |

**Code: 25BESEES4201 ENVIRONMENTAL SCIENCE LAB-IV 1.0 Credits [LTP: 0-0-2]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Demonstrate basic water quality analysis techniques | Apply |
| CO2 | Apply GIS tools for map digitization and data visualization | Apply |
| CO3 | Execute attribute-based queries in QGIS | Apply |
| CO4 | Utilize SAGA GIS for raster data exploration and image analysis | Apply |
| CO5 | Perform visual interpretation and geospatial analysis | Apply |

### B. Mapping matrix of CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 2 | - | - | - | 2 | 1 | - | - | - | 1 | 3 | - | 2 |
| CO2 | 2 | 3 | 3 | - | 2 | - | 2 | 1 | - | - | 1 | 1 | 3 | 1 | 2 |
| CO3 | 2 | 3 | 3 | - | 2 | - | 2 | 1 | - | - | 1 | 1 | 3 | 1 | 2 |
| CO4 | 2 | 2 | 3 | 1 | 2 | - | 2 | 1 | - | - | 1 | 1 | 1 | 1 | 2 |
| CO5 | 2 | 2 | 3 | 1 | 2 | - | 2 | 1 | - | - | 1 | 1 | 1 | 1 | 2 |
| WT. AVG | 2 | 2.6 | 2.8 | 1 | 2 | - | 2 | 1 | - | - | 1 | 1 | 2.2 | 1 | 2 |

## C. LIST OF EXPERIMENTS

| | |
|---|---|
| 1 | Estimation of Residual chlorine in the water sample |
| 2 | Qualitative estimation of Nitrate in water sample. |
| 3 | Qualitative estimation of Phosphate in water sample |
| 4 | To digitize a toposheet using Quantum GIS. |
| 5 | Map Preparation using QGIS |
| 6 | To get familiar with constructing attribute queries in Quantum GIS |
| 7 | To getting familiar with SAGA interface, view and explore raster data in SAGA. |
| 8 | Visual Interpretation of Images by Using Saga |
| 9 | Georeferencing a Toposheet using SAGA |
| 10 | Mosaicking and Sub setting Images using SAGA |
| 11 | To digitize a toposheet using Quantum GIS. |
| 12 | To digitize a toposheet using Quantum GIS. |

**Code: 25BESEES4202 . CHEMISTRY LAB-IV . 1.0 Credits [LTP: 0-0-2]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Evaluate the technique of various ions present in a mixture | Evaluate |
| CO2 | Recognize the basic practical skills for the synthesis and analysis of organic compounds. | Understand |
| CO3 | Demonstrate purification and separation techniques of compounds | Apply |
| CO4 | Analyze and present experimental results and draw sound conclusions based on experimental evidence. | Analyze |
| CO5 | Apply different processes used in industries and their applications | Apply |

## B. Mapping matrix of CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | **3** | **3** | **2** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | 1 | **3** | **-** | **-** |
| **CO2** | **2** | **3** | **3** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | 1 | **3** | **-** | **-** |
| **CO3** | **2** | **3** | **3** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | 1 | **3** | **-** | **-** |
| **CO4** | **2** | **3** | **3** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | 1 | **3** | **-** | **-** |
| **CO5** | **1** | **2** | **3** | **1** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | 1 | **3** | **-** | **-** |
| **WT. AVG** | **2** | **2.8** | **2.8** | **1** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | 1 | **3** | **-** | **-** |

## C. LIST OF EXPERIMENTS

| | |
|---|---|
| **Inorganic Chemistry** | |
| **1** | Estimation of sodium carbonate and sodium hydroxide present in a mixture. |
| **2** | Estimation of acetic acid in commercial vinegar using NaOH |
| **3** | Estimation of water of crystallization in Mohr's salt by titrating with $KMnO_4$. |
| **4** | Estimation of Ferrous and Ferric by dichromate method |
| **5** | Estimation of Cu as copper thiocyanate |
| **6** | Estimation of Ascorbic Acid from lemon peel |
| **Organic Chemistry** | |
| **7** | Preparation of Ni- DMG complex |
| **8** | To separate and identify the organic mixture containing two solid components using NaOH. |
| **9** | To prepare Iodoform from ethanol and acetone |
| **10** | Estimation of glucose by Fehling's solution. |
| **11** | Isolation of caffeine from tea leaves. |
| **12** | Synthesis of methyl orange |

| Code: 25BESEES4203 | Data Science with Python Lab | 1.0 Credits [LTP: 0-0-2] |
|---|---|---|

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Recall and write basic Python programs to perform fundamental operations such as checking even/odd numbers, calculating factorial, and manipulating lists and dictionaries. | Remembering |
| CO2 | Explain the usage of key Python data structures and libraries commonly used in Data Science, and describe the purpose of data cleaning and visualization techniques. | Understanding |
| CO3 | Apply Python programming skills to load datasets, handle missing values, and create basic data visualizations including bar plots, histograms, and boxplots using libraries like Pandas and Seaborn. | Applying |
| CO4 | Analyze datasets by generating summary statistics and identifying outliers through visual and statistical methods. | Analyzing |
| CO5 | Evaluate the success of integrating external resources such as Google Drive into data science environments like Google Colab and assess the effectiveness of data cleaning and visualization techniques applied on sample datasets. | Evaluating |

## B. MAPPING MATRIX OF CO, PO & PSO

| COs \ POs/PSOs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | - | - | 2 | - | - | - | - | 2 | - | 2 | 2 | 1 | - |
| CO2 | 3 | - | - | 2 | 3 | - | - | - | - | 2 | - | 2 | 2 | 2 | - |
| CO3 | 3 | 2 | - | 2 | 3 | - | - | - | - | 3 | 2 | 3 | 2 | 3 | - |
| CO4 | 3 | 3 | 2 | 3 | 3 | - | - | - | - | 2 | 2 | 2 | 2 | 3 | 3 |
| CO5 | 2 | - | - | 2 | 3 | - | - | 2 | 2 | 3 | 2 | 2 | - | 3 | 3 |
| WT AVG | 2.8 | 2.5 | 2.0 | 2.25 | 2.8 | - | - | 2 | 2 | 2.4 | 2.0 | 2.2 | 2.0 | 2.4 | 3 |

## C. LIST OF EXPERIMENTS:

| | |
|---|---|
| **1** | Write a program to check whether a number is even or odd |
| **2** | Write a program to find the factorial of a number |
| 3 | Write a program to remove duplicates from a list |
| 4 | Write a program to create a dictionary from two lists |
| 5 | Write a program to load a dataset and display basic information |
| 6 | Write a program to import essential libraries used in Data Science and display a message confirming their successful loading |
| 7 | Write a program to create a dataset with missing values and perform basic data cleaning operations like filling missing values |
| 8 | Write a program to create a bar plot and histogram using the ‘tips’ dataset from Seaborn |
| 9 | Write a program to generate summary statistics and create a boxplot for outlier detection using the Iris dataset |
| 10 | Write a program to mount Google Drive in Google Colab and confirm successful integration |

**Code: 25BEACHM4224 QUANTITATIVE AND VERBAL APTITUDE TRAINING II Credits: 1 (1-0-2)**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Understand principles of profit and loss, averages, ratios, and equations to solve quantitative problems. | Understand |
| CO2 | Apply concepts of speed, time, distance, probability, and permutations to real-life and theoretical problems. | Apply |
| CO3 | Analyze logical reasoning problems using connectives, syllogisms, and Venn diagrams. | Analyze |
| CO4 | Demonstrate proficiency in grammar, sentence construction, and transformation through speech and voice. | Apply |
| CO5 | Create solutions using image-based interpretation and attention to detail to enhance analytical thinking. | Create |

## B. CO-PO MAPPING MATRIX

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 1 | 2 | - | - | 1 | 1 | 2 | 1 | 2 | 1 | - | - |
| CO2 | 2 | 3 | 3 | 2 | 2 | - | - | 1 | 1 | 2 | 2 | 3 | 1 | - | - |
| CO3 | 3 | 3 | 3 | 2 | 2 | - | - | 1 | 1 | 2 | 2 | 3 | 1 | - | - |
| CO4 | 3 | 3 | 3 | 3 | 3 | - | - | 1 | 2 | 3 | 2 | 3 | 1 | - | - |
| CO5 | 2 | 3 | 2 | 2 | 3 | - | 1 | 1 | 1 | 3 | 1 | 2 | 1 | - | - |
| Wt. AVG | 2.6 | 2.8 | 2.6 | 2.0 | 2.4 | - | 1 | 1 | 1.2 | 2.4 | 1.6 | 2.6 | 1 | - | - |

## C. OUTLINE OF THECOURSE

| Unit No. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| **1** | Quantitative Techniques and Business Maths | 3 |
| **2** | Permutation, Probability and Speed Analysis | 3 |
| **3** | Verbal Logic and Grammar Usage | 3 |
| **4** | Logical Thinking and Data-Based Reasoning | 3 |
| **5** | Visual & Spatial Analysis and Interpretation | 3 |

## D. DETAILED SYLLABUS

| LIST OF LABS | |
|---|---|
| | **Unit 1: Quantitative Techniques and Business Maths** |
| 1 | **Profit, Loss & Partnerships**<br>*Basic terminologies, Partnership, Averages* |

| | |
|---|---|
| 2 | **Mixtures and Alligations**<br>*Weighted Average, Mixtures and Alligations* |
| 3 | **Ratio, Proportion and Ages**<br>*Ratio, Proportion, Variation, Simple equations, Ages* |
| 4 | **Unit 2: Permutation, Probability and Speed Analysis** |
| 5 | **Permutations & Combinations – I**<br>*Fundamental Counting, Permutation, Circular Permutations* |
| 6 | **Permutations & Combinations – II**<br>*Computation of Combination, Probability* |
| 7 | **Speed-Time-Distance**<br>*Basics, Relative Speed, Boats, Trains, Races* |
| 8 | **Unit 3: Verbal Logic and Grammar Usage** |
| 7. | **Articles & Prepositions**<br>*Definite/Indefinite Articles, Omission, Compound Prepositions* |
| 8. | **Interrogatives & Sentence Framing**<br>*Prepositional Phrases, Interrogative Structures* |
| | **Speech and Voice Transformation**<br>*Active-Passive Voice, Direct-Indirect Speech* |
| 9. | **Unit 4: Logical Thinking and Data-Based Reasoning** |
| 10. | **Logical Connectives & Syllogisms**<br>*Logical Connectives, Syllogistic Analysis* |
| | **VennDiagrams**<br>*Interpretation and Problem Solving with Venn Diagrams* |
| 11. | **Clocks, Calendars & Cubes**<br>*Time Reasoning, Direction Sense, Cubes* |
| 12. | **Unit 5: Visual & Spatial Analysis and Interpretation** |
| 13. | **Progressions & Logarithms**<br>*Arithmetic, Geometric Progressions, Logarithms* |
| 14. | **Geometry & Quadratics**<br>*Geometry, Mensuration, Quadratic Equations* |
| 15 | **Image Interpretation & Detail Analysis**<br>*Rebus, Forming Words, String Matching, Text/Image Comprehension* |

| Code: BUACHM4223 | PUBLIC SPEAKING | Credits [LTP: 0-0-1] |
|---|---|---|

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Produce effective public speaking skills. | Apply |
| CO2 | Analyze arguments critically from different perspectives. | Analyse |
| CO3 | Show impromptu and on-the-spot speaking skills. | Apply |
| CO4 | Illustrate critical thinking and problem-solving abilities. | Apply |
| CO5 | Practice confidence and overcome public speaking anxiety. | Apply |

## B. OUTLINE OF THE COURSE

| Unit | Title of the Unit | Time Required for the Unit (Hours) |
|---|---|---|
| **1** | Introduction to Public Speaking and Preparing Your Speech | **3** |
| **2** | Delivery Techniques and Persuasive Speaking | **4** |
| **3** | Impromptu Speaking and Introduction to Debating | **3** |
| **4** | Constructing Arguments and Rebuttal and Cross-Examination | **2** |
| **5** | Debate Practice and Conclusion and Final Presentations | **3** |

## C. DETAILED SYLLABUS

| Unit | Title of the Unit |
|---|---|
| **1.** | **Introduction to Public Speaking and Preparing Your Speech** |

| | |
|---|---|
| | • Overview of the course and its objectives.<br>• Understanding the importance of public speaking and debate skills.<br>• Introduction to effective communication strategies.<br>• Introduction to the art of persuasion.<br>• Selecting and analyzing a topic.<br>• Conducting research and gathering evidence.<br>• Organizing your speech with a clear introduction, body, and conclusion.<br>• Understanding different speech structures and formats. |
| **2.** | **Delivery Techniques and Persuasive Speaking** |
| | • Enhancing vocal skills (projection, intonation, pace, etc.).• Body language and non-verbal communication.<br>• Using visual aids effectively.<br>• Managing stage fright and nervousness.<br>• Identifying persuasive techniques and rhetorical devices.<br>• Developing logical arguments and appeals.<br>• Understanding the target audience and adapting the speech accordingly.<br>• Practicing persuasive delivery. |
| **3.** | **Impromptu Speaking and Introduction to Debating** |
| | • Strategies for impromptu speaking.<br>• Developing quick thinking and improvisation skills.<br>• Structuring impromptu speeches effectively.<br>• Practice sessions with impromptu topics.<br>• Overview of the debate format and structure.<br>• Understanding the roles of different participants.<br>• Analyzing and evaluating arguments |
| **4.** | **Constructing Arguments and Rebuttal and Cross-Examination** |
| | • Identifying and formulating strong arguments.<br>• Using evidence and examples to support your points.<br>• Developing logical and coherent argumentation.<br>• Counter-arguments and refutation techniques.<br>• Effective rebuttal techniques.<br>• Strategies for countering opponents' arguments.<br>• Cross-examination skills and tactics.<br>• Practice sessions for rebuttal and cross-examination. |
| **5.** | **Debate Practice and Conclusion and Final Presentations** |
| | • Conducting mock debates.<br>• Applying the learned techniques in real debate scenarios.<br>• Receiving constructive feedback and analysis.<br>• Recap of key concepts and techniques.<br>• Final presentations by participants.'<br>• Peer evaluation and feedback. |

## D. RECOMMENDED STUDY MATERIAL

| Sr.No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| 1. | The Art of Public Speaking | Stephen E. Lucas | 2020 | McGraw-Hill Education |
| 2. | Speak with Confidence: A Practical Guide | Dianna Booher | 2018 | Harper Business |
| 3. | Debate: A Strategy for Successful Academic Writing | Gary Goshgarian and Kathleen Krueger | 2012 | Longman |

**Code: 25BULCSE4201 SKILL ENHANCEMENT COURSE -IV 1.0 Credits [LTP: 0-0-2]**

**Course: DOCUMENT PREPARATION AND PRESENTATION**

### E. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Understand the process of downloading, installing, and accessing LaTeX, LibreOffice, and MS Office software on various platforms. | Understand |
| CO2 | Analyze software-specific features and menu options to effectively create and manipulate documents. | Analyze |
| CO3 | Demonstrate the ability to develop well-structured and visually appealing documents using LaTeX, LibreOffice Writer, or MS Word | Apply |
| CO4 | Apply advanced formatting techniques to enhance the readability and aesthetics of document content | Apply |
| CO5 | Incorporate and analyze the use of tables, figures, algorithms, and equations into documents to effectively communicate complex information. | Apply |

### F. MAPPING MATRIX OF CO, PO AND PSO

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | - | - | 2 | - | 3 | - | - | - | - | - | - | - | - | 3 | - |
| **CO2** | - | - | 2 | 3 | 2 | - | - | - | - | - | - | - | - | 3 | - |
| **CO3** | - | - | 3 | - | 2 | - | - | - | - | - | - | - | - | 3 | - |
| **CO4** | 2 | - | - | 2 | 2 | - | - | - | - | - | - | - | - | 2 | - |
| **CO5** | - | 3 | 2 | - | 1 | - | - | - | - | - | - | - | 1 | 3 | - |
| **Avg wt.** | 2 | 2 | 2.2 | 2.5 | 2 | - | - | - | - | - | - | - | 1 | 2.8 | - |

**G. DETAILED SYLLABUS**

| Sr. No. | LIST OF ACTIVITES |
|---|---|
| **1** | Downloading, Installing and Accessing LaTex / LibreOffice / MS Office |
| **2** | Using Software Specific Features and Menu Options |
| **f3** | Creating a LaTeX/ LibreOffice/MS Office document |
| **4** | Setting Up the Document |
| **5** | Formatting the document content |
| **6** | Adding Tables and Figures to the document |
| **7** | Incorporating Algorithms and Equations in the documents |
| **8** | Using the Referencing and Indexing options |
| **9** | Using Zotero for referencing |
| **10** | Making Presentations in LibreOffice / MS Office |

| Code: 25 BESCES5101 | GENERAL METEOROLOGY | 3.0 Credits [LTP: |
|---|---|---|

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Understand the scope, historical evolution, and institutional framework of meteorology, including the roles of WMO, IMD, and regional meteorological centers. | Understand |
| CO2 | Explain the composition and vertical structure of the atmosphere, and apply the concepts of temperature distribution, lapse rates, and adiabatic processes to atmospheric studies. | Understand |
| CO3 | Analyze solar radiation processes, Earth's energy balance, greenhouse effect, and interpret radiation laws (Planck's, Stefan-Boltzmann, Wien's) in the context of global warming and climate dynamics. | Analyze |
| CO4 | Describe global and local wind systems, atmospheric pressure patterns, cyclonic systems, and monsoon mechanisms with special emphasis on the Indian subcontinent. | Understand |
| CO5 | Identify various weather systems, use meteorological instruments, interpret synoptic weather charts, and explain the fundamentals of satellite meteorology and weather forecasting. | Understand |

## B. MAPPING OF COURSE OUTCOMES WITH PROGRAMME OUTCOMES

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | - | - | - | - | 2 | | - | - | - | 1 | 2 | - | 1 |
| CO2 | 3 | 2 | - | - | - | - | 2 | | - | - | - | 1 | 2 | - | 1 |
| CO3 | 3 | 2 | - | - | - | - | 2 | | - | - | - | 1 | 2 | - | 1 |
| CO4 | 3 | 2 | - | - | - | - | 2 | | - | - | - | 1 | 2 | - | 1 |
| CO5 | 3 | 2 | - | - | - | - | 2 | | - | - | - | 1 | 2 | - | 1 |
| WT. AVG | 3 | 2 | - | - | - | - | 2 | - | - | - | - | 1 | 2 | - | 1 |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | Introduction to Meteorology and the Atmosphere | 9 |
| 2. | Solar Radiation and Energy Balance | 9 |
| 3. | Atmospheric Pressure and Wind Systems | 9 |
| 4. | Humidity and Precipitation | 9 |
| 5. | Weather Systems and Forecasting | 9 |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| 1. | **Introduction to Meteorology and the Atmosphere** |
| | • Definition and scope of Meteorology<br>• History and importance of Meteorology in environmental studies<br>• World meteorological organization (WMO)<br>• Regional Meteorological Centers<br>• India Meteorological Department<br>• Composition and structure of the atmosphere<br>• Vertical distribution of temperature and pressure<br>• Concepts of lapse rate, adiabatic processes |
| 2. | **Solar Radiation and Energy Balance** |
| | • Insolation and factors affecting it<br>• Albedo, heat budget of the Earth-atmosphere system<br>• Greenhouse effect and global warming<br>• Diurnal and seasonal variation in temperature<br>• Radiation laws (Planck's law, Stefan-Boltzmann law, Wien's law) |
| 3. | **Atmospheric Pressure and Wind Systems** |
| | • Pressure belts and global wind circulation<br>• Coriolis force and geostrophic wind<br>• Trade winds, westerlies, polar easterlies<br>• Local winds (land and sea breezes, mountain and valley winds, Loo, etc.)<br>• Cyclones and anticyclones |
| 4. | **Humidity and Precipitation** |
| | • Concepts of absolute, specific and relative humidity<br>• Dew point, condensation and cloud formation<br>• Types of clouds (as per WMO classification)<br>• Forms and types of precipitation<br>• Monsoon systems (with emphasis on Indian Monsoon)<br>• Mechanism of Indian monsoon and general distribution of precipitation during South-West and North-East monsoon |
| 5. | **Weather Systems and Forecasting** |
| | • Weather elements and observations<br>• Fronts and air masses<br>• Thunderstorms, hailstorms, and tornadoes<br>• Meteorological instruments and observations (thermometer, barometer, hygrometer, anemometer, etc.)<br>• Basics of weather forecasting and interpretation of synoptic charts<br>• Introduction to satellite meteorology and radar applications |

