GANDHI INSTITUTE OF TECHNOLOGY AND MANAGEMENT(GITAM)
(Deemed to be University)
VISAKHAPATNAM * HYDERABAD * BENGALURU

Accredited by NAAC with A^+ Grade

CURRICULUM AND SYLLABUS

OF

UENVS03: B.Sc. Environmental Science

w.e.f. 2021-22 admitted batch

(Updated up to July 2022)

Academic Regulations

Applicable for the Undergraduate Programme in the Schools of Technology, Humanities & Social Sciences, Business and Sciences

https://www.gitam.edu/academic-regulations

VISION AND MISSION OF THE UNIVERSITY

VISION

To become a global leader in higher education.

MISSION

To impart futuristic and comprehensive education of global standards with a high sense of discipline and social relevance in a serene and invigorating environment.

UENVS03: B.Sc. Environmental Science

VISION AND MISSION OF THE SCHOOL

VISION

To develop science education in an intellectually vibrant atmosphere.

MISSION

1. To transmit, expand and apply knowledge of science through teaching, interaction, research, and societal service.
2. Realising the full potential of science and attaining new heights in Science & Technology to impart quality scientific education.
3. To provide a flexible curriculum with more elective courses and allow a choice-based credit system for the students in a research-oriented teaching and learning environment.
4. To inculcate and create an environment of research and academic excellence by propagating the knowledge and cater the needs of the industry and society
5. To create excellent prospects for emerging entrepreneurs by disseminating the knowledge and tapping their potential skills

UENVS03: B.Sc. Environmental Science

(w.e.f. academic year 2021-22 admitted batch)

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO 1	Exhibit their proficiency for solving contemporary environmental issues through measurement, modeling, monitoring and management.
PEO 2	Engross in the environmental science profession at local and global levels through ethical contribution in terms of professional and skilled practice of science and allied professions.
PEO 3	Acclimatize to the dynamically changing world through sustained learning and professional