## E. RECOMMENDED STUDY MATERIAL:

| Sr.No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Selected Topics in Inorganic Chemistry | Malik Tuli,Madan | Latest | S. Chand & Sons |
| 2. | Advanced Inorganic Chemistry | S. K Agarwal, Keemtil | Latest | Pragati Prakashan |

**Code: 25BESCES5102** **Geospatial Techniques-III** **3.0 Credits [LTP: 3-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Understand the fundamental concepts and practical applications of GPS and GNSS technologies for accurate geo-positioning and mobile-based field data collection and validation. | Understand |
| CO2 | Apply advanced spatial analysis techniques such as interpolation, network, and surface analysis to model, interpret, and solve complex real-world geographic problems using GIS tools. | Apply |
| CO3 | Demonstrate the ability to apply spatial models and decision support systems to analyze environmental and planning problems for effective decision-making and sustainable resource management. | Apply |
| CO4 | Apply MCDM techniques, including AHP and GIS-based analysis, to perform suitability and risk mapping for informed spatial decision-making. | Apply |
| CO5 | Design and implement integrated geospatial projects using RS, GIS, and GPS technologies to address real-world environmental and urban challenges. | Apply |

## B. MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | **2** | **1** | **2** | **–** | **2** | **–** | **3** | **-** | **–** | **–** | **–** | **1** | **1** | **1** | **2** |
| **CO2** | **2** | **1** | **2** | **–** | **2** | **–** | **3** | **-** | **–** | **–** | **–** | **1** | **1** | **1** | **2** |
| **CO3** | **2** | **1** | **2** | **–** | **2** | **–** | **3** | **-** | **–** | **–** | **–** | **1** | **1** | **1** | **2** |
| **CO4** | **2** | **1** | **2** | **–** | **2** | **–** | **3** | **-** | **–** | **–** | **–** | **1** | **1** | **1** | **2** |
| **CO5** | **2** | **1** | **2** | **–** | **2** | **–** | **3** | **-** | **–** | **–** | **–** | **1** | **1** | **1** | **2** |
| **WT. AV G** | **2** | **1** | **2** | **-** | **2** | **-** | **3** | **-** | **-** | **-** | **-** | **1** | **1** | 1 | **2** |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the unit | Time required for the Unit (Hours) |
|---|---|---|
| **1.** | **GPS: An overview** | **9** |
| **2.** | **Advance spatial analysis** | **9** |
| **3.** | **Spatial Modeling and Decision Support** | **9** |
| **4.** | **Multi-Criteria Decision Making (MCD) in GIS** | **9** |
| **5.** | **Project Design with integrated approach of RS, GIS and GPS** | **9** |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| **1.** | **GPS: An overview** |
| | • Introduction of unit<br>• Basics of GPS and GNSS<br>• Geo-positioning - Basic Concepts,<br>• Pseudo Range Measurement,<br>• Phase Difference Measurement<br>• Types of GPS data: waypoints, tracks, routes<br>• Use of mobile-based data collection (e.g., Survey123, Collector) |

| | |
|---|---|
| | • Field data collection and validation |
| 2. | **Advance spatial analysis** |
| | • Introduction to Unit<br>• Spatial interpolation (IDW, Kriging)<br>• Comparative analysis of TIN ,DTM and DSM<br>• Network analysis<br>• Surface analysis(Slope and Aspects, Viewshed analysis) |
| **3.** | **Spatial Modeling and Decision Support** |
| | • Introduction to Unit<br>• Phases of Decision making and Planning process<br>• DSS Vs SDSS<br>• Types of DSS<br>• Introduction to environmental models (SWAT, LULC change)<br>• Real world examples of DSS and SDSS |
| **4.** | **Multi-Criteria Decision Making (MCD) in GIS** |
| | • Introduction of unit<br>• Elements of MCDM<br>• MADM Vs MODM<br>• Steps of MCDM<br>• AHP<br>• Data preparation for MCDM<br>• Suitability and risk mapping |
| **5.** | **Project Design with integrated approach of RS, GIS and GPS** |
| | • Introduction of unit<br>• Aerosol and air quality mapping (MODIS, AERONET)<br>• Case study: Groundwater recharge zone mapping<br>• Case study: Urban sprawl and land transformation<br>• Case study: Remote sensing for crop yield estimation<br>• Hands-on mini-project with QGIS/ArcGIS<br>• Conclusion and real-life applications |

## E. RECOMMENDED STUDY MATERIAL:

| Sr. No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1 | Global Positioning System: Principles and Applications | Gopi, Satish | 2005 | Tata Mac-Grow Hill |
| 2 | Essentials of GPS | Agrawal, N.K. | 2004 | Spatial Network Pvt. Ltd |
| 3 | A framework for the development of decision support systems, Management Information Sciences Quarterly 4:1-26. | Sprague, R.H | 1997 | Source for DSS development model. |

| | | | | |
|---|---|---|---|---|
| 4 | Introduction to Geographic Information Systems | 1. Kang-tsung Chang, | 2007 | Tata McGraw Hill, New Delhi. |
| 5. | Concepts and Techniques of Geographic Information Systems" | C.P.Lo and Albert K.W.Yeung | 2006 | Prentice Hall of India,New Delhi |
| 6 | Principles of Geographical Information Systems | Burrough, Peter A. and Rachael McDonnell, | 1998 | Oxford University Press, New York. |
| 7 | Textbook of Remote sensing, GIS and GNSS | Dr Shailesh Sharma | 2023 | Notion Press |
| 8 | Foundations of Decision Support Systems | Bonczek, R.H., C.W. Holsapple, and A.B. Whinston, | 1981 | Academic Press, New York. Basic text on DSS |

| Code: 25BESCES5103 | ORGANIC CHEMISTRY | 3.0 Credits [LTP: 3-0-0] |
|---|---|---|

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Demonstrate structure elucidation of organic compounds using UV, IR and NMR spectroscopy. | Apply |
| CO2 | Demonstrate Nuclear Magnetic Resonance spectroscopy and PMR spectra of organic compounds. | Apply |
| CO3 | Apply mechanism of action of heterocyclic compounds in pharmaceutics/drugs. | Apply |
| CO4 | Describe carbohydrates, their structure and conversion with other carbohydrates | Understand |
| CO5 | Understand the chemical nature of Amino Acids, Peptides and Proteins. | Understand |

## B. Mapping matrix of CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | - | 1 | - | - | - | - | - | - | - | - | 3 | - | - |
| CO2 | 2 | 3 | 1 | - | - | - | - | - | - | - | - | - | 3 | - | - |
| CO3 | 2 | 3 | - | - | - | - | - | - | - | - | - | - | 3 | - | - |
| CO4 | 3 | 3 | - | - | - | - | - | - | - | - | - | - | 3 | - | - |
| CO5 | 3 | 2 | - | - | - | - | - | - | - | - | - | - | 3 | - | - |
| WT. AVG | 2.6 | 2.6 | 2 | 1 | - | - | - | - | - | - | - | - | 3 | - | - |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | Electromagnetic Spectrum | 9 |
| 2. | Nuclear Magnetic Resonance (NMR) spectroscopy | 9 |
| 3. | Heterocyclic Compounds | 9 |
| 4. | Carbohydrates | 9 |
| 5. | Amino Acids, Peptides and Proteins | 9 |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| 1 | **Electromagnetic Spectrum** |
| | • Introduction to the Unit<br>• **Electromagnetic Radiation**<br>• Origin of organic spectra, Types of energy changes, Types of molecular spectra, General instrumentation, absorbance and transmittance, line width.<br>• **Ultraviolet Absorption Spectroscopy**- absorption laws (Beer-Lambert Law) molarabsorptivity, presentation and analysis of UV spectra, types of electronic transitions,<br>• Effect of solvents on transitions, effect of conjugation, concept of chromophore and auxochrome, bathochromic, hypsochromic and hyperchromic and hypochromic shifts,<br>• UV spectra of conjugated enes and enones.<br>• **Infrared Absorption Spectroscopy** – Theory-Absorption of infra radiation Molecular vibrations, Hookes law, selection rules, intensity and position of IR bands measurement of IR spectrum, finger print region, characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds.<br>• Conclusion & real life application. |
| 2 | **Nuclear Magnetic Resonance (NMR) spectroscopy** |
| | • Introduction to the Unit.<br>• **Nuclear Magnetic Resonance (NMR) spectroscopy**: Principles of NMR spectroscopy, Larmor precession, chemical shift and low resolution spectra different scales, |
| | • Proton magnetic resonance ($^1$H-NMR) spectroscopy, nuclear shielding and deshielding, chemical shift and molecular structure, spin-spin splitting and coupling constants, areas of signals. Interpretation of NMR spectra of simple organic molecules such as ethyl bromide, ethanol, acetaldehyde, I,1,2-tribromoethane, ethyl acetate, toluene and acetophenone.<br>• Conclusion & real life application |
| 3 | **Heterocyclic Compounds** |
| | • Introduction to the Unit.<br>• Simple five membered ring compounds with one hetero atom Ex. Furan. Thiophene and pyrrole<br>• Aromatic character<br>• Preparation from 1, 4, - dicarbonyl compounds,<br>• PaulKnorr synthesis. Properties: Acidic character of pyrrole - electrophilic substitution at 2 or 5 position, Halogenation, Nitration and Sulphonation under mild conditions - Diels Alder reaction in furan.<br>• Pyridine – Structure - Basicity – Aromaticity<br>• Conclusion & real life application. |
| 4 | **Carbohydrates** |

| | |
|---|---|
| | • Introduction to the Unit<br>• **Carbohydrates**: Classification, and General Properties<br>• Glucose and Fructose (open chain and cyclic structure)<br>• Determination of configuration of monosaccharides, absolute configuration of Glucose and Fructose, Mutarotation<br>• Structure of disacharrides (sucrose, cellobiose, maltose, lactose) and polysaccharides (starch and cellulose) excluding their structure elucidation<br>• Mechanism of osazone formation. Epimers, anomers. Interconversion of glucose and fructose, chain lengthening and chain, shortening of aldoses. Conversion of glucose into mannose. Determination of ring size of monosaccharides.<br>• Conclusion & real life application. |
| **5** | **Amino Acids, Peptides and Proteins** |
| | • Introduction to the Unit<br>• Amino Acids, Peptides, Proteins and its classification, structure and stereochemistry of amino acids. acid-base behaviour, isoelectric point and electrophoresis. Preparation and reactions of alpha-amino acids.<br>• Amino Acids Preparation by Strecker synthesis using Gabriel's phthalimide synthesis.<br>• Reactions of Amino acids: ester of –COOH group, acetylation of –NH2 group, complexation with $Cu^{2+}$ ions, ninhydrin test<br>• Overview of Primary, Secondary, Tertiary and Quaternary Structure of proteins.<br>• Determination of Primary structure of Peptides by degradation- Edmann degradation (N terminal and C terminal ) thiohydantoin and with carboxy peptidase enzyme<br>• Conclusion & real life application. |

## E. RECOMMENDED STUDY MATERIAL:

| Sr.No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | A Text Book of Organic Chemistry | O. P. Agarwal | Vol. I & II | Goyal Publication |
| 2. | A Text Book of Organic Chemistry | B. S. Bahl and ArunBahl | Latest | S. Chand & Company Ltd. |
| 3. | Organic Chemistry | S. M. Mukherji, S. P. Singh and R. P. Kapoor | Vol. I, II &III | Wiley Eastern Ltd. (New Age International) |
| 4 | Organic Chemistry | I.L. Finar | Vol.-I & II | |

**Code:BESCES5104 FUNDAMENTALS OF CLOUD COMPUTING 3.0 Credits [LTP: 3-0-0]**

## A. COURSEOUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Recall cloud computing basics, history, characteristics, and deployment models. | Remember |
| CO2 | Understand IaaS, PaaS, and SaaS, their benefits, risks, and examples. | Understand |
| CO3 | Apply knowledge of cloud platforms like AWS, Azure, and GCP, and cloud migration strategies. | Apply |
| CO4 | Analyze cloud storage, performance, security challenges, and mitigation strategies. | Analyze |
| CO5 | Evaluate cloud management, virtualization, economic models, and best practices. | Evaluate |

## B. MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | 2 | 1 | 1 |
| CO2 | 3 | 3 | 2 | 1 | - | - | - | - | - | - | - | - | 2 | 1 | - |
| CO3 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | 1 | 1 | - |
| CO4 | 3 | 2 | 1 | - | - | - | - | - | - | - | - | - | - | - | - |
| CO5 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | - | - | - | - |
| WT. AVG | 2.8 | 2.2 | 1.4 | 1 | 1 | - | - | - | - | - | - | - | 1.8 | 1 | 1 |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the unit | Time required for the Unit (Hours) |
|---|---|---|
| 1 | Fundamentals of Cloud Computing | 9 |
| 2 | Cloud Models | 9 |
| 3 | Cloud Platforms | 9 |
| 4 | Cloud Computing - Challenges, Risk and Mitigation | 9 |
| 5 | Managing the Cloud | 9 |

## D. DETAILED SYLLABUS

| Unit | Unit details |
|---|---|
| 1 | Fundamentals of Cloud Computing |

| | |
|---|---|
| | • Introduction of Unit<br>• Cloud Computing Basics – History of Cloud Computing, Characteristics of Cloud Computing, Need for Cloud computing, Advantages and Possible Disadvantages of cloud computing<br>• Cloud Deployment Models- Public, Private, Hybrid Community, Other deployment Models.<br>• Conclusion of Unit |
| **2** | **Cloud Models** |
| | • Introduction of Unit<br>• Introduction to Cloud Services, Infrastructure as a Service (IaaS) – Overview,<br>• Data Protection, IaaS security, Benefits, Risks and Examples of IaaS.<br>• Platform as a Service (PaaS) – Overview, IaaSvsPaaS, PaaS Examples, benefits and risks. Software as a Service (SaaS) – Introducing SaaS: SaaS Examples – Office 365, Google G Suite, Salesforce.com<br>• Virtulization-Hypervisor and its type, Types of Virtulization)<br>• Conclusion of Unit |
| **3** | **Cloud Platforms** |
| | • Introduction of Unit<br>• Introducing Cloud Platforms, Amazon Web Services, Microsoft Azure, Google Cloud Platform, Salesforce.com<br>• Cloud Migration : Delivering Business Processes from the Cloud: Business process, examples, Broad Approaches to Migrating into the Cloud, The Seven-Step Model of Migration into a Cloud,<br>• Conclusion of Unit |
| **4** | **Cloud Computing - Challenges, Risk andMitigation** |
| | • Introduction of Unit<br>• Cloud Storage, Application performance, Data Integration, Security. Ensuring Successful Cloud Adoption: Designing a Cloud Proof of Concept, Vendor roles and capabilities, moving to the Cloud. Impact of Cloud on IT Service Management.<br>• Risks and Consequences of Cloud Computing – Legal Issues, Compliance Issues, Privacy and Security.<br>• Conclusion of Unit |
| **5** | **Managing the Cloud** |
| | • Introduction of Unit<br>• Managing and Securing Cloud Services, Virtualization and the Cloud, Managing Desktops and devices on the cloud, SOA and Cloud computing, Managing the Cloud environment,<br>• Planning for the Cloud – Economic Cost Model and Leveraging the Cloud, Cloud computing resources, Cloud Dos and Don'ts.<br>• Conclusion of Unit |

E. **RECOMMENDED STUDY MATERIAL:**

| Sr.No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Cloud computing a practical approach | Anthony T.Velte , Toby J. Velte Robert Elsenpeter, | Latest | TMH. |
| 2. | Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - | Michael Miller | 2008 | Que 2008 |

**Code: 25BESEES5101 INORGANIC CHEMISTRY 3.0 Credits [LTP: 3-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Demonstrate different Acid Base theories and Solvent system concept. | Apply |
| CO2 | Analyze metal ligand bonding in transition metal complexes with the help of Valence Bond Theory and Crystal field Theory. | Analyze |
| CO3 | Understand the magnetic &spectral properties, thermodynamic and kinetic aspects of metal complexes. | Understand |
| CO4 | Describe synthesis, properties and applications of organometallic compounds. | Understand |
| CO5 | Evaluate redox potential, redox cycle and disproportionation using Frost, Latemar and Roubaixdiagram. | Evaluate |

## B. Mapping matrix of CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | - | 1 | - | - | - | - | - | - | - | - | 3 | - | - |
| CO2 | 2 | 3 | 1 | - | - | - | - | - | - | - | - | - | 3 | - | - |
| CO3 | 3 | 2 | 1 | - | - | - | - | - | - | - | - | - | 3 | - | - |
| CO4 | 3 | 3 | 1 | - | - | - | - | - | - | - | - | - | 3 | - | - |
| CO5 | 2 | 3 | 1 | - | - | - | - | - | - | - | - | - | 3 | - | - |
| WT. AVG | 2.6 | 2.6 | 1 | 1 | - | - | - | - | - | - | - | - | 3 | - | - |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | Acids & Bases and Non-aqueous Solvents | 9 |
| 2. | Metal Ligand bonding in transition metal complexes | 9 |
| 3. | Magnetic and Spectral properties of Transition Metal Complexes | 9 |
| 4. | Organometallic Chemistry | 9 |
| 5. | Oxidation & Reduction | 9 |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| **1.** | **Acids & Bases and Non-aqueous Solvents** |
| | • Introduction of the Unit<br>• **Acids and bases:** Theories of Arrhenius, Bronsted-Lowry, Lux-Flood<br>• Solvent system concept and Lewis concept of acids and bases<br>• Hard and Soft Acids and Bases (HSAB): Classification of acids and bases as hard and soft.<br>• Pearson's HSAB concept, acid-base strength and hardness and softness. Symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness<br>• **Non-aqueous solvents :**Physical properties of solvent, types of solvent and their general characteristics<br>• reactions in non-aqueous solvents with reference to liq. $NH_3$ and liq. $SO_2$, HF<br>• Conclusion of the Unit |
| **2.** | **Metal Ligand bonding in transition metal complexes** |
| | • Introduction of the Unit<br>• **Transition Metals:** Characteristic properties transition elements – ionic radii, oxidation states, complexation tendency, magnetic behavior and electronic spectral properties.<br>• Metal ligands bonding in transition metal complexes<br>• Limitatation of VBT, Elementary idea of CFT, Crystal field splitting in Octahederal, Tetrahederal and Square planer complexes, Factors affecting the crystal field parameter<br>• Conclusion of the Unit |
| **3.** | **Magnetic and Spectral properties of Transition Metal Complexes** |
| | • Introduction of the Unit<br>• Magnetic Properties of Transition Metal Complexes: Types of magnetic behavior, methods of determining magnetic susceptibility, L-S and J-J coupling, orbital contribution to magnetic moments. Correlation of magnetic moment data and stereochemistry of Co (II) and Ni (II) complexes; anomalous magnetic moments<br>• Spectral properties of transition metal complexes: Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states and Spectoscopic terms (L-S Coupling) , spectrochemical series, orgelenergy level diagram for d1 and d9 states, the electronic spectrum of [ Ti(H2O)6]+3 complex ion.<br>• Thermodynamic and Kinetic Aspects of Metal Complexes: A brief outline of thermodynamic stability of metal complexes and factors affecting the stability, substitution reactions of square planar complexes<br>• Conclusion of the Unit |
| **4.** | **Organometallic Chemistry** |
| | • Introduction of the Unit<br>• **Organometallic chemistry:** Definition, nomenclature and classification of organometallic compounds,<br>• Preparation, properties, bonding and applications of alkyls and aryls of Li, Al, Hg, Sn and Ti, a brief account of metal – ethylenic complexes and homogenous hydrogenation, mononuclear carbonyls and the nature of bonding in metal carbonyls.<br>• Conclusion of the Unit |
| **5.** | **Oxidation & Reduction** |

| | |
|---|---|
| | • Introduction of the Unit<br>• Use of Redox potential data<br>• Analysis of redox cycle<br>• Redox stability in water<br>• Disproportnation<br>• Diagrammatical presentation of potential data-Frost, Latimar and pourbaix diagram<br>• Principle involved in the extraction of elements<br>• Conclusion of the Unit |

## E. RECOMMENDED STUDY MATERIAL:

| Sr.No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Selected Topics in Inorganic Chemistry | Malik Tuli, Madan | Latest | S. Chand & Sons |
| 2. | Advanced Inorganic Chemistry | S. K Agarwal, Keemtil | Latest | Pragati Prakashan |

**Code: 25BESEES5102 COMPUTER ORGANIZATION AND ARCHITECTURE 3 Credits [LTP: 3-0-**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Identify basic computer elements & Explain the basic structure, organization of different computer units. | Remember |
| CO2 | Demonstrate programming proficiency using various addressing modes and instruction set. | Understand |
| CO3 | Design Micro programmed control unit and Develop Arithmetic algorithms. | Apply |
| CO4 | Discuss the concepts of Memory and I/O organization | Analyze |
| CO5 | Compare the commercially available processor architectures (Pentium & Athlon) and examine the architectural features of advanced processors. | Evaluate |

## B. MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | 2 | 1 | 3 | -- | -- | - | - | - | - | - | - | 3 | 1 | 1 |
| CO2 | 1 | 2 | 1 | 3 | -- | -- | - | - | - | - | - | - | 3 | 2 | 1 |
| CO3 | 1 | 1 | 2 | 3 | - | -- | - | - | - | - | - | - | 3 | 3 | 1 |
| CO4 | 1 | 2 | 1 | 3 | - | -- | - | - | - | - | - | - | 3 | 2 | 1 |
| CO5 | 2 | 2 | 1 | 3 | -- | -- | - | - | - | - | - | - | 3 | 1 | 2 |
| WT. AVG | 1 | 2 | 1 | 3 | -- | -- | - | - | - | - | - | - | 3 | 1 | 1 |

## C. OUTLINE OF THECOURSE

| Unit No. | Title of the unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | Register Transfer and Micro-operation | 9 |
| 2. | Basic Computer Organization | 9 |
| 3. | Micro Programmed Control Unit | 9 |
| 4. | Computer Arithmetic | 9 |
| 5. | Modes of Data Transfer and Memory Organization | 9 |

## D. DETAILEDSYLLABUS

| Unit | Unit Details |
|---|---|
| **1.** | **Register Transfer and Micro-operation** |
| | • Introduction of the Unit<br>• Register Transfer Language, Register Transfer, Bus and Memory Transfer: Three state bus buffers, Memory Transfer.<br>• Arithmetic Micro-operations: Binary Adder, Binary Adder-Subtrator, Binary Incrementor,<br>• Logic Micro-operations: List of Logic micro- operations, Shift Micro-operations (excluding H/W implementation), Arithmetic Logic Shift Unit.<br>• Conclusion & Real life applications |
| **2.** | **Basic Computer Organization** |
| | • Introduction of the Unit<br>• Instruction Codes, Computer Registers: Common bus system, Computer Instructions:<br>• Instruction formats, Instruction Cycle: Fetch and Decode, Flowchart for Instruction cycle, Register reference instructions.<br>• Conclusion & Real life applications |
| **3.** | **Micro Programmed Control Unit** |
| | • Introduction of the Unit<br>• Control Memory, Address Sequencing, Conditional branching, Mapping of instruction, Subroutines.<br>• Design of Control Unit, Central Processing Unit: Introduction, General Register Organization,<br>• Stack Organization: Register stack, Memory stack; Instruction Formats, Addressing Modes.<br>• Conclusion & Real life applications |
| **4.** | **Computer Arithmetic** |
| | • Introduction of the Unit<br>• Introduction, Addition and Subtraction,<br>• Multiplication Algorithms (Booth algorithm), Division Algorithms, Output interface, Introduction<br>• Input – Output Organization: Peripheral devices, Input – Multiprocessors: Characteristics of multi-processors.<br>• Conclusion & Real life applications |
| **5.** | **Modes of Data Transfer and Memory Organization** |
| | • Introduction of the Unit<br>• Modes of Data Transfer: Priority Interrupt, Direct Memory Access,<br>• Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory,<br>• Associative Memory, Cache Memory, Virtual Memory<br>• Conclusion & Real life applications |

## E. RECOMMENDED STUDYMATERIAL:

| Sr. No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1 | Computer system architecture | Morris Mano | Latest | PHI Publication |
| 2 | Computer organization and architecture | William stallings | Latest | PHI Publication |
| 3 | Digital computer electronics | Malvino | Latest | TMH |

| Code: 25BESCES5201 | Environmental Science Lab | 1.0 Credit [LTP: 0-0-2] |
|---|---|---|

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Analyze spatial and temporal environmental changes using remote sensing and GIS tools | Analyze |
| CO2 | **Apply terrain and hydrological analysis using DEM and GIS platforms.** | Apply |
| CO3 | Utilize filtering and thermal band analysis for environmental monitoring | Apply |
| CO4 | Implement spatial data integration and exploration techniques. | Apply |
| CO5 | Demonstrate competence in using QGIS and SAGA for advanced spatial analysis | Apply |

## B. MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 3 | 3 | - | 2 | - | 2 | 1 | - | - | 1 | 1 | 3 | 1 | 2 |
| **CO2** | 2 | 3 | 3 | - | 2 | - | 2 | 1 | - | - | 1 | 1 | 3 | 1 | 2 |
| **CO3** | 2 | 3 | 3 | - | 2 | - | 2 | 1 | - | - | 1 | 1 | 3 | 1 | 2 |
| **CO4** | 2 | 3 | 3 | - | 2 | - | 2 | 1 | - | - | 1 | 1 | 3 | 1 | 2 |
| **CO5** | 2 | 3 | 3 | - | 2 | - | 2 | 1 | - | - | 1 | 1 | 3 | 1 | 2 |
| **WT. AVG** | 2 | 3 | 3 | - | 2 | - | 2 | 1 | - | - | 1 | 1 | 3 | 1 | 2 |

## C. List of Experiments

| | |
|---|---|
| 1 | Change Detection using SAGA |
| 2 | Introduction to Filters Using Saga |
| 3 | Terrain Analysis using QGIS and SAGA |
| 4 | Data Exploration using QGIS |
| 5 | To understand Concept of Multi-criteria analysis using spatial analysis tools of QGIS. |
| 6 | Working with Tables |
| 7 | Working with Google Earth using QGIS |
| 8 | Using GPS DATA With QGIS |
| 9 | To understand basics of hydrological analysis and to delineate watershed basin using DEM data |
| 10 | To create a brightness temperate map of the Study area using Landsat-8 thermal bands. |
| 11 | To assess the impact of disaster of the study area |
| 12 | To assess spatiotemporal changes in vegetation cover of study Area |

**Code: 25BESEES5202 CHEMISTRY LAB-V 1.0 Credit [LTP: 0-0-2]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Understand the mechanisms involved in the synthesis of organic compounds such as p-bromoacetanilide, p-nitroacetanilide, and aspirin. | Understand |
| CO2 | Explain the principles of the chromatographic techniques | Understand |
| CO3 | Apply the principles behind conductometric measurements and their application in studying the saponification of ethyl acetate. | Apply |
| CO4 | Describe the relationship between concentration and properties such as surface tension and conductivity in detergent solutions. | Understand |
| CO5 | Apply solvent extraction techniques to separate mixtures of organic compounds. | Apply |

## B. Mapping matrix of CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | **2** | **3** | **2** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **1** | **3** | **-** | **-** |
| **CO2** | **2** | **3** | **3** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **1** | **3** | **-** | **-** |
| **CO3** | **2** | **3** | **3** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **1** | **3** | **-** | **-** |
| **CO4** | **2** | **3** | **3** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **1** | **3** | **-** | **-** |
| **CO5** | **3** | **3** | **2** | **1** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **1** | **3** | **-** | **-** |
| **WT. AVG** | **2.2** | **3** | **2.6** | **1** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **1** | **3** | **-** | **-** |

## C. List of Experiments

| | |
|---|---|
| 1 | Synthesis of p bromoacetanalide |
| 2 | Synthesis of p-nitroacetanalide |
| 3 | Benzolytation of Aniline |
| 4 | Paper chromatographic separation of compounds in Spinach plant |
| 5 | To separate a mixture of sugar by paper chromatography |
| 6 | Synthesis of Aspirin |
| **Physical Chemistry** | |
| 7 | To determine the heat of neutralization for strong acid and strong base |
| 8 | Detection of Adulterants in various foods. |
| 9 | To study the saponification of ethyl acetate conductmetrically |
| 10 | Study the variation of surface tension with different concentration of detergent solutions. DetermineCMC. |
| 11 | To separate mixture of organic compounds by solvent extraction. |
| 12 | Determination of conductivity, molar conductivity, degree of dissociation and dissociation constant ofa weak acid. |

| Code: 25BESCES5203 | **Power-Bi Lab** | 1.0 Credit [LTP: 0-0-2] |
|---|---|---|

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Recall the key features and functions of Power BI Desktop and Power BI Service. | Remembering |
| CO2 | Explain the use of different Power BI visuals like bar chart, pie chart, slicer, and cards. | Understanding |
| CO3 | Import datasets and apply various visualizations to represent data in Power BI. | Applying |
| CO4 | Analyze data trends using sorting, filtering, and slicers to gain meaningful insights. | Analyzing |
| CO5 | Evaluate and publish interactive reports and dashboards using formatting and service tools. | Evaluating |

## B. MAPPING MATRIX OF CO, PO & PSO

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | - | - | - | 2 | - | - | - | - | 2 | - | 2 | 1 | 1 | - |
| CO2 | 2 | - | - | 2 | 3 | - | - | - | - | 2 | - | 2 | 2 | 2 | - |
| CO3 | 3 | 2 | - | 2 | 3 | - | - | - | - | 3 | 2 | 3 | 2 | 3 | - |
| CO4 | 3 | 3 | 2 | 3 | 3 | - | - | - | - | 3 | 2 | 3 | 2 | 3 | 2 |
| CO5 | 2 | 2 | 2 | 2 | 3 | - | - | - | 2 | 3 | 2 | 2 | - | 3 | 3 |
| **Avg. WT** | **2.4** | **2.33** | **2.0** | **2.25** | **2.8** | — | — | **2.0** | **2.0** | **2.6** | **2.0** | **2.4** | **1.75** | **2.4** | **2.5** |

## C. LIST OF EXPERIMENTS:

| | |
|---|---|
| 1 | Import data from an Excel file into Power BI Desktop. |
| 2 | Create a bar chart to show sales by product. |
| 3 | Create a pie chart to display sales by region. |
| 4 | Add a slicer to filter data by year. |
| 5 | Display customer details using a table visual. |
| 6 | Show total sales using a card visual. |
| 7 | Sort a chart by sales amount in descending order. |
| 8 | Format visuals by adding titles and changing colors. |
| 9 | Save and publish the report to Power BI Service. |
| 10 | Create a dashboard in Power BI Service by pinning visuals. |

**Code: 25BUACHM5114 PRESENTATION & INTERVIEW SKILLS 2.0 Credits [LTP: 2-**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, students will be able to: | Bloom Level |
|---|---|---|
| CO1 | Understand human behavior, develop positive thinking, adaptability, and self-awareness, and apply these skills in the workplace. | Understand |
| CO2 | Compose technical writings, formal letters, job applications, CV, and business reports, and demonstrate proficiency in email communication. | Apply |
| CO3 | Apply effective oral presentation and public speaking skills, including voice modulation, tone, and visual aids, to deliver engaging business | Apply |
| CO4 | Exhibit appropriate interview etiquette, effectively participate in various types of interviews, and contribute meaningfully to group discussions. | Apply |
| CO5 | Analyze the distinctions between groups and teams, evaluate strategies for time and stress management, formulate comprehensive long-term career plans, and demonstrate mastery in negotiation techniques. | Analyze |

## B. MAPPING MATRIX OF CO, PO AND PSO

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | - | - | - | — | — | 3 | — | 2 | 1 | — | — | — | — | 1 | 1 |
| **CO2** | - | - | - | 2 | — | - | - | — | — | 3 | — | — | — | - | 2 |
| **CO3** | - | - | - | — | 1 | - | - | — | 2 | 3 | — | — | — | 1 | 2 |
| **CO4** | - | - | - | - | | - | - | 1 | 3 | 2 | — | — | — | - | 3 |
| **CO5** | - | - | - | - | | - | - | — | 2 | — | — | 1 | — | - | 3 |
| **Wt Avg** | - | - | - | - | | - | - | 1.5 | 1.6 | 1.6 | - | 1 | - | 1 | 2.2 |

## C. OUTLINE OF THE COURSE

| Unit | Unit name | Time required for the Unit (Hours) |
|---|---|---|
| 1 | **Professional Attitude & Approach** | 6 |
| 2 | **Professional Writing-I** | 6 |
| 3 | **Presentation Skills: Structure Study** | 6 |
| 4 | **Interview Skills & Group Discussion** | 6 |
| 5 | **Negotiation Skills & Time Management** | 6 |

## D. DETAILED SYLLABUS

| UNIT | UNIT NAME |
|---|---|
| 1 | **Professional Attitude & Approach** |
| | • Introduction to the Unit<br>• Understanding Human behavior<br>• Relationships between truth and beliefs<br>• Positive Thinking<br>• Adaptability and resilience<br>• Adaptability in the workplace<br>• Self -Awareness<br>• Conclusion & Real-Life Application |
| **2** | **Professional Writing** |
| | • Introduction to the Unit<br>• Technical Writing<br>• Formal Letter Writing<br>• Job applications<br>• Notice Agenda and Minutes of Meeting<br>• CV preparation (differences between Bio-Data, CV, and Resume)<br>• Report Writing (Business Reports, Memo Reports)<br>• Email Communication<br>• Conclusion & Real-Life Application |
| **3** | Presentation Skills: Structure Study |
| | • Introduction to the Unit<br>• Oral Presentation: Voice modulation, tone, describing a process<br>• Presentation Skills: Oral presentation and public speaking skills<br>• Business presentations<br>• Preparation: organizing the material, Self-Introduction, introducing the topic, answering questions, individual presentation practice, and presenting visuals effectively.<br>• Conclusion & Real-Life Application |
| **4** | **Interview Skills & Group Discussion** |
| | • Introduction to the Unit<br>• Interview Skills: types of interviews, successful interviews,<br>• Interview etiquette, dress code, body language<br>• Online Job Interview: Telephone/online (skype) interviews<br>• Offline Job Interviews: One-to-one interviews & panel interviews<br>• Mock Interviews<br>• Introduction to Group Discussion (GD)<br>• Differences between GD and debate<br>• Participating in GD, understanding GD, brainstorming the topic, questioning and clarifying<br>• GD strategies<br>• Conclusion & Real-Life Application |
| **5** | **Negotiation Skills & Time Management** |
| | • Introduction to the Unit<br>• Recognizing differences between groups and teams<br>• Time Management<br>• Stress Management<br>• Networking professionally<br>• Respecting social protocols |

| | |
|---|---|
| | ● Understanding career management<br>● Develop a long-term career plan<br>● Points of view<br>● Agreement-Disagreement<br>● Discussion techniques<br>● Situations and negotiators<br>● Difficulties in negotiation and reaching an agreement<br>● Conclusion & Real-Life Application |

## E. RECOMMENDED STUDY MATERIAL

| Sr. No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | English for Engineers and Technologists | Rod Ellis | (Combined edition, Vol. 1 and 2) | Orient Blackswan 2010. |
| 2. | The Elements of Style | William Strunk Jr. & E.B. White | 4th Edition | Pearson, 1999. |
| 3. | Technical Communications | Raman Sharma | London, 2004 | Oxford Publication |
| 4. | Success in Interview | Anand Ganguly | 5 Edition, 2016 | RPH |

| Code: 25BULCSE5201 | SKILL ENHANCEMENT COURSE-V | 2.0 Credits [LTP: 0-0-2] |
|---|---|---|

**Course: Artificial Intelligence using Python**

**A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING**

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Implement classical search algorithms such as BFS and DFS for solving problem spaces. | Apply |
| CO2 | Apply Python programming to model and solve real-life AI problems using game-based logic and state-space search. | Apply |
| CO3 | Use heuristic and optimization-based techniques like A*, hill climbing, and alpha-beta pruning for decision-making problems. | Analyze |
| CO4 | Develop rule-based AI systems including inference engines and simple chatbots. | Understand |
| CO5 | Analyze and solve constraint satisfaction and logic-based problems using Python. | Analyze |

**B. MAPPING MATRIX OF CO, PO & PSO**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 3 | 2 | 1 | - | - | 1 | - | 2 | 1 | 3 | 1 | 1 | - |
| **CO2** | 3 | 3 | 3 | 2 | 2 | - | - | 1 | - | 2 | 2 | 3 | 1 | 1 | - |
| **CO3** | 3 | 3 | 3 | 3 | 2 | - | - | 1 | - | 2 | 2 | 3 | 1 | 1 | - |
| **CO4** | 2 | 2 | 2 | 3 | 2 | 1 | - | 2 | 2 | 3 | 2 | 2 | 1 | 1 | - |
| **CO5** | 3 | 3 | 3 | 2 | 3 | - | - | 1 | 1 | 2 | 2 | 3 | 1 | 1 | - |
| **Wt. Avg** | 2.8 | 2.6 | 2.8 | 2.4 | 2 | 1 | - | 1.2 | 1.5 | 2.2 | 1.8 | 2.8 | 1 | 1 | - |

**C. DETAILED SYLLABUS**

| Sr. No. | LIST OF ACTIVITES |
|---|---|
| 1 | Implement Breadth First Search (BFS) for a graph or a maze problem using Python |
| 2 | Implement Depth First Search (DFS) for a graph or tree traversal using Python |
| 3 | Develop a Tic-Tac-Toe Game using Minimax Algorithm |
| 4 | Solve the 8-Puzzle Problem using BFS/DFS/Heuristic Search |
| 5 | Implement the Water Jug Problem using BFS or DFS |
| 6 | Solve Travelling Salesman Problem using Greedy/Brute Force method |
| 7 | Implement Tower of Hanoi using Recursion in Python |
| 8 | Solve the Monkey-Banana Problem using state-space search |

| | |
|---|---|
| **9** | Implement Alpha-Beta Pruning for a 2-player game scenario (e.g., Tic-Tac-Toe/Chess Tree) |
| **10** | Solve the 8-Queens Problem using Backtracking |
| **11** | Implement A* Search Algorithm for a pathfinding problem |
| **12** | Implement Hill Climbing Algorithm for optimization problems |
| **13** | Build a simple Chatbot using rule-based logic in Python |
| **14** | Implement a basic Decision Tree classifier using Python and test it on a dataset |
| **15** | Create a Knowledge Base and solve queries using Forward/Backward Chaining (rule-based inference) |

**Code: 25BESCES5401 INDUSTRIAL TRAINING & SEMINAR 1 Credit [LTP: 0-0-2]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Discuss the organizational structure of company/ Industry/ Institute | Understand |
| CO2 | Prepare professional work report and presentations | Remembering |
| CO3 | Develop the written communications and technical report writing skills. | Apply |
| CO4 | Articulate the professional work report through presentations | Apply |
| CO5 | Conclude the gained knowledge through final presentation and project report submission. | Evaluate |

## B. MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 1 | 1 | - | - | - | - | - | 1 | - | 1 | - | 2 | 3 | - | 2 |
| **CO2** | 1 | 1 | - | 1 | - | - | - | 1 | - | 1 | - | 2 | 3 | - | - |
| **CO3** | - | - | - | - | 2 | - | - | 1 | - | 2 | - | 2 | 3 | - | - |
| **CO4** | - | - | - | - | 2 | - | - | 1 | 2 | 2 | - | 2 | 3 | - | 2 |
| **CO5** | - | - | 2 | - | 2 | - | - | 1 | - | 2 | 2 | 2 | 3 | - | 2 |
| **WT. AVG** | 1 | 1 | - | 1 | 2 | - | - | 1 | 2 | - | - | 2.6 | 2.2 | - | 2 |

## C. OUTLINE OF THE COURSE

| | |
|---|---|
| 1 | At the end of the Fourth Semester each student would undergo Industrial Training in an Industry/ Professional Organization / Research Laboratory with the prior approval of the Head of Department and Training & Placement Officer for two months. |
| 2 | Students shall be required to submit log book and certificate from the organization and power point presentation based on the training. |
| 3 | Students shall be required to submit a written typed report and power point presentation based on the training. |
| 4 | Students shall be required to give the presentations in the allotted period about the training attended after 4th Semester. |
| 5 | The evaluation shall be done as per continuous evaluation process during Vth semester by the respective department and the marks/result shall be notified accordingly. A department specific panel comprising of HOD/Sr. Faculty/ Project Coordinators shall judge each individual student for the above-mentioned work. The departmental panel shall display the proper schedule for the class/ one to one interaction/presentation for all the students. |

| Code: 25BESCES6101 | DISASTER MANAGEMENT | 3.0 Credits [LTP: 3-0-0] |
|---|---|---|

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Classify the natural and man-made disasters. | Understand |
| CO2 | Discuss the Vulnerability and Risk Analysis. | Understand |
| CO3 | Describe the idea, structure, and strategy of disaster preparedness | Understand |
| CO4 | Explain steps for preparedness for disasters based on participation, communication, and emergency activation | Understand |
| CO5 | Define long-Term Counter Disaster Plans and the Function of Educational Institutions | Remember |

## B. MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | - | - | - | - | 2 | 1 | - | - | - | 1 | - | - | - |
| CO2 | 3 | - | - | - | - | - | 2 | 2 | - | - | - | 1 | - | - | - |
| CO3 | 3 | 3 | - | - | - | - | 3 | 3 | 1 | 1 | 1 | 1 | 3 | - | 2 |
| CO4 | 3 | 3 | - | - | - | - | 3 | 3 | 1 | 1 | 1 | 1 | 3 | - | 2 |
| CO5 | 3 | 3 | - | - | 1 | - | 2 | 3 | 1 | 1 | 1 | 1 | 3 | - | 2 |
| WT. AVG | 3 | 3 | - | - | 1 | - | 2.4 | 2.4 | 1 | 1 | 1 | 1 | 3 | | 2 |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | Introduction on Disaster | 9 |
| 2. | Risk and Vulnerability Analysis | 9 |
| 3. | Disaster Preparedness and Response Preparedness-I | 9 |
| 4. | Disaster Preparedness and Response Preparedness-II | 9 |
| 5. | Rehabilitation, Reconstruction and Recovery | 9 |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| **1.** | • Introduction on Disaster |
| | • Introduction of the Unit<br>• Different Types of Disaster :<br>• Natural Disaster: such as Flood, Cyclone, Earthquakes, Landslides etc<br>• Man-made Disaster: such as Fire, Industrial Pollution, Nuclear Disaster, BiologicalDisasters, Accidents (Air, Sea, Rail & Road), Structural failures(Building and Bridge), War & Terrorism etc. Causes, effects and practical examples for all disasters.<br>• Conclusion & real life application |
| **2.** | **Risk and Vulnerability Analysis** |
| | • Introduction of the Unit<br>• Risk : Its concept and analysis<br>• Risk Reduction<br>• Vulnerability : Its concept and analysis<br>• Strategic Development for Vulnerability Reduction<br>• Conclusion & real life application |
| **3.** | **Disaster Preparedness and Response Preparedness-I** |
| | • Introduction of the Unit<br>• Disaster Preparedness: Concept and Nature<br>• Disaster Preparedness Plan |
| | • Prediction, Early Warnings and Safety Measures of Disaster.<br>• Role of Information, Education, Communication, and Training<br>• Role of Government, International and NGO Bodies.<br>• Role of IT in Disaster Preparedness<br>• Role of Engineers on Disaster Management<br>• Conclusion & real life application |
| **4.** | **Disaster Preparedness and Response Preparedness-II** |
| | • Introduction of the Unit<br>• Disaster Response: Introduction<br>• Disaster Response Plan<br>• Communication, Participation, and Activation of Emergency Preparedness Plan<br>• Search, Rescue, Evacuation and Logistic Management<br>• Role of Government, International and NGO Bodies<br>• Psychological Response and Management (Trauma, Stress, Rumor and Panic)<br>• Relief and Recovery<br>• Medical Health Response to Different Disasters<br>• Conclusion & real life application |
| **5.** | **Rehabilitation, Reconstruction and Recovery** |

| | |
|---|---|
| | • Introduction of the Unit<br>• Reconstruction and Rehabilitation as a Means of Development.<br>• Damage Assessment<br>• Post Disaster effects and Remedial Measures.<br>• Creation of Long-term Job Opportunities and Livelihood Options,<br>• Disaster Resistant House Construction<br>• Sanitation and Hygiene<br>• Education and Awareness<br>• Dealing with Victims' Psychology,<br>• Long-term Counter Disaster Planning<br>• 10. Role of Educational Institute<br>• Conclusion & real life application |

## E. RECOMMENDED STUDY MATERIAL:

| Sr.No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1 | Environmental Engineering and Disaster Management | Jain, Rani, Gupta, Pareek, Agarwal, Saxena | 2010 | CBH |
| 2 | Disaster Management | Agarwal and Sahu | 2010 | Dhanpat Rai and Co. pvt ltd |
| 3 | Environmental Engineering and Disaster Management | Joshi, Santwani, Sharma, Sharma | 2010 | Vardhan Publisher and distributor |

**Code: 25BESCES6102** **PHYSICAL CHEMISTRY** **3.0 Credits [LTP: 3-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Evaluate photochemical and photophysical processes using Jablonski diagram and their quantum yield expressions. | Evaluate |
| CO2 | Understand the selection rules in rotational and vibrational spectra. | Understand |
| CO3 | Describe the fundamental concepts of electrochemistry and relate the conductivity of an electrolyte with its concentration. | Understand |
| CO4 | Demonstrate the mechanisms of unimolecular and bimolecular reactions at surfaces using Gibbs, Freundlich and Langmuir isotherm. | Apply |
| CO5 | Apply foundational concepts of Quantum Mechanics, covering black body radiation to the Schrödinger wave equation for the hydrogen atom. | Apply |

## B. Mapping matrix of CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | - | - | - | - | - | - | - | - | - | 3 | - | - |
| CO2 | 3 | 2 | - | 2 | - | - | - | - | - | - | - | - | 3 | - | - |
| CO3 | 3 | 2 | 3 | 1 | - | - | - | - | - | - | - | - | 3 | - | - |
| CO4 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - | 3 | - | - |
| CO5 | 2 | - | 3 | - | - | - | - | - | - | - | - | - | 3 | - | - |
| WT. AVG | 2.6 | 2 | 1.2 | 1.5 | - | - | - | - | - | - | - | - | 3 | - | - |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | Photochemistry | 9 |
| 2. | Spectroscopy | 9 |
| 3. | Electrochemistry-I | 9 |
| 4. | Electrochemistry-II | 9 |
| 5. | Quantum Mechanics | 9 |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| **1.** | **Photochemistry** |
| | • Introduction to the Unit.<br>• **Photochemistry:** Interaction of radiation with matter, difference between thermal and photochemical processes.<br>• Laws of photochemistry: Grothus-Drapper law, Stark-Einstien law<br>• Jablonski diagram depicting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non radiative process (internal conversion, inter system crossing) quantum yield, photosensitized reaction-energy transfer process (simple examples)<br>• Conclusion & real life application |
| **2.** | **Spectroscopy** |
| | • Introduction to the Unit.<br>• Spectroscopy I: Electromagnetic radiation of the spectrum, basic features of different spectrometers, statement of the Born Oppenheimer approximation, degree of freedom.<br>• Rotational spectrum: Diatomic molecules, Energy levels of rigid rotator, (semiclassical principles) selection rules, spectral intensity, distribution using population distribution (Maxwell Boltzmann distribution), determination of bond length, qualitative description of non-rigid rotator, isotope effect.<br>• Vibrational spectrum: Energy levels of simple harmonic oscillator, selection rules, pure<br>• vibrational spectrum, intensity, determination of force constant, qualitative relations of force constants and bond energy, effect of anharmonic motion and isotopes on the spectrum, idea of vibrational frequencies of different functional groups.<br>• Conclusion & real life application |
| **3** | **Electrochemistry-I** |
| | • Introduction to the Unit<br>• Electrical transport- conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of equivalent and specific conductance with dilution.<br>• Migration of ions and Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes. Ostwald dilution law its uses and limitations.<br>• Debye Huckel– Onsager`s equation for strong electrolytes (elementary treatment only). n |
| 4 | **Electrochemistry-II** |
| | ● Introduction to the Unit.<br>● Types of reversible electrodes, gas metal ion, metal-metal ion, metal insoluble salt-anion and redox electrodes.<br>● Electrode reactions, Nernst equation, derivation of cell E.M.F. and single electrode potential, standard hydrogen electrode, reference electrodes, standard electrode potential, sign convention, electrochemical series and its significance.<br>● EMF of a cell and its measurements. Computation of cells EMF. Calculation of thermodynamic quantities of cell reactions (ΔG, ΔH and K), polarization, over potential and hydrogen overvoltage.<br>● Electrolytic and galvanic cells-reversible and irreversible cells, conventional representation of electrochemical cell<br>Conclusion & real-life application |
| 5 | **Quantum Mechanics** |

| | |
|---|---|
| | • Introduction to the Unit<br>• Quantum Mechanics I: Black body radiation, Planck`s radiation law, photoelectric effect, heat capacity of solids, Bohr's model of hydrogen atom (no derivation) and its defects.<br>• Compton Effect. De Broglie hypothesis, Heisenberg's uncertainty principle, Sinusoidal wave equation, Hamiltonian operator, Schrodinger wave equation and its importance, physical interpretation of the wave function, postulates of quantum mechanics, particle in a one dimensional box.<br>• Schrodinger wave equation for H-atom, separation into three equations (without derivation), quantum numbers and their importance, hydrogen like wave functions, radial wave functions, angular wave functions.<br>• Conclusion & real life application |

## D. RECOMMENDED STUDY MATERIAL:

| Sr. No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Fundamentals of Molecular Spectroscopy | C. M. Banwell and E. McCash | 4th Edition | Tata McGraw Hill |
| 2. | Spectrometric Identification of Organic Compounds | Robert M. Silverstein, Francis X. Webster, David Kiemle | 7th Edition | Wiley |
| 3. | Applications of Spectroscopic techniques in Organic Chemistry | P.S. Kalsi | 6th Edition | New Age International |
| 4 | Physical Chemistry | Bahl and Tuli | Latest | S. Chand |

| Code: 25BESCES6103 | SOFT COMPUTING | 3.0 Credits[LTP:3-0-0] |
|---|---|---|

## A. COURSEOUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Understand the fundamentals and significance of Soft Computing and differentiate it from traditional hard computing techniques. | Remember |
| CO2 | Analyze the structure and function of artificial neural networks and apply learning algorithms for classification tasks. | Understand |
| CO3 | Apply fuzzy logic principles to model uncertainty and build fuzzy inference systems for real-world problems. | Apply |
| CO4 | Design and apply genetic algorithms for optimization and problem-solving in complex domains. | Analyze |
| CO5 | Develop hybrid soft computing models by integrating ANN, fuzzy logic, and genetic algorithms to solve complex real-world problems. | Evaluate |

## B. MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | 2 | 1 | 1 |
| CO2 | 3 | 3 | 2 | 1 | - | - | - | - | - | - | - | - | 2 | 1 | 1 |
| CO3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | 1 | 1 | 1 |
| CO4 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | - | 1 | 1 | - |
| CO5 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | - | - | - | - |
| WT. AVG | 2 | 2 | 2 | 1 | 3 | | | | | | | | 2 | 1 | 1 |

## C. OUTLINEOFTHECOURSE

| Unit No. | Title of the unit | Time required for the Unit(Hours) |
|---|---|---|
| 1 | Introduction to Soft Computing | 9 |
| 2 | Artificial Neural Networks (ANN) | 9 |
| 3 | Fuzzy Logic and Reasoning | 9 |
| 4 | Genetic Algorithms and Evolutionary Computing | 9 |
| 5 | Hybrid Soft Computing Systems | 9 |

## D. DETAILEDSYLLABUS

| Unit | Unit Details |
|---|---|
| **1.** | Introduction to Soft Computing |
| | • Introduction of Unit<br>• Definition and Characteristics of Soft Computing<br>• Comparison: Soft Computing vs Hard Computing<br>• Components of Soft Computing: ANN, Fuzzy Logic, Genetic Algorithms<br>• Real-life Applications of Soft Computing in Engineering and Decision Making<br>• Future Scope and Challenges |
| **2.** | Artificial Neural Networks (ANN) |
| | • Introduction of Unit<br>• Biological vs Artificial Neurons<br>• Perceptron and Multi-layer Perceptrons (MLP)<br>• Backpropagation Algorithm<br>• Applications of ANN in AI<br>• Conclusion & Real Life Application |
| **3.** | Fuzzy Logic and Reasoning |
| | • Introduction of Unit<br>• Fuzzy Sets vs Crisp Sets<br>• Membership Functions<br>• Fuzzy Rules and Fuzzy Inference Systems<br>• Applications of Fuzzy Logic in AI<br>• Conclusion & Real Life Application |
| **4.** | Genetic Algorithms and Evolutionary Computing |
| | • Introduction of Unit<br>• Introduction to Genetic Algorithms (GAs)<br>• Chromosomes, Fitness Function, Selection<br>• Crossover and Mutation Operators<br>• Applications of GAs in Optimization Problems<br>• Conclusion & Real Life Application |
| **5.** | Applications and Tools of Soft Computing |
| | • Introduction of Unit<br>• Introduction to real-life applications of soft computing<br>• Simple case studies using ANN, Fuzzy Logic, and Genetic Algorithms<br>• Overview of Neuro-Fuzzy systems (basic idea only, no complex math)<br>• Common tools used in Soft Computing (brief intro to MATLAB, Python, Fuzzy Toolbox)<br>• Hands-on examples of soft computing in daily life (e.g., washing machines, weather prediction, medical diagnosis) |

E. **RCOMMENDED STUDY MATERIAL**:

| Sr. No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Soft Computing and Intelligent Systems Design | Fakhreddine O. Karray, Clarence De Silva | 1st Edition | Pearson Education |
| 2. | Soft Computing: Fundamentals and Applications | V. K. Jain | 1st Edition | McGraw Hill Education (India) Pvt. Ltd. |

| Code: 25BESCES6201 | TECHNICAL SEMINAR | 1Credit [LTP: 0-0-2] |
|---|---|---|

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Identify the problem statement with the help of literature review. | Remember |
| CO2 | Discuss the reviewed problem through presentation. | Understand |
| CO3 | Elaborate the various research designs and methodologies to conduct survey/ analysis | Understand |
| CO4 | Articulate the technical report through discussion and presentations | Apply |
| CO5 | Summarize the final technical report presentation and submission. | Evaluate |

## B. MAPPING MATRIX OF CO, PO & PSO

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 1 | 1 | - | - | - | - | - | 1 | - | 1 | - | 2 | 3 | - | 2 |
| **CO2** | 1 | 1 | - | 1 | - | - | - | 1 | - | 1 | - | 2 | 3 | - | - |
| **CO3** | - | - | - | - | 2 | - | - | 1 | - | 2 | - | 2 | 3 | - | - |
| **CO4** | - | - | - | - | 2 | - | - | 1 | 2 | 2 | - | 2 | 3 | - | 2 |
| **CO5** | - | - | 2 | - | 2 | - | - | 1 | - | 2 | 2 | 2 | 3 | - | 2 |
| **WT. AVG** | 1 | 1 | - | 1 | 2 | - | - | 1 | 2 | - | - | 2.6 | 2.2 | - | 2 |

## C. OUTLINE OF THE COURSE

| | |
|---|---|
| 1 | Dissertation consist of finalization of thesis based on literature review carried out during semester break of third year. |
| 2 | Objective finalization & presentation |
| 3 | Design & experimentation/survey details |
| 4 | Thesis preparation and submission |
| 5 | Final presentation |

**Code: 25BUACHM6115 ENTREPRENEURIAL & MANAGERIAL SKILLS 2.0 Credits [LTP: 2-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Demonstrate an integrated awareness of Entrepreneurship and its link to professional life. | Understand |
| CO2 | Understand and analyze the concepts of Entrepreneurship Development and various Entrepreneurship models. | Apply |
| CO3 | Understand the role of effective leadership in organizational strategy & propose appropriate leadership styles and approaches through evaluation of dynamic leadership | Understand |
| CO4 | Comprehend the Presentation & Interview Skills behaviors and issues relating to leadership. | Understand |
| CO5 | Develop practical, ethically-informed leadership skills that can be applied in a range of situations. | Apply |

## B. MAPPING MATRIX OF CO PO &PSO

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | - | - | - | - | - | - | - | - | 3 | 2 | - | 1 | - | - | 3 |
| **CO2** | 3 | 2 | 1 | - | - | - | - | - | - | - | - | - | - | - | 3 |
| **CO3** | - | - | - | - | - | - | - | 2 | 3 | 1 | - | - | - | - | 1 |
| **CO4** | - | - | - | - | - | 3 | - | 2 | 1 | - | - | - | - | - | 1 |
| **CO5** | - | - | - | - | - | - | - | 3 | 2 | 1 | - | - | - | - | 1 |
| **Wt. Avg** | 3 | 2 | 1 | - | - | 3 | - | 2.. | 2.2 | 1.3 | -. | 1 | - | - | 2 |

## C. OUTLINE OF THE COURSE

| Unit | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | **Entrepreneurship** | 6 |
| 2. | **Entrepreneurship Development** | 6 |
| 3. | **Leadership Styles: Effective Vs Successful Managers.** | 6 |
| 4. | **Behavioral Theory of Leadership.** | 6 |
| 5. | **Leadership Styles: Case Study and Adaptation.** | 6 |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| 1. | **Entrepreneurship** |

| | |
|---|---|
| | ● Introduction to the Unit<br>● Concept of Entrepreneur. Intrapreneur, Entrepreneurship and Manager<br>● Difference between Entrepreneur and Intrapreneur, Entrepreneur and Entrepreneurship. Attributes and Characteristics of successful entrepreneurs. Functions of an Entrepreneur<br>● Classification of Entrepreneurs. Role of Entrepreneur in Indian Economy, Developing entrepreneurial culture, Factors influencing Entrepreneurship Growth - Economic, Non-Economic Factors, For profit or Not for profit entrepreneurs, Constraints for the Growth of Entrepreneurial Culture, Entrepreneurship as a career<br>● Entrepreneurship as a style of management, Emerging Models of Corporate Entrepreneurship, India's start up revolution–Trends, Imperatives, benefits; the players involved in the ecosystem, Business Incubators-Rural<br>● Entrepreneurship, social entrepreneurship, women entrepreneurs, Cases of Tata, Birlas, Kirloskar and new generation entrepreneurs in India.<br>● Conclusion of the Unit |
| **2.** | **Entrepreneurship development** |
| | ● Introduction to the Unit<br>● Entrepreneurial Competencies, Developing Competencies.<br>● Concept of entrepreneurship development, Entrepreneur Training and developing, Role of Entrepreneur Development Programs (EDP)<br>● Objectives – contents – methods - execution. Role of Mentors<br>● Innovation and Entrepreneurship, Design Thinking Process. Role of consultancy organizations in promoting Entrepreneurs<br>● Problems and difficulties of Entrepreneurs - Marketing Finance, Human Resource, Production; Research - external problems<br>● Mobility of Entrepreneurs, Entrepreneurial change, occupational mobility - factors in mobility<br>● Conclusion of the Unit |
| **3.** | **Leadership Styles: Effective Vs. Successful Managers** |
| | ● Introduction to the Unit<br>● Types of Leadership Style<br>● Types of Management Styles<br>● Distinction between Effective Leadership and Effective Management<br>● Conclusion of the Unit |
| **4.** | **Behavioral theory of Leadership** |
| | ● Introduction to the Unit<br>● Definition of Behavioral Theory<br>● Classification of Behavioral theory<br>● Conclusion of the Unit |
| **5.** | **Leadership Styles: Case Study and Adaptation** |
| | ● Introduction to the Unit<br>● Peter Weaver Case Study<br>● Dealing with Crisis: Case Study<br>● Arsenic and Old Lace Case Study<br>● Conclusion of the Unit |

**Code: 25BULCSE6201 LEADERSHIP COMMUNICATION LAB 1 Credit [LTP: 0-0-2]**

## A. COURSE OUTCOMES

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Show the skills for reporting educational qualifications, skills & expertise sections on social media | Apply |
| CO2 | Identify the stages of the writing process and formatting process | Understand |
| CO3 | Analyze the presentation's weak spots and areas for improvement. | Analyze |
| CO4 | Use various strategies and personal skills to perform well in interviews and Group Discussions. | Apply |
| CO5 | Practice negotiation and team management skills and their mutual dynamics. | Apply |

## B. MAPPING MATRIX OF CO, PO AND PSO

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 1 | 2 | 1 | 0 | 3 | 2 | 3 | 2 | 2 | - | 1 | 3 |
| CO2 | 2 | 3 | 2 | 2 | 3 | 1 | 0 | 2 | 1 | 3 | 2 | 2 | - | 1 | 3 |
| CO3 | 2 | 3 | 3 | 3 | 2 | 1 | 0 | 2 | 2 | 3 | 1 | 2 | - | 1 | 3 |
| CO4 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 3 | 3 | 3 | 2 | 2 | - | 1 | 3 |
| CO5 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | - | 1 | 3 |
| WT. AVG | 2 | 2.4 | 2.2 | 2 | 2.2 | 1.4 | 1.5 | 2.6 | 2.2 | 3 | 2 | 2 | - | 1 | 3 |

## C. OUTLINE OF THE COURSE

| UNIT NO. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| **1** | **Branding and Leadership** | **2** |
| **2** | **Professional Writing and Leadership** | **8** |
| **3** | **Presentation Skills and Corporate Leadership** | **2** |
| **4** | **Interview & Group Discussion: Preparation by Mock Practice** | **4** |
| **5** | **Negotiation Skills, Team Management & Professional Awareness** | **8** |

**D. DETAILED SYLLABUS**

| List of Labs | |
|---|---|
| 1. | Introduction to Personal Branding and ways to create a brand. How to improve social media visibility for career growth |
| 2. | Learning Communication and Professional Writing including formatting process. |
| 3. | Informal communication, non-verbal cues, Speakers vs communicators |
| 4. | Leaders and Professional Appearance, ways to improve presentation skills. Planning your presentation, building, audio-visual aids, giving presentation, audience rapport, and overcoming stage fright. |
| 5. | How leaders communicate, skills of a good communicator. |
| 6. | 40-question self-assessment, making sure your message matters, choosing your words, improving your skills |
| 7. | Definition of defensive/non-defensive communication & 5 skills for communicating non-defensively. |
| 8. | Definition of feedback, giving feedback, 10 common feedback mistakes, 5 tips on receiving feedback, 10 tips for dealing with difficult people. |
| 9. | Barriers to listening, what is listening, listening vs hearing, bad listening habits, active listening. Preparing for Interview, Mock Practice |
| 10. | Advanced Group Discussion-II: Analysis of professional GD Videos and Practices on Topics/Video/Article based topics |
| 11. | When to use/not use e-mail, e-mail etiquette, when to use/not use telephone and video conferencing, 7 tips on telephone etiquette |
| 12. | Team Management and Negotiation Skills. How to improve negotiation Skills |

| Code: 25BULCSE6201 | SKILL ENHANCEMENT COURSE-VI | 1.0 Credits [LTP: 0-0-2] |
|---|---|---|

## Course: Automate & Maintain Lab

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Remember the basic components of computer hardware and office software. | Remembering |
| CO2 | Understand the functionality of productivity tools like Word, Excel, PowerPoint, etc. | Understanding |
| CO3 | Apply troubleshooting steps to resolve basic PC hardware issues. | Applying |
| CO4 | Analyze system configurations and office document structures for efficiency. | Analyzing |
| CO5 | Create professional documents, presentations, and data reports using office tools. | Evaluating |

## B. MAPPING MATRIX OF CO, PO & PSO

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | – | – | 3 | – | – | – | – | 2 | – | 2 | 3 | 3 | 2 |
| CO2 | 2 | 3 | 2 | 2 | 3 | 2 | – | 2 | – | 2 | – | 3 | 2 | 3 | 3 |
| CO3 | 2 | 3 | 3 | – | 3 | – | – | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 2 | – | – | – | 2 | 2 | 3 | 3 | 2 | 3 |
| CO5 | 2 | 3 | 3 | 2 | 3 | 2 | – | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 3 |
| WT. AVG | 2.4 | 2.8 | 2.75 | 2.25 | 3.0 | 2.0 | – | 2.0 | 2.5 | 2.2 | 2.0 | 2.8 | 2.6 | 2.8 | 2.8 |

## C. DETAILED SYLLABUS

| S. No. | LIST OF ACTIVITES |
|---|---|
| 1 | Professional Resume Creation using MS Word |
| 2 | Invoice Generation using MS Excel Functions |
| 3 | Sales Data Visualization using Charts in MS Excel |
| 4 | Create a Presentation with Multimedia Effects in MS PowerPoint |
| 5 | Mail Merge using Word and Excel |
| 6 | Assembling a Basic Desktop Computer System |
| 7 | Installing Windows Operating System |
| 8 | Checking and Replacing Faulty RAM Module |
| 9 | Diagnosing and Troubleshooting Boot Failure |
| 10 | Connecting and Configuring Peripheral Devices |

**Code: 25BULCSE6202 SKILL ENHANCEMENT COURSE-VII 2 Credits [LTP: 0-0-2]**

**Course: Data Science and Analytics**

## A. COURSE OUTCOMES

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Apply Numbly and Pandas libraries for efficient data handling and manipulation. | Apply |
| CO2 | Visualize datasets using appropriate plots to derive initial insights. | Understand |
| CO3 | Perform descriptive statistical analysis on real-world datasets. | Analyze |
| CO4 | Conduct statistical hypothesis testing using Z-test, T-test, and ANOVA. | Apply |
| CO5 | Build and evaluate basic predictive models including linear and logistic regression. | Apply |

## B. MAPPING MATRIX OF CO, PO AND PSO

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 1 | 3 | - | - | 1 | - | 2 | 2 | 3 | 1 | - | - |
| CO2 | 2 | 2 | 2 | 2 | 3 | 1 | 1 | 1 | - | 3 | 1 | 2 | 1 | - | - |
| CO3 | 3 | 3 | 3 | 2 | 2 | - | 1 | 1 | - | 2 | 2 | 3 | 1 | - | - |
| CO4 | 2 | 3 | 3 | 3 | 2 | - | 1 | 2 | 1 | 2 | 2 | 3 | 1 | - | - |
| CO5 | 3 | 3 | 3 | 2 | 3 | 1 | 1 | 2 | 2 | 3 | 2 | 3 | 1 | - | - |
| WT. AVG | 2.6 | 2.6 | 2.6 | 2 | 2.6 | 1 | 1 | 1.4 | 1.5 | 2.4 | 1.8 | 2.8 | 1 | - | - |

## C. DETAILED SYLLABUS

| Sr. No. | LIST OF ACTIVITES |
|---|---|
| **1** | ntroduction to NumPy Arrays (Creation, indexing, slicing, reshaping) |
| **2** | Working with Pandas Data Frames (Loading, cleaning, merging datasets) |
| **3** | Data Visualization using Matplotlib (Line, bar, pie, and histogram plots) |
| **4** | Statistical Analysis: Frequency Distributions and Central Tendencies (mean, median, mode) |
| **5** | Measuring Variability (range, variance, standard deviation, IQR) |
| **6** | Normal Distribution and Z-scores (Curve plotting and probability) |
| **7** | Scatter Plots and Correlation Coefficient Calculation (Pearson, Spearman) |
| **8** | Simple Linear Regression (Model fitting, residuals, $R^2$ score) |
| **9** | Z-test (One and two-sample testing with visualization) |

| | |
|---|---|
| **10** | T-test (Independent and paired t-tests for sample comparison) |
| **11** | ANOVA (One-way analysis with multiple group mean comparison) |
| **12** | Logistic Regression (Binary classification, confusion matrix, ROC) |
| **13** | Model Validation Techniques (Train/test split, cross-validation, MSE, MAE) |
| **14** | Time Series Analysis (Trend, seasonality, plotting, decomposition) |
| **15** | Exploratory Data Analysis (EDA): Summary stats, handling missing data, boxplots |
| **Software Requirements** | Operating Systems: Windows 7 or higher<br>Software: Python, Numpy, Scipy, Matplotlib, Pandas, statmodels, seaborn, plotly, bokeh |

| Code: 25BESCES6401 | DISSERTATION | 6 Credits [LTP: 0-0-12] |
|---|---|---|

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Identify the research problem through literature review | Remember |
| CO2 | Develop the solution to the research problem | Understand |
| CO3 | Investigate the various complex problems based on the analysis | Analyze |
| CO4 | Plan, implement and execute the project | Apply |
| CO5 | Defend technical information by means of written and oral reports | Evaluate |

## B. MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | - | 3 | 2 | 2 | 2 | 2 | 2 | - | - | - | - | - | 1 | 1 | - |
| **CO2** | 2 | 3 | 3 | 2 | 2 | 2 | - | - | - | - | - | - | 2 | - | - |
| **CO3** | 2 | - | 3 | - | 3 | 2 | 2 | - | - | - | - | 1 | 2 | 2 | - |
| **CO4** | - | 3 | 3 | 3 | 3 | - | 2 | - | - | - | - | - | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 3 | - | 3 | 2 | 2 | - | - | - | - | 1 | 3 | 3 | 3 |
| **WT. AVG** | 2.5 | 3 | 2.8 | 2.6 | 2.6 | 2 | 2 | - | - | - | - | 1 | 2.2 | 2.2 | 3 |

## C. OUTLINE OF THE COURSE

| | |
|---|---|
| 1 | Dissertation consist of finalization of thesis based on literature review carried out during semester break of third year. |
| 2 | Objective finalization & presentation |
| 3 | Design & experimentation/survey details |
| 4 | Thesis preparation and submission with plagiarism report |
| 5 | Final presentation |

**Code: 25BESCES7101 RESEARCH METHODOLOGY 3 Credits [LTP: 3-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Employ statistical data and methodologies to examine their connections. | Apply |
| CO2 | Demonstrate the use of Central Tendency Measures and their Applications. | Apply |
| CO3 | Practice estimating techniques on various data sets. | Apply |
| CO4 | Explain the research challenge for a practical application. | Understanding |
| CO5 | Investigate the research problem using various sources of data. | Analyze |

## B. MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | - | 3 | - | - |
| CO2 | 2 | 3 | 1 | - | - | - | - | - | - | - | - | - | 3 | | - |
| CO3 | 1 | 2 | 3 | - | - | - | - | - | - | - | - | - | 3 | | 1 |
| CO4 | 1 | 2 | 3 | - | - | - | - | - | | - | - | - | 3 | | 1 |
| CO5 | 1 | 3 | 2 | 1 | - | - | - | - | - | - | - | - | 3 | | 1 |
| WT. AVG | 1.4 | 2.4 | 2.4 | 1 | | | | | | | | | 3 | | 1 |

### C. OUTLINE OF THE COURSE

| Unit No. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1 | Introduction to Statistics | 9 |
| 2 | Central of Tendency | 9 |
| 3 | Estimation | 9 |
| 4 | Research problem | 9 |
| 5 | Research Designs | 9 |

**D. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| **1.** | **Introduction to Statistics** |
| | • Introduction of Unit<br>• Introduction to Statistics; Data Types and sources<br>• Population vs. Sample,<br>• Scales of Measurement, and Data representation techniques.<br>• Conclusion of Unit |
| **2.** | **Central of Tendency** |
| | • Introduction of Unit<br>• Measures and applications of Central Tendency<br>• Simple linear regression<br>• Coefficient of Correlation<br>• Conclusion of Unit |
| **3.** | **Estimation** |
| | • Introduction of Unit<br>• Method of Estimation, Interval Estimation,<br>• Confidence Interval-I& II<br>• Formulating the research hypothesis-<br>• Types of Research hypothesis<br>• Conclusion of the Unit |
| **4.** | **Research problem** |
| | • Introduction of Unit<br>• Defining the Research problem;<br>• Problem identification process;<br>• Components of the research problem<br>• Conclusion of the Unit |
| **5.** | **Research Designs** |
| | • Introduction of Unit<br>• Meaning of Research Designs;<br>• Nature and Classification of Research<br>• Exploratory Research Designs<br>• Case study Method<br>• Conclusion of the Unit |

**E. RECOMMENDED STUDY MATERIAL:**

| Sr.No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Research Methodology | R. Panneerselvam | Latest | PHI |
| 2. | Research Methodology: Methods and Trends | Dr. C. R. Kothari | Latest | Tata McGraw-Hill. |
| 3 | Business Statistics | JK Sharma | Latest | PEARSON: New Delhi. |

**Code: 25BESCES7102 WRITING & PRESENTATION SKILLS 3 Credits [LTP: 3-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Investigate relevant sources through a comprehensive literature survey to inform scientific research or technical writing. | Analyze |
| CO2 | Critique scientific papers, identifying key findings, methodologies, and limitations to inform their own research or technical writing. | Evaluate |
| CO3 | Compare established structures and guidelines for conference and journal papers to effectively communicate research findings. | Analyze |
| CO4 | Construct clear, concise, and well-organized technical documents, including posters, review papers, and research proposals. | Apply |
| CO5 | Demonstrate effective presentation skills using various documentation and presentation tools to communicate complex technical information. | Apply |

## B. MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | - | - | 2 | 2 | 1 | - | - | - | - | - | - | 1 | 3 | - | - |
| **CO2** | - | 3 | 2 | 2 | - | - | - | - | - | - | - | 1 | 3 | - | - |
| **CO3** | - | 1 | 3 | - | - | - | - | - | - | 1 | - | 1 | 3 | - | - |
| **CO4** | - | - | 3 | - | 2 | - | - | - | - | 2 | 3 | 1 | - | | 2 |
| **CO5** | - | - | 1 | - | 3 | - | - | - | 1 | 2 | - | 1 | - | | 1 |
| **WT. AVG** | | 2 | 2.2 | 2 | 2 | - | - | | 1 | 1.6 | 3 | 1 | 3 | | 1.5 |

### C. OUTLINE OF THE COURSE

| Unit No. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1 | Literature survey | 9 |
| 2 | How to study a scientific paper | 9 |
| 3 | Publishing a paper | 9 |
| 4 | Technical writing | 9 |
| 5 | Presentations skills | 9 |

**D. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| **1** | **Literature survey** |
| | • Introduction of Unit<br>• Overview – What is literature survey<br>• Functions of literature survey<br>• Methods of data collection – Observation, survey<br>• Conclusion of the Unit |
| **2** | **How to study a scientific paper** |
| | • Introduction of Unit<br>• Summarizing paper – Reading abstracts and finding ideas, conclusion<br>• Advantages of their<br>• Approach, the draw backs of the papers<br>• Conclusion of the Unit |
| **3** | **Publishing a paper** |
| | • Introduction of Unit<br>• How to write scientific paper Structure of a conference and journal paper<br>• how (and How Not) to write a Good Systems Paper: Abstract writing, chapter writing, discussion Conclusion, references, bibliography<br>• Conclusion of the unit |
| **4** | **Technical writing** |
| | • Introduction of Unit<br>• Discussion of technical writing<br>• Examples, Poster papers, review papers, how to organize thesis Project report.<br>• How to write a research proposal. How research is funded<br>• Conclusion of unit |
| **5** | **Presentations skills** |
| | • Introduction of Unit<br>• Talk structure, basic presentations skills Documentation and presentation tools LATEX,<br>• Microsoft office,<br>• PowerPoint and other<br>• Conclusion of the unit |

**E. RECOMMENDED STUDY MATERIAL:**

| Sr.No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1. | Essentials Of Research Methodology & Dissertation Writing | KananYelikar, Jaypee Brothers | Latest | Medical Publishers |
| 2. | Technical Writing | B.N Basu | Latest | PHI |
| 3 | Crtical Thinking, Academic Writing and Presentation | Marilyn Anderson, PramodNayar, MadhucchandaSen, | Latest | PEARSON: New Delhi. |

**Code: 25BESCES7201 DATA ANALYSIS USING STATISTICAL PACKAGE FOR SOCIAL SCIENCES (SPSS) 1.0 Credit[LTP: 0-0-2]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Explain the characteristics of variables and differentiate between different types of variables in a datasets. | Understand |
| CO2 | Recall the various summary statistics used in descriptive data analysis, including frequencies, percentages, and averages. | Remember |
| CO3 | Apply charting techniques to represent categorical and continuous data accurately and effectively | Apply |
| CO4 | Understand the principles of table design for presenting frequencies, percentages, and averages effectively | Understand |
| CO5 | Analyze and interpret data visualizations, identifying patterns, trends, and relationships between variables. | Analyze |

## B. MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | - | - | - | - | - | - | - | - | - | 3 | - | - | |
| **CO2** | 3 | 2 | 1 | - | - | - | - | - | - | - | - | - | 3 | - | - |
| **CO3** | 3 | 2 | - | - | - | - | - | - | - | - | - | - | 2 | - | - |
| **CO4** | - | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | - | - |
| **CO5** | - | 2 | 3 | - | - | - | - | - | - | - | - | - | 2 | | - |
| **WT. AVG** | 3 | 2.4 | 2 | | | | | | | | | 3 | 2.2 | | |

### C. List of Experiments:

| | |
|---|---|
| 1 | Type of Scale of Measurements, choosing appropriate scale and measurement to the data, Preparing codebook |
| 2 | Getting to Know SPSS: Starting SPSS, Working with data file |
| 3 | Preparing the Data file: Creating data file and entering data, |
| 4 | Defining the variables, entering data, modifying data file, import file. |
| 5 | Descriptive statistics: Categorical variables, continuous |
| 6 | Correlation: Pearson product moment correlation |
| 7 | Spearman rank correlation, Partial correlation, Simple |
| 8 | linear regression, |
| 9 | One sample and two independent sample t test |
| 10 | ANOVA |

**Code: 25 BESEES7101 ENVIRONMENTAL BIOTECHNOLOGY 3.0 Credits [LTP: 3-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Describe the methods, instruments, and technologies used in environmental biotechnology. | Understand |
| CO2 | Explain function of microbes as agents of biotechnology. | Understand |
| CO3 | Define the fundamental terms used in genetics and molecular biology. | Remember |
| CO4 | Implement the use of bioreactors in the environment. | Apply |
| CO5 | Discuss metal biotechnology and mining | Understand |

## B. MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | **3** | **2** | **2** | **2** | **-** | **-** | **2** | **-** | **-** | **-** | **-** | **2** | 3 | - | 2 |
| **CO2** | **3** | **3** | **2** | **-** | **-** | **-** | **2** | **-** | **-** | **-** | **-** | **2** | 3 | - | 2 |
| **CO3** | **2** | **3** | **2** | **1** | **-** | **-** | **2** | **-** | **-** | **-** | **-** | **2** | 3 | - | 2 |
| **CO4** | **2** | **3** | **2** | **1** | **-** | **-** | **2** | **-** | **-** | **-** | **1** | **2** | 3 | | 2 |
| **CO5** | **3** | **3** | **2** | **1** | **-** | **-** | **2** | **-** | **-** | **-** | **1** | **2** | 3 | | 2 |
| **WT. AVG** | **2.6** | **2.4** | **2.0** | **1.2** | **-** | **-** | **2** | **-** | **-** | **-** | **1** | **2** | 3 | | 2 |

### C. OUTLINE OF THE COURSE

| Unit No. | Title of the Unit | Time required for the Unit(Hours) |
|---|---|---|
| **1.** | **Structure and Function of DNA and RNA** | **9** |
| **2.** | **Structure and Function of Protein** | **9** |
| **3.** | **Recombinant DNA Technology** | **9** |
| **4.** | **Ecological restoration and Bioremediation** | **9** |
| **5.** | **Ecologically safe products and processes** | **9** |

**D. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| **1.** | **Structure and Function of DNA, RNA and Protein** |
| | • Introduction of the Unit<br>• DNA: structural forms and their characteristics (B, A, C, D, T, Z)<br>• Physical properties: UV absorption spectra, denaturation and renaturation kinetics<br>• Biological significance of different forms; Synthesis.<br>• RNA: structural forms and their characteristics.<br>• Conclusion of the unit |
| **2.** | **Structure and Function of Protein** |
| | • Introduction of the Unit<br>• Protein: hierarchical structure, types of amino acids<br>• Posttranslational modifications and their significance; synthesis, types and their role: structural, functional (enzymes).<br>• Central dogma of biology<br>• Genetic material<br>• Prokaryotes, viruses, eukaryotes and organelles; mobile DNA<br>• Chromosomal organization (euchromatin, heterochromatin - constitutive and facultative heterochromatin).<br>• Conclusion of the unit |
| **3.** | **Recombinant DNA Technology** |
| | • Introduction of the Unit<br>• Recombinant DNA: origin and current status; steps of preparation<br>• Toolkit of enzymes for manipulation of DNA: restriction enzymes, polymerases (DNA/RNA polymerases, transferase, reverse transcriptase), other DNA modifying enzymes (nucleases, ligase, phosphatases, polynucleotide kinase)<br>• Genomic and cDNA libraries: construction, screening and uses<br>• Cloning and expression vectors (plasmids, bacteriophage, phagmids, cosmids, artificial chromosomes<br>• Nucleic acid microarrays, R-DNA technology in environmental management.<br>• Conclusion of the unit |
| 4. | **Ecological restoration and Bioremediation** |
| | • Introduction of the Unit<br>• Wastewater treatment: anaerobic, aerobic process, methan ogenesis, treatment schemes for waste water: dairy, distillery, tannery, sugar, antibiotic industries<br>• Solid waste treatment: sources and management (composting, vermiculture and methane production, landfill. Hazardous waste treatment).<br>• Specific bioremediation technologies: land farming, biopiles, composting, bioventing, biosparging, pump and treat method, phytoremediation;<br>• Remediation of degraded ecosystems; advantages and disadvantages; degradation of xenobiotics in environment, decay behavior and degradative plasmids, hydrocarbons, substituted hydrocarbons, oil pollution,<br>• Surfactants, pesticides, heavy metals degradative pathways |

| | |
|---|---|
| | • Conclusion of the unit |
| 5. | **Ecologically safe products and processes** |
| | • Introduction of the Unit<br>• PGPR bacteria: biofertilizers, microbial insecticides and pesticides, bio-control of plant pathogen, Integrated pest management<br>• Development of stress tolerant plants, biofuel<br>• Mining and metal biotechnology: microbial transformation, accumulation and concentration of metals, metal leaching, extraction<br>• Exploitation of microbes in copper and uranium extraction, use of bioreactors for bioremediation.<br>• Conclusion of the unit |

**E. RECOMMENDED STUDY MATERIAL:**

| Sr. No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1 | Environmental Biotechnology: Theory and Application | Evans, G.G. & Furlong, J. | 2010 | Wiley-Blackwell Publications |
| 2. | Environmental Biotechnology | Scagg, A.H. | 2005 | Oxford University Press. |

**Code: 25BESEES7102 STEREOCHEMISTRY 3.0 Credits [LTP: 3-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Identify various types of stereogenic units present in the molecules. | Understand |
| CO2 | Predict major/minor stereoisomers in a given asymmetric reaction. | Understand |
| CO3 | Define a mechanism for a given organic reaction. | Remember |
| CO4 | Illustrate reaction intermediates/mechanisms. | Understand |
| CO5 | Gains preliminary knowledge of NMR spectroscopic technique. | Remember |

## B. MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | - | 1 | 3 | - | - |
| CO2 | 3 | 2 | 3 | - | - | - | - | - | - | - | - | 1 | 3 | - | - |
| CO3 | 2 | 3 | 2 | 3 | - | - | - | - | - | - | - | 1 | 3 | - | - |
| CO4 | 2 | 3 | 2 | 3 | - | - | - | - | - | - | - | 1 | 3 | - | - |
| CO5 | 3 | 3 | 2 | 3 | - | - | - | - | - | - | - | 1 | 3 | | - |
| WT. AVG | 2.6 | 2.6 | 2.2 | 2.5 | - | - | - | - | - | - | - | 1 | 3 | - | - |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| 1. | Basic concept of stereochemistry | 9 |
| 2. | Element of symmetry | 9 |
| 3. | Configuration & nomenclature | 9 |
| 4. | Conformational analysis of cycloalkanes | 9 |
| 5. | Topicity and Prochirality | 9 |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| **1.** | **Basic concept of stereochemistry** |
| | • Introduction of the Unit<br>• Stereochemistry- Definition<br>• Terminology used in stereochemistry<br>• Representation of three dimensional molecules<br>• Stereoselectivity and stereospecificity<br>• Conclusion of the unit |
| **2.** | **Element of symmetry** |
| | • Introduction of the Unit<br>• Chirality<br>• Chiral auxilliary, diastereotopic induction<br>• Stereogenic unit: Center of chirality, axis of chirality, plane of chirality and helicity.<br>• Stereochemistry of - allenes, spirans, biphenyls, cyclophanes, ansa compounds, trans-cyclooctene, helicenes, benzphenanthrenes.<br>• Conclusion of the unit |
| **3.** | **Configuration & Nomenclature** |
| | • Introduction of the Unit<br>• D/ L system of nomenclature<br>• Erythro and threo system of nomenclature<br>• R/S. nomenclature<br>• Principles of asymmetric synthesis, Cram's rule, Felkin's model, Prelog's rule<br>• Conclusion of the unit |
| 4. | **Conformational analysis of cycloalkanes** |
| | |
| 5. | **Topicity and Prochirality** |
| | • Introduction of the Unit<br>• Topicity of ligands and faces.<br>• Diastereotopic ligands and NMR spectroscopy.<br>• Chemical reactivity of heterotropic ligands and faces with chiral and achiral reagents.<br>• Resolution of racemates., chiral auxilliary, diastereotopic induction<br>• Conclusion of the unit |

## E. RECOMMENDED STUDY MATERIAL:

| Sr. No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1 | Stereochemistry of Organic compounds, | Nasipuri D. | 1991 | Wiley Eastern |
| 2. | Reaction mechanism in Organic Chemistry | Mukherji S.M. and Singh S.P. | latest | Mcmillan. |

**Code: 25BESEES7103 INTERNET TECHNOLOGIES 3.0 Credits [LTP: 3-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Analyze a web page and identify its elements and attributes. | Remember |
| CO2 | Create web pages using XHTML and Cascading Style Sheets. | Create |
| CO3 | Build dynamic web pages using JavaScript (Client side programming). | Apply |
| CO4 | Analyze existing web pages to identify XML documents and Schemas. | Analyze |
| CO5 | Evaluate the effectiveness of different web development frameworks for specific project requirements. | Evaluate |

## B. MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | **2** | **1** | **1** | - | - | - | - | - | - | - | - | - | **1** | **1** | **1** |
| **CO2** | **2** | **2** | **1** | **1** | - | - | - | - | - | - | - | - | **2** | **2** | **1** |
| **CO3** | **3** | **3** | **2** | **1** | - | - | - | - | - | - | - | - | **2** | **2** | **2** |
| **CO4** | **3** | **3** | **2** | **2** | - | - | - | - | - | - | - | - | **3** | **2** | **2** |
| **CO5** | **3** | **3** | **3** | **3** | - | - | - | - | - | - | - | - | **3** | **3** | **3** |
| **WT. AVG** | **2.6** | **2.4** | **1.8** | 1.7 | - | - | - | - | - | - | - | - | **2.2** | | **1.8** |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the Unit | Time required for the Unit(Hours) |
|---|---|---|
| **1.** | **Introductory concepts** | **9** |
| **2.** | **Internet Protocol Overview** | **9** |
| **3.** | **Protocols and client /server applications** | **9** |
| **4.** | **HTTP and the Web Services** | **9** |
| **5.** | **Designing internet systems and servers** | **9** |

**D. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| **1.** | **Introductory concepts** |
| | • Introduction of the unit<br>• History and Development of Internets and Intranets<br>• IANA, RIR/NIR/LIR and ISPs for internet number management<br>• Internet Domain and Domain Name System<br>• Internet Access Overview<br>• Internet Backbone Networks: Optical Backbone, Marine Cables, Teleports, Satellite and Terrestrial Links<br>• Conclusion of the unit |
| **2.** | **Internet Protocol Overview** |
| | • Introduction of the Unit<br>• TCP/IP and the IP Layer overview<br>• IPv4 and IPv6 Address Types and Formats<br>• IPv4 and IPv6 Header Structure<br>• Internet RFCs<br>• Conclusion of the unit |
| **3.** | **Protocols and client /server applications** |
| | • Introduction of the Unit<br>• Standard protocols: SMTP, E-mail, Message (RFC22), PGP, POP, IMAP, HTTP, FTP<br>• N-Tiered Client/Server Architecture<br>• Universal Internet Browsing<br>• Multiprotocol Support<br>• Conclusion of the unit |
| **4.** | **HTTP and the Web Services** |
| | • Introduction of the Unit<br>• HTTP, Web Servers and Web Access<br>• Universal naming with URLs<br>• WWW Technology: HTML, DHTML, WML, XML<br>• Tools: WYSIWYG Authoring Tools<br>• Helper applications: CGI, PERL, JAVA SCRIPTS, PHP, ASP, .NET Applications<br>• Introduction to AJAX (Programming)<br>• Browser as a rendering engine: text, HTML, gif and jpeg<br>• Conclusion of the unit |
| 5. | **Designing internet systems and servers** |
| | • Introduction of the Unit<br>• Designing of Internet System Network Architecture<br>• Choice of platforms<br>• Sever Concepts: WEB, Proxy, RADIUS, MAIL<br>• Cookies<br>• Load Balancing: Proxy Arrays<br>• Server Setup and Configuration Guidelines<br>• Security and System Administration Issues, Firewalls and Content Filtering.<br>• Conclusion of the unit |

**E. RECOMMENDED STUDY MATERIAL:**

| Sr.No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1 | Web Enabled Commercial Application Development Using Html, Dhtml,javascript | Ivan Bayross | 2009 | BPB Publications |
| 2. | Data communication and networking | Behrouz forouzan | 4rd | MCGraw hill |

**Code: 25BESEES7104 SOLID AND HAZARDOUS WASTE MANAGEMENT 3.0 Credits [LTP: 3-**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Discuss the various types of waste and their sources. | Understand |
| CO2 | Differentiate the waste into different categories. | Analyze |
| CO3 | Describe the steps of storage, reduce and transportation | Understand |
| CO4 | Identify the different waste processing technologies | Understand |
| CO5 | Recognize the different waste disposal methods | Understand |

## B. MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | **3** | **2** | **2** | **1** | **-** | **-** | **2** | **1** | **-** | **-** | **-** | **2** | 3 | - | 1 |
| **CO2** | **3** | **3** | **2** | **-** | **-** | **-** | **2** | **1** | **-** | **-** | **-** | **2** | 3 | - | 1 |
| **CO3** | **2** | **3** | **2** | **1** | **-** | **-** | **2** | **1** | **-** | **-** | **1** | **2** | 3 | - | 1 |
| **CO4** | **2** | **3** | **2** | **1** | **-** | **-** | **2** | **1** | **-** | **-** | **1** | **2** | 3 | - | 1 |
| **CO5** | **3** | **3** | **2** | **1** | **-** | **-** | **2** | **1** | **-** | **-** | **-** | **2** | 3 | | 1 |
| **WT. AVG** | **2.6** | **2.4** | **2.0** | **1** | **-** | **-** | **2** | **1** | **-** | **-** | **1** | **2** | 3 | | 1 |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the Unit | Time required for the Unit(Hours) |
|---|---|---|
| **1.** | **Sources, classification and regulatory framework** | **9** |
| **2.** | **Waste characterization and source reduction** | **9** |
| **3.** | **Storage, collection and transport of wastes** | **9** |
| **4.** | **Waste processing technologies** | **9** |
| **5.** | **Waste disposal** | **9** |

**D. DETAILED SYLLABUS**

| Unit | Unit Details |
|---|---|
| **1.** | **Sources, classification and regulatory framework** |
| | • Introduction of the Unit<br>• Types and Sources of solid and hazardous wastes<br>• Need for solid and hazardous waste management – Elements of integrated waste management and roles of stakeholders<br>• Salient features of Indian legislations on management and handling of municipal solid wastes, hazardous wastes, biomedical wastes, lead acid batteries, electronic wastes , plastics and fly ash<br>• Financing waste management.<br>• Conclusion of the unit |
| **2.** | **Waste characterization and source reduction** |
| | • Introduction of the Unit<br>• Waste generation rates and variation - Composition, physical, chemical and biological properties of solid wastes<br>• Hazardous Characteristics – TCLP tests – waste sampling and characterization plan - Source reduction of wastes –Waste exchange - Extended producer responsibility<br>• Recycling and reuse Practical: Composition of MSW, Determination of Physical and Chemical Properties of MSW<br>• Conclusion of the unit |
| **3.** | **Storage, collection and transport of wastes** |
| | • Introduction of the Unit<br>• Handling and segregation of wastes at source<br>• Storage and collection of municipal solid wastes<br>• Analysis of Collection systems<br>• Need for transfer and transport<br>• Transfer stations Optimizing waste allocation<br>• Compatibility, storage, labeling and handling of hazardous wastes<br>• Hazardous waste manifests and transport<br>• Conclusion of the unit |
| 4. | **Waste processing technologies** |
| | • Introduction of the Unit<br>• Objectives of waste processing<br>• Material separation and processing technologies<br>• Biological &chemical conversion technologies<br>• Methods and controls of Composting<br>• Thermal conversion technologies, energy recovery<br>• Incineration<br>• Solidification & stabilization of hazardous wastes- treatment of biomedical wastes<br>• Conclusion of the unit |
| 5. | **Waste disposal** |

| | |
|---|---|
| | • Introduction of the Unit<br>• Waste disposal options – Disposal in landfills<br>• Landfill Classification, types and methods – site selection<br>• Design and operation of sanitary landfills, secure landfills and landfill bioreactors<br>• Leachate and landfill gas management<br>• Landfill closure and environmental monitoring – Rehabilitation of open dumps – landfill remediation<br>• Conclusion of the unit |

**E. RECOMMENDED STUDY MATERIAL:**

| Sr.No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1 | Pollution control & Waste management in Developing Countries | Georges E. Ekosse, Rogers W'O Okut-Uma | 2000 | Commonwealth Publishers, New Delhi |
| 2. | Solid Waste Management, Collection, Processing and Disposal | B. B. Sundaresan, A. D. Bhide | 2001 | Mudrashilpa Offset Printers |

| Code: 25BESEES7105 | BIO-CHEMISTRY | 3.0 Credits [LTP: 3-0-0] |
|---|---|---|

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Recall the elements present in living systems, such as the porphyrin ring and metalloporphyrins. | Remember |
| CO2 | Understand how iron is stored and transported in living systems, and the implications of these processes. | Understand |
| CO3 | Define the structures and properties of hemoglobin and myoglobin | Remember |
| CO4 | Describe the components and phases of photosynthesis, including the roles of Photosystem I and Photosystem II. | Remember |
| CO5 | Recall the types and basic requirements of nitrogen fixation, including physical and biological processes. | Remember |

## B. MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | **3** | **2** | **3** | **3** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **1** | 3 | - | - |
| **CO2** | **3** | **2** | **3** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **1** | 3 | - | - |
| **CO3** | **2** | **3** | **3** | **1** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **1** | 3 | - | - |
| **CO4** | **2** | **3** | **2** | **3** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **1** | 3 | - | - |
| **CO5** | **3** | **3** | **3** | **2** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **1** | 3 | - | - |
| **WT. AVG** | **3** | **2.6** | **2.4** | **2.2** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **1** | 3 | - | - |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| **1.** | **Metal storage and transport system-I** | **9** |
| **2.** | **Metal storage and transport system-II** | **9** |
| **3.** | **Haemoglobin & Myoglobin** | **9** |
| **4.** | **Photosystems** | **9** |
| **5.** | **Nitrogen Fixation** | **9** |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| **1.** | **Metal storage and transport system-I** |
| | • Introduction of the Unit<br>• Elements in living systems<br>• Porphyrin ring<br>• Metalloporphyrin<br>• Role of iron in living system<br>• Metal storage transport and biominiralation ferritin, transferrin and siderrophores<br>• Conclusion of the unit |
| **2.** | **Metal storage and transport system-II** |
| | • Introduction of the Unit<br>• Storage of iron-ferritin<br>• Transport of iron-transferrins<br>• Siderophores<br>• Iron-containing proteins with porphyrin ligand systems<br>• Conclusion of the unit |
| **3.** | **Haemoglobin & Myoglobin** |
| | • Introduction of the Unit<br>• Haemoglobin<br>• Properties hemoglobin<br>• Biological roles of the hemoglobin<br>• Function of hemoglobin in the human body<br>• Structure of the hemoglobin<br>• Myoglobin<br>• Structure of the myoglobin<br>• The dioxygen-binding reaction<br>• Cooperative effect<br>• Bohr's effect<br>• Heme models<br>• Conclusion of the unit |
| 4. | **Photosystems** |
| | • Introduction of the Unit<br>• Photosynthesis<br>• Phase of photosynthesis<br>• Role of photosystem I and Photosystem II<br>• Mechanism of light dependent reduction<br>• Generation of ATP via cyclic electron flow<br>• Conclusion of the unit |
| 5. | **Nitrogen Fixation** |
| | • Introduction of the Unit<br>• Nitrogen Fixation<br>• Type of nitrogen fixation<br>• Physical nitrogen fixation<br>• Biological nitrogen fixation<br>• Basic requirement of nitrogen fixation<br>• Mode of action of nitrogenase<br>• Conclusion of the unit |

## E. RECOMMENDED STUDY MATERIAL:

| Sr. No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1 | Bioinorganic chemistry | Ivano Bertini, Harry B. Gray, Stephen J. Lippard, and Joan Selverstone Valentine | Latest | LibreTexts |
| 2. | Biophysical Chemistry, | Gurtu-Gurtu, | Latest | Pragati Edition |

**Code: 25BESEES7106 E-COMMERCE 3.0 Credits [LTP: 3-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Analyse the impact of E-commerce on business models and strategy. | Analyze |
| CO2 | Describe the major types of E-commerce. | Remember |
| CO3 | Explain the process that should be followed in building an E-commerce presence. | Apply |
| CO4 | Identify the key security threats in the E-commerce environment. | Remember |
| CO5 | Describe how procurement and supply chains relate to B2B E-commerce. | Remember |

## B. MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | 1 | 1 | - | - | - | - | - | - | - | - | 1 | 1 | 1 | 1 |
| CO2 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | 1 | 2 | 2 | 1 |
| CO3 | 3 | 3 | 2 | 1 | - | - | - | - | - | - | - | 1 | 3 | 2 | 2 |
| CO4 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | 1 | 3 | 3 | 2 |
| CO5 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | 1 | 3 | 3 | 3 |
| WT. AVG | 2.5 | 2.5 | 2.5 | 2 | - | - | - | - | - | - | - | 1 | 2.5 | 3.5 | 2.5 |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the unit | Time required for the Unit (Hours) |
|---|---|---|
| 1 | Introduction to E-Commerce | 9 |
| 2 | The Network Infrastructure for E-Commerce | 9 |
| 3 | E-Commerce Security and Fraud Issues and Protection | 9 |
| 4 | E-payment systems | 9 |
| 5 | Introduction to Management Information System | 9 |

## D. DETAILED SYLLABUS

| Unit | Unit details |
|---|---|
| **1** | **Introduction to E-Commerce** |
| | • Introduction to the Unit<br>• What is e-commerce<br>• Goals of e-commerce<br>• Advantages and disadvantages of e-commerce<br>• Scope of e-commerce<br>• Application e-commerce and e-business<br>• Types of e-commerce<br>• Types of E-Marketing<br>• Conclusion of Unit |
| **2** | **The Network Infrastructure for E-Commerce** |
| | • Introduction to the Unit<br>• Introduction to Information Superhighway (I-Way)<br>• Components of the I-Way<br>• TCP/IP Protocol<br>• Osi model<br>• Wireless Application Protocol<br>• Reasons for building own website<br>• Benefits of website<br>• Conclusion of Unit |
| **3** | **E-Commerce Security and Fraud Issues and Protection** |
| | • Introduction to the Unit<br>• Definition of Internet<br>• Advantages and Disadvantages of the Interne<br>• Extranet and Intranet Difference<br>• Technical Malware attack: Viruses, Worms, and Trojan Horses, Heartbleed, Distributed Denial of Service, Cryptblocker, Page hijacking, Botnets, Malvertising, ransom ware, sniffing, Non-Technical malware attack: Social Phising, Pharming, Identity Theft and Identify Fraud, Spam attacks.<br>• Conclusion of Unit |
| **4** | **E-payment systems** |
| | • Introduction to the Unit<br>• Concepts of EDI and Limitation<br>• Application of EDI<br>• Disadvantages of EDI<br>• EDI model<br>• Online payment cards (credit cards, charge cards, debit cards, smart cards), processing cards in online,credit card payment procedure<br>• e-micro payments, e-checking and its processing in online. Automated clearing house (ACH) network,mobile payments (Digital wallet)<br>• Conclusion of Unit |
| **5** | **Introduction to Management Information System** |
| | • Introduction to the Unit<br>• Supply Chain Management Systems,<br>• Customer Relationships Management Systems<br>• computer based information system (CBIS)<br>• Information System Resources<br>• Management information system |

| | |
|---|---|
| | • Transaction processing (TPS) system<br>• decision support system (DSS)<br>• Conclusion of Unit |

## E. RECOMMENDED STUDY MATERIAL:

| Sr.No | Reference Book | Author | Publication |
|---|---|---|---|
| 1 | E-Commerce-Strategy, Technologies &Applications | by David Whitley | TMH |
| 2 | E-Commerce- The cutting edge of business | by Kamlesh K. Bajaj | TMH |

**Code: 25BESEES7201 ENVIRONMENTAL SCIENCE LAB -VII 1.0 Credit [LTP: 0-0-2]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Define the different characteristics of the soil. | Remember |
| CO2 | Examine distinct organic molecules from soil using various techniques. | analyze |
| CO3 | Decribe the process of making biofuel using many techniques | understand |
| CO4 | Explain the role of turbidimetry and Nephelometry | Understand |
| CO5 | Use your topic knowledge and expertise to address challenging issues with clear solutions. | Apply |

## B. MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 2 | - | - | 1 | - | - | - | 1 | 2 | 3 | - | 1 |
| **CO2** | 3 | 3 | 2 | - | - | - | 1 | - | - | - | 1 | 2 | 3 | - | 1 |
| **CO3** | 2 | 3 | 2 | 1 | - | - | 1 | - | - | - | 1 | 2 | 3 | - | 1 |
| **CO4** | 2 | 3 | 2 | 1 | - | - | 1 | - | - | - | 1 | 2 | 3 | - | 1 |
| **CO5** | 3 | 3 | 2 | 3 | - | - | 1 | - | - | - | 1 | 2 | 3 | - | 1 |
| **WT. AVG** | 2.6 | 2.4 | 2.0 | 1.7 | - | - | 1 | - | - | - | 1 | 2 | 3 | - | 1 |

### C. List of Experiments:

| | |
|---|---|
| 1 | Determination of primary productivity by light and dark bottle method. |
| 2 | Determination of total nitrogen value of the soil by Kjeldahl's method |
| 3 | Determination of soil organic carbon |
| 4 | Determination of SAR value of soil |
| 5 | Determination of mechanical composition of soil by Pipette method. |
| 6 | Measurement of photo density flux by Luxmeter. |
| 7 | Determination of Cation-exchange capacity of soil sample. |
| 8 | Determination of MPN value of the drinking water and mineral water |
| 9 | Extraction and separation of organic compounds from soil by Acid digestion method |
| 10 | To study the Principle and application of Nephelometry and Turbidimetry: General discussion, Instruments for nephelometry and turbidimetry |
| 11 | Biofuel production methods and characterization for biodiesel and bioethanol. |
| 12 | Extraction and separation of organic compounds from soil by Steam distillation for volatiles |

**Code: 25BESEES7202** **CHEMISTRY LAB -VII** **1.0 Credit [LTP: 0-0-2]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Demonstrate proficiency in synthesizing and characterizing complex compounds like Prussian Blue and Chloro penta-ammino cobalt (III) chloride. | Understand |
| CO2 | Develop skills in quantitative analysis techniques such as titration and colorimetry for estimating concentrations of substances like vitamin C and nitrite. | Apply |
| CO3 | Gain expertise in separation methods like solvent extraction and ion-exchange chromatography for isolating and quantifying metal ions in mixtures. | Understand |
| CO4 | Understand the principles of spectroscopy through the preparation of coordination compounds like [Ni(en)3]S2O3 and studying their absorption spectra. | Understand |
| CO | Apply various analytical techniques and methods to solve real-world problems, such as determining caffeine content in beverages using HPLC. | Apply |

## B. MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | **2** | **3** | **2** | - | - | - | - | - | - | - | - | **1** | 3 | - | - |
| **CO2** | **2** | **2** | **3** | - | - | - | - | - | - | - | - | **1** | 3 | - | - |
| **CO3** | **2** | **3** | **3** | - | - | - | - | - | - | - | - | **1** | 3 | - | - |
| **CO4** | **2** | **3** | **2** | - | - | - | - | - | - | - | - | **1** | 3 | - | - |
| **CO5** | **2** | **2** | **3** | - | - | - | - | - | - | - | - | **1** | 3 | - | - |
| **WT. AVG** | **2** | **2.6** | **2.6** | - | - | - | - | - | - | - | - | **1** | 3 | - | - |

## C. List of Experiments:

| | |
|---|---|
| 1 | Synthesis of prussian blue |
| 2 | Estimation of vitamin C by titration with potassium bromate |
| 3 | Separation and determination of Fe (III) and Mg (II) /Zn (II) using ethyl acetate /ether as a solvent |
| 4 | Determination of nitrite in a water sample by colorimetric method |
| 5 | Preparation of $[Ni(en)_3]S_2O_3$, $[Ni(H_2O)_6]Cl_2$, and $[Ni(NH_3)_6]Cl_2$ and studying their absorption spectra. |
| 6 | Determination of iron by solvent extraction techniques in a mixture of $Fe^{+3}$, $Al^{+3}$ & $Ni^{+3}$ using 8 - hydroxyquinoline reagent |
| 7 | The determination of caffeine in a beverage using HPLC. |
| 8 | Synthesis of Chloro penta-ammino cobalt (III) chloride |
| 9 | Ion – exchange chromatography; Separation & estimation of ($Zn^{+2}$/ $Cd^{+2}$) & ($Zn^{+2}$ / $Mg^{+2}$) in mixtures using Amberlite IRA 400 anion exchanger |
| 10 | Determination of Keq of M – L systems in Fe (III) – Salicylic acid |
| 11 | Analysis of Fe(III) – β – resorcilic acid by Job's &Mole ratio method |
| 12 | Synthesis of Tris, 2-4 pentanedionato cobalt ( III)trihydrate |

**Code: 25BESEES7203 PYTHON PROGRAMMING LAB 1.0 Credit [LTP: 0-0-2]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Recall and identify basic Python syntax, including data types, variables, and operators. | Remember |
| CO2 | Demonstrate and understand the concept of Control statements used for Decision making & iteration in Python | Understand |
| CO3 | Implement the different Python Packages like pandas, numpy, matplot, scipy along with lists, tuple,set and dictionary in a Python Program | Apply |
| CO4 | Evaluate and Examine object-oriented design principles to create well-structured Python classes and objects. | Analyze |
| CO5 | Critically evaluate the concepts of file handling and exceptions in Python | Evaluate |

## B. MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | **1** | **1** | **1** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **1** | **1** | **1** |
| **CO2** | **2** | **2** | **1** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **2** | **2** | **1** |
| **CO3** | **3** | **3** | **2** | **1** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **3** | **2** | **2** |
| **CO4** | **3** | **3** | **3** | **2** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **3** | **3** | **2** |
| **CO5** | **3** | **3** | **3** | **3** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **3** | **3** | **3** |
| **WT. AVG** | **2.5** | **2.5** | **2.5** | 2 | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **2.5** | **2.5** | **2.5** |

## C. List of Experiments:

| | |
|---|---|
| 1 | Write a program to demonstrate basic data type in Python. |
| 2 | Write a program to compute distance between two points taking input from the user |
| 3 | Write a Program for checking whether the given number is an even number or not. |
| 4 | Find the sum of all the primes below two million. |
| 5 | 5. Write and run a Python program that outputs the value of each of the following expressions:<br>5.0/9.0<br>5.0/9<br>5/9.0<br>5/9<br>9.0/5.0<br>9.0/5<br>9/5.0<br>9/5<br>Based on your results, what is the rule for arithmetic operators when integers and floating point numbers are used? |
| 6 | Write and run a Python program that asks the user for a temperature in Celsius and converts and outputs the temperature in Fahrenheit. (Use the formula given in the example above and solve for tempFin terms of tempC.) |
| 7 | . Here is an algorithm to print out n! (n factorial) from 0! to 19!:<br>1. Set f = 1<br>2. Set n = 0<br>3. Repeat the following 20 times:<br>a. Output n, "! = ", f<br>b. Add 1 to n<br>c. Multiply f by n<br>Using a for loop, write and run a Python program for this algorithm. |
| 8 | Modify the program above using a while loop so it prints out all of the factorial values that are less than 1 billion |
| 9 | Modify the first program so it finds the minimum in the array instead of the maximum |
| 10 | (Harder) Modify the first program so that it finds the index of the maximum in the array rather than the maximum itself. |
| 11 | Modify the bubble sort program so it implements the improvements discussed in class. (HINT: To exit the main loop if the array is already sorted, simply change the loop variable to equal the last value so the loop ends early.) |
| 12 | Try entering the following literal values at the prompt. (Hit ENTER after each)<br>-5<br>-4.2<br>4.5<br>4.14<br>0.90<br>Something odd should occur. Describe it on paper. |

**Code: 25BESCES7401** **MINOR PROJECT-I** **2 Credits [LTP: 0-0-4]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Identify literature for review and research methods. | Understand |
| CO2 | Apply knowledge and understanding in relation to the agreed area of study. | Apply |
| CO3 | Communicate in written form by integrating, analysing and applying key texts and practices. | Understand |
| CO4 | Develop responses on the basis of the evaluation and analysis undertake. | Evaluate |
| CO5 | Demonstrate advanced critical research skills in relation to career development or work-related learning studies. | Apply |

## B. MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | - | - | **3** | - | - | - | - | - | - | - | **2** | **3** | **3** | - | - |
| **CO2** | - | - | **2** | - | - | - | - | - | - | - | - | **2** | **3** | - | - |
| **CO3** | - | - | **3** | - | - | - | - | - | - | - | - | **1** | **3** | - | - |
| **CO4** | - | - | **3** | **2** | - | - | - | - | - | - | - | **3** | **3** | - | - |
| **CO5** | - | - | **3** | **2** | - | - | - | - | - | - | - | **3** | **3** | - | - |
| **WT. AVG** | - | - | **2.8** | **2** | - | - | - | - | - | - | **2** | **2.4** | **3** | - | - |

### C. OUTLINE OF THE COURSE

| | |
|---|---|
| 1 | Project consist of finalization of report based on literature review and research |
| 2 | Objective finalization & presentation |
| 3 | Design & experimentation/survey details |
| 4 | Spiral project report preparation and submission |
| 5 | Final presentation |

**Code: 25BESEES8101 ENVIRONMENTAL CHEMISTRY 3.0 Credits [LTP: 3-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Analyze the mechanisms of heavy metal precipitation and the behavior of amphoteric hydroxides in various environmental conditions. | Analyze |
| CO2 | Evaluate water and wastewater quality parameters and determine their environmental significance using appropriate analytical methods. | Evaluate |
| CO3 | Understand the atmospheric chemical reactions and processes to develop strategies for mitigating photochemical smog, ozone depletion, and global warming. | Understand |
| CO4 | Apply principles of soil chemistry to assess the impact of agricultural chemicals and develop methods for the reclamation of contaminated land using techniques such as leaching and electro-kinetic remediation | Apply |
| CO5 | Understand environmental impact and toxicity of emerging pollutants including heavy metals, endocrine-disrupting chemicals, and nano materials, and propose potential solutions for their mitigation. | Understand |

## B. MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 2 | - | - | 2 | - | - | - | - | 1 | 3 | - | - |
| **CO2** | 3 | 3 | 2 | - | - | - | 2 | - | - | - | - | 1 | 3 | - | - |
| **CO3** | 2 | 3 | 2 | 1 | - | - | 2 | - | - | - | - | 1 | 3 | - | - |
| **CO4** | 2 | 3 | 2 | 1 | - | - | 2 | - | - | - | - | 1 | 3 | - | - |
| **CO5** | 3 | 3 | 2 | 3 | - | - | 2 | - | - | - | - | 1 | 3 | - | - |
| **WT. AVG** | 2.6 | 2.4 | 2.0 | 1.7 | - | - | 2.0 | - | - | - | - | 1 | 3 | - | - |

### C. OUTLINE OF THE COURSE

| Unit No. | Title of the Unit | Time required for the Unit(Hours) |
|---|---|---|
| 1. | Fundamentals of environmental chemistry | 9 |
| 2. | Aquatic chemistry | 9 |
| 3. | Atmospheric chemistry | 9 |
| 4. | Soil Chemistry | 9 |
| 5. | Emerging Pollutants | 9 |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| **1.** | **Fundaments of environmental chemistry** |
| | • Introduction of the Unit<br>• Heavy metal precipitation, amphoteric hydroxides<br>• $CO_2$ solubility in water and species distribution<br>• Ocean acidification<br>• Conclusion of the unit |
| **2.** | **Aquatic Chemistry** |
| | • Introduction of the Unit<br>• Water and wastewater quality parameters- environmental significance and determination<br>• Fate of chemicals in aquatic environment, volatilization, partitioning, hydrolysis, photochemical transformation<br>• Environmental significance of colloids, coagulation<br>• Conclusion of the unit |
| **3.** | **Atmospheric chemistry** |
| | • Introduction of the Unit<br>• Atmospheric structure – chemical and photochemical reactions<br>• Photochemical smog.<br>• Ozone layer depletion<br>• Greenhouse gases and global warming, CO2 capture and sequestration<br>• Acid rain- origin and composition of particulates.<br>• Black carbon,<br>• Air quality parameters determination<br>• Conclusion of the unit |
| 4. | **Soil Chemistry** |
| | • Introduction of the Unit<br>• Nature and composition of soil<br>• Clays- cation exchange capacity-acid base and ion-exchange reactions in soil<br>• Agricultural chemicals in soil-reclamation of contaminated land; salt by leaching<br>• Heavy metals by electro-kinetic remediation.<br>• Conclusion of the unit |
| 5. | **Emerging Pollutants** |
| | • Introduction of the Unit<br>• Heavy metals-chemical speciation<br>• Speciation of Hg & As- endocrine disturbing chemicals<br>• Pesticides, Dioxins & Furan, PCBs , PAHs and Fluro compounds toxicity<br>• Nano materials, CNT, titania, composites, environmental applications.<br>• Conclusion of the unit |

## E. RECOMMENDED STUDY MATERIAL:

| Sr.No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1 | Chemistry for Environmental Engineering and Science | Sawyer, C.N., Mac Carty, P.L. and Parkin, G.F. | 5th | Tata McGraw – Hill |
| 2 | Environmental Chemistry | Manahan, S.E | 9th | CRC press |

**Code: 25 BESEES8102 ORGANOMETALLIC CHEMISTRY 3.0 Credits [LTP: 3-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Understand the fundamentals of coordination chemistry, including Werner complexes, the trans effect, and the difference between soft and hard ligands. | Understand |
| CO2 | Differentiate between alkyls, aryls, and other σ-bonded ligands in coordination complexes. | Remember |
| CO3 | Describe the bonding and structure of metal carbonyls and phosphines in coordination complexes. | Remember |
| CO4 | Identify and classify pi-complexes formed by alkene, alkyne, allyl, diene, cyclopentadienyl, and arene ligands. | Remember |
| CO5 | Understand the mechanisms of oxidative addition and reductive elimination in coordination complexes, including SN2 pathways, radical, and ionic mechanisms. | Understand |

## B. MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | **3** | **2** | **2** | **2** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **1** | **3** | - | - |
| **CO2** | **3** | **3** | **2** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **1** | **3** | - | - |
| **CO3** | **2** | **3** | **2** | **1** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **1** | **3** | - | - |
| **CO4** | **2** | **3** | **2** | **1** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **1** | **3** | - | - |
| **CO5** | **3** | **3** | **2** | **3** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **1** | **3** | - | - |
| **WT. AVG** | **2.6** | **2.4** | **2.0** | **1.7** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **1** | **3** | - | - |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| **1.** | **Coordination chemistry** | **9** |
| **2.** | **Alkyls and Hydrides** | **9** |
| **3.** | **Carbonyls, Phosphines, and Substitution** | **9** |
| **4.** | **Pi-Complexes** | **9** |
| **5.** | **Oxidative Addition and Reductive Elimination** | **9** |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| **1.** | **Coordination chemistry** |
| | • Introduction of the Unit<br>• Werner Complexes<br>• The Trans Effect<br>• Soft versus Hard Ligands<br>• The Crystal Field<br>• The Ligand Field<br>• The *σ* Model and Hypervalency<br>• Back Bonding<br>• Electroneutrality<br>• Types of Ligand<br>• Conclusion of the unit |
| **2.** | **Alkyls and Hydrides** |
| | • Introduction of the Unit<br>• Alkyls and Aryls<br>• Other σ-Bonded Ligands<br>• Metal Hydrides<br>• Sigma Complexes<br>• Bond Strengths<br>• Conclusion of the unit |
| **3.** | **Carbonyls, Phosphines, and Substitution** |
| | • Introduction of the Unit<br>• Metal Carbonyls<br>• Phosphines<br>• N-Heterocyclic Carbenes<br>• Dissociative Substitution<br>• Associative Substitution<br>• Redox Effects and Interchange Substitution<br>• Photochemical Substitution<br>• Counterions and Solvents in Substitution<br>• Conclusion of the unit |
| 4. | **Pi-Complexes** |
| | • Introduction of the Unit<br>• Alkene and Alkyne Complexes<br>• Allyls<br>• Diene Complexes<br>• Cyclopentadienyl Complexes<br>• Arenes and Other Alicyclic Ligands<br>• Isolobal Replacement and Metalacycles<br>• Stability of Polyene and Polyenyl Complexes,<br>• Conclusion of the unit |
| 5. | **Oxidative Addition and Reductive Elimination** |

| | |
|---|---|
| | • Introduction of the Unit<br>• SN2 Pathways<br>• Radical Mechanisms<br>• Ionic Mechanisms<br>• Reductive Elimination<br>• σ-Bond Metathesis<br>• Oxidative Coupling and Reductive Fragmentation<br>• Conclusion of the unit |

## E. RECOMMENDED STUDY MATERIAL:

| S.No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1 | The organometallic Chemistry of the Transition metals | Robert h. Crabtree | Sixth Edition | Wiley |
| 2 | Introduction to Organometallic Chemistry | M. S. Balakrishna & Prasenjit Ghosh | Latest | LibreTexts |

**Code: 25BESEES8103 COMPUTER GRAPHICS 3.0 Credits [LTP: 3-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Understand the basics of computer graphics, different graphics systems and applications of computer graphics. | Remember |
| CO2 | Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis. | Understand |
| CO3 | Use of geometric transformations on graphics objects and their application in composite form. | Apply |
| CO4 | Explore projections and visible surface detection techniques for display of 3D scene on 2D screen. f) | Analyze |
| CO5 | Render projected objects to naturalize the scene in 2D view and use of illumination models for this. | Evaluate |

## B. MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 1 | 1 | 1 | - | - | - | - | - | - | - | - | - | 1 | 1 | 1 |
| **CO2** | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - | 2 | 2 | 1 |
| **CO3** | 3 | 3 | 2 | 1 | - | - | - | - | - | - | - | - | 3 | 2 | 2 |
| **CO4** | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | - | 3 | 3 | 2 |
| **CO5** | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | - | 3 | 3 | 3 |
| **WT. AVG** | 2.5 | 2.5 | 2.5 | 2 | - | - | - | - | - | - | - | - | 2.5 | 2.5 | 2.5 |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the Unit | Time required for the Unit(Hours) |
|---|---|---|
| 1. | Introductory concepts | 9 |
| 2. | Graphics Output Primitives | 9 |
| 3. | 2D Viewing | 9 |
| 4. | 2D-3D Transformations | 9 |
| 5. | Advanced Topics | 9 |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| **1.** | **Introductory concepts** |
| | • Introduction of the Unit<br>• Coordinate representation and Pixel Graphics output devices: CRT, Raster Scan & Random Scan systems<br>• Color CRT monitors, DVST, flat-panel displays, video controller and raster scan display processor. Graphics Input Devices: Keyboard, Mouse, Track-ball, space ball, Joysticks, data Glove, Light Pen, Digitizer, Image scanners, touch panels, voice systems<br>• Graphics software<br>• Conclusion of the unit |
| **2.** | **Graphics Output Primitives** |
| | • Introduction of the Unit<br>• Point and Lines, Line Drawing Algorithms: Simple, DDA, Bresenham's Line Drawing algorithm, Circle and Ellipse drawing algorithm, Polygon drawing: Representation of polygon<br>• Conventional methods for drawing polygons<br>• Real time Scan Conversion and Run length encoding<br>• Filled area primitives, character generation, Antialiasing<br>• Conclusion of the unit |
| **3.** | **2D Viewing** |
| | • Introduction of the Unit<br>• Viewing pipeline, Window-to-viewport transformation, 2-D Clipping, Chen-Sutherland Line Clipping, Mid-point subdivision algorithm, Liang-Barsky clipping, Cyrus-Beck line clipping<br>• Polygon Clipping: Sutherland-Hodgeman and Weiler-Atherton polygon clipping<br>• Character Clipping<br>• Conclusion of the unit |
| 4. | **2D-3D Transformations** |
| | • Introduction of the Unit<br>• Scaling, Rotation, Translation, Shearing, Reflection<br>• Homogeneous coordinates, Composite Transformations, Affine transformation<br>• 3-D concepts and representation, Solid Body transformations, Projections: Perspective, Orthographic, Axonometric, Oblique projections<br>• Conclusion of the unit |
| 5. | **Advanced Topics** |
| | • Introduction of the Unit<br>• Curves and surfaces: Spline representations, Bezier curves and surfaces, B-spline curves and surfaces Visible surface detection methods: Back-face detection,<br>• Depthbuffer, A-buffer, Z- buffer , scan-line Illumination models and surface rendering: Basic illumination models<br>• Half-toning and dithering techniques, Polygon Rendering, Color models<br>• Conclusion of the unit |

## E. RECOMMENDEDSTUDYMATERIAL:

| Sr.No | Reference Book | Author | Publication |
|---|---|---|---|
| 1 | Computer Graphics | D. Hearn And P. Baker | Pearson Education |
| 2. | Computer Graphics with virtual reality systems | R. K. Maurya | Wiley-India |

**Code: 25BESEES8104 ORGANISMAL AND EVOLUTIONARY BIOLOGY 3.0 Credits [LTP: 3-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Describe the main ideas underlying the processes of ecology and evolution. | Understand |
| CO2 | Explain the ways in which these ideas are applicable to different creatures, populations, species, communities, and the ecosystem at large. | Remember |
| CO3 | Utilise these ideas to comprehend the evolution of life on Earth | Apply |
| CO4 | Understand the Diversification of organisms and system operation | Understand |
| CO5 | Determine how these ideas relate to pressing ecological issues of the day, like species extinction and environmental change, and devise personal strategies for resolving these significant problems. | Understand |

## B. MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | **3** | **2** | **2** | **2** | **-** | **-** | **1** | **-** | **-** | **-** | **-** | **2** | **3** | **-** | **-** |
| **CO2** | **3** | **3** | **2** | **-** | **-** | **-** | **1** | **-** | **-** | **-** | **-** | **2** | **3** | **-** | **-** |
| **CO3** | **2** | **3** | **2** | **1** | **-** | **-** | **1** | **-** | **-** | **-** | **-** | **2** | **3** | **-** | **-** |
| **CO4** | **2** | **3** | **2** | **1** | **-** | **-** | **1** | **-** | **-** | **-** | **-** | **2** | **3** | **-** | **-** |
| **CO5** | **3** | **3** | **2** | **3** | **-** | **-** | **1** | **-** | **-** | **-** | **-** | **2** | **3** | **-** | **-** |
| **WT. AVG** | **2.6** | **2.4** | **2.0** | **1.7** | **-** | **-** | **1** | **-** | **-** | **-** | **-** | **2** | **3** | **-** | **-** |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| **1.** | **History of life on Earth** | **9** |
| **2.** | **Evolution of unicellular life-I** | **9** |
| **3.** | **Evolution of unicellular life-II** | **9** |
| **4.** | **Molecular evolution** | **9** |
| **5.** | **Fundamentals of population genetics** | **9** |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| **1.** | **History of life on Earth** |
| | • Introduction of the Unit<br>• Paleontology and evolutionary History<br>• Evolutionary time scale; eras, periods and epoch<br>• Major events in the evolutionary time scale<br>• Origins of unicellular and multi cellular organisms<br>• Major groups of plants and animals<br>• Stages in primate evolution including Homo<br>• Conclusion of the unit |
| **2.** | **Evolution of unicellular life-I** |
| | • Introduction of the Unit<br>• Origin of cells and unicellular evolution and basic biological molecules<br>• Abiotic synthesis of organic monomers and polymers<br>• Oparin-Haldane hypothesis<br>• Study of Miller<br>• The first cell<br>• Lamarck's concept of evolution<br>• Conclusion of the unit |
| **3.** | **Evolution of unicellular life-II** |
| | • Introduction of the Unit<br>• Darwin's Evolutionary Theory: variation, adaptation, struggle,fitness and natural selection<br>• Mendelism<br>• Spontaneity of mutations<br>• Bio-geographic evidence of evolution<br>• Evolution of geographic patterns of diversity<br>• Conclusion of the unit |
| 4. | **Molecular evolution** |
| | • Introduction of the Unit<br>• Neutral evolution;<br>• Molecular divergence and molecular clocks<br>• Molecular tools in phylogeny classification and identification<br>• Protein and nucleotide sequence analysis<br>• Origin of new genes and proteins<br>• Gene duplication and divergence.<br>• Conclusion of the unit |
| 5. | **Fundamentals of population genetics** |
| | • Introduction of the Unit<br>• Concepts of populations, gene pool, gene frequency<br>• Concepts and rate of change in gene frequency through natural selection, migration and genetic drift<br>• Adaptive radiation<br>• Isolating mechanisms<br>• Speciation (allopatric, sympatric, peripatric and parapatric)<br>• Convergent evolution<br>• Sexual selection<br>• Coevolution<br>• Hardy-Weinberg Law<br>• Conclusion of the unit |

## E. RECOMMENDED STUDY MATERIAL:

| Sr. No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1 | Evolutionary Biology | Minkoff, E.C. | 1983 | Addison Wesley. Publishing Company |
| 2. | Molecular Evolution and Phylogenetics | Nei, M. & Kumar, S. | 200 | Oxford University Press. |

| Code: 25BESEES8105 | ANALYTICAL CHEMISTRY | 3.0 Credits [LTP: 3-0-0] |
|---|---|---|

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Identify common analytical problems and approaches for solving them. | Remember |
| CO2 | Grasp fundamental units of measure and significant figures in analytical calculations. | Understand |
| CO3 | Distinguish between analysis, determination, and measurement in analytical chemistry. | Remember |
| CO4 | Differentiate between different types of gravimetric methods, including precipitation and volatilization gravimetry. | Remember |
| CO5 | Comprehend the principles and applications of titrimetric analysis | Understand |

## B. MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | **3** | **2** | **2** | **2** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **1** | 3 | - | - |
| **CO2** | **3** | **3** | **2** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **1** | 3 | - | - |
| **CO3** | **2** | **3** | **2** | **1** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **1** | 3 | - | - |
| **CO4** | **2** | **3** | **2** | **1** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **1** | 3 | - | - |
| **CO5** | **3** | **3** | **2** | **3** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **1** | 3 | - | - |
| **WT. AVG** | **2.6** | **2.4** | **2.0** | **1.7** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **1** | 3 | - | - |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the Unit | Time required for the Unit (Hours) |
|---|---|---|
| **1.** | **Introduction to Analytical Chemistry** | **9** |
| **2.** | **Basic Tools of Analytical Chemistry** | **9** |
| **3.** | **The Language of Analytical Chemistry** | **9** |
| **4.** | **Gravimetric Methods of Analysis** | **9** |
| **5.** | **Titrimetric Methods of Analysis** | **9** |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| **1.** | **Introduction to Analytical Chemistry** |
| | • Introduction of the Unit<br>• Analytical Perspective<br>• Common Analytical Problems<br>• Quantitative analysis<br>• Characterization analysis<br>• Fundamental analysis<br>• Conclusion of the unit |
| 2. | **Basic Tools of Analytical Chemistry** |
| | • Introduction of the Unit<br>• Fundamental Units of Measure<br>• Significant Figures<br>• Units for Expressing Concentration<br>• Stoichiometric Calculations<br>• Basic Equipment and Instrumentation<br>• Preparing Solutions<br>• Conclusion of the unit |
| **3.** | **The Language of Analytical Chemistry** |
| | • Introduction of the Unit<br>• Analysis, Determination, and Measurement<br>• Techniques, Methods, Procedures, and Protocols<br>• Classifying Analytical Techniques<br>• Selecting an Analytical Method<br>• Developing the Procedure<br>• Compensating for Interferences<br>• Calibration and Standardization<br>• Importance of Analytical Methodology<br>• Conclusion of the unit |
| 4. | **Gravimetric Methods of Analysis** |
| | • Introduction of the Unit<br>• Overview of Gravimetry<br>• Types of Gravimetric Methods<br>• Precipitation Gravimetry<br>• Volatilization Gravimetry<br>• Conclusion of the unit |
| 5. | **Titrimetric Methods of Analysis** |
| | • Introduction of the Unit<br>• Overview of Titrimetry<br>• Titrations Based on Acid–Base Reactions<br>• Titrations Based on Complexation Reactions<br>• Titrations Based on Redox Reactions<br>• Precipitation Titrations<br>• Conclusion of the unit |

**E. . RECOMMENDED STUDY MATERIAL:**

| Sr. No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1 | Modern Analytical Chemistry | David Harvey | 2000 | McGraw-Hill Higher Education |
| 2. | Analytical Chemistry | Christian, Gary D | 7th | Wiley |

**Code: 25BESEES8106 ARTIFICIAL INTELLIGENCE 3.0 Credits [LTP: 3-0-0]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations. Demonstrate awareness and fundamental understanding of various applications of AI | Remember |
| CO2 | Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning. | Understand |
| CO3 | Convert world knowledge into FOPL formula and construct well-crafted prolog programmes of moderate size Apply truth functional propositional Logic(PL) and first order predicate logic (FOPL) to world knowledge | Apply |
| CO4 | Experience AI development tools such as an Prolog. Demonstrate proficiency developing applications in Prolog | Analyze |
| CO5 | Demonstrate an ability to share in discussions of AI, its current scope and limitations, and societal implications. Explore the current scope, potential, limitations, and implications of intelligent systems. | Evaluate |

## B. MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | 1 | 1 | - | - | - | - | - | - | - | - | - | 1 | 1 | 1 |
| CO2 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - | 2 | 2 | 1 |
| CO3 | 3 | 3 | 2 | 1 | - | - | - | - | - | - | - | - | 3 | 2 | 2 |
| CO4 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | - | 3 | 3 | 2 |
| CO5 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | - | 3 | 3 | 3 |
| WT. AVG | 2.5 | 2.5 | 2.5 | 2 | - | - | - | - | - | - | - | - | 2.5 | 2.5 | 2.5 |

## C. OUTLINE OF THE COURSE

| Unit No. | Title of the Unit | Time required for the Unit(Hours) |
|---|---|---|
| 1. | Introduction to Artificial Intelligence | 9 |
| 2. | Problem Solving Methods | 9 |
| 3. | Knowledge Representation | 9 |
| 4. | Software Agents | 9 |
| 5. | Artificial Intelligence Applications | 9 |

## D. DETAILED SYLLABUS

| Unit | Unit Details |
|---|---|
| **1.** | **Introductory concepts** |
| | • Introduction of the Unit<br>• Artificial Intelligence Introduction<br>• Future of Artificial Intelligence<br>• Characteristics of Intelligent Agents<br>• Typical Intelligent Agents<br>• Conclusion of the unit |
| **2.** | **Problem Solving Methods** |
| | • Introduction of the Unit<br>• Problem solving Methods<br>• Search Strategies<br>• Uninformed and Informed Search<br>• Local Search<br>• Heuristics<br>• Algorithms and Optimization Problems<br>• Searching with Partial Observations<br>• Constraint: Satisfaction Problems, Constraint Propagation, Backtracking Search<br>• Game Playing<br>• Optimal Decisions in Games<br>• Alpha-Beta Pruning<br>• Stochastic Games<br>• Conclusion of the unit |
| **3.** | **Knowledge Representation** |
| | • Introduction of the Unit<br>• Knowledge Representation<br>• First-Order Predicate Logic<br>• Prolog Programming<br>• Unification<br>• Forward and Backward Chaining<br>• Resolution<br>• Ontological Engineering<br>• Categories and Objects<br>• Events<br>• Mental Events and Mental Objects<br>• Reasoning Systems for Categories<br>• Reasoning with Default Information<br>• Conclusion of the unit |
| **4.** | **Software Agents** |
| | • Introduction of the Unit<br>• Architecture for Intelligent Agents<br>• Agent communication<br>• Negotiation and Bargaining<br>• Argumentation among Agents<br>• Trust and Reputation in Multi-agent systems<br>• Conclusion of the unit |
| **5.** | **Artificial Intelligence Applications** |

| | |
|---|---|
| | • Introduction of the Unit<br>• Artificial Intelligence applications<br>• Language Models<br>• Information Retrieval<br>• Information Extraction<br>• Natural Language Processing<br>• Machine Translation<br>• Speech Recognition<br>• Robotics<br>• Hardware and Software for Robots<br>• Planning and Perception<br>• Conclusion of the unit |

## E. RECOMMENDED STUDY MATERIAL:

| Sr. No | Reference Book | Author | Edition | Publication |
|---|---|---|---|---|
| 1 | Artificial Intelligence | Rich & Knight | 2nd | Tata McGraw Hill |
| 2. | Introduction to A.I and Expert Systems | DAN.W. Patterson | 2007 | PHI |

**Code: 25BESCES8401 RESEARCH PROJECT-II 10.0 Credits [LTP: 0-0-20]**

## A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

| Course Outcome | At the end of this course, learners will be able to: | Bloom Level |
|---|---|---|
| CO1 | Identify literature for review and research methods. | Understand |
| CO2 | Apply knowledge and understanding in relation to the agreed area of study. | Apply |
| CO3 | Communicate in written form by integrating, analyzing and applying key texts and practices. | Understand |
| CO4 | Develop responses on the basis of the evaluation and analysis undertake. | Evaluate |
| CO5 | Demonstrate advanced critical research skills in relation to career development or work-related learning studies. | Apply |

## B. MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | - | - | **3** | - | - | - | - | - | - | - | **2** | **3** | **3** | - | - |
| **CO2** | - | - | **2** | - | - | - | - | - | - | - | - | **2** | **3** | - | - |
| **CO3** | - | - | **3** | - | - | - | - | - | - | - | - | **1** | **3** | - | - |
| **CO4** | - | - | **3** | **2** | - | - | - | - | - | - | - | **3** | **3** | - | - |
| **CO5** | - | - | **3** | **2** | - | - | - | - | - | - | - | **3** | **3** | - | - |
| **WT. AVG** | - | - | **2.8** | **2** | - | - | - | - | - | - | **2** | **2.2** | **3** | - | - |

## C. OUTLINE OF THE COURSE

| | |
|---|---|
| 1 | Research project consist of thesis based on literature review and research work |
| 2 | Objective finalization & presentation |
| 3 | Design & experimentation/survey details |
| 4 | Thesis preparation and submission with research paper |
| 5 | Final presentation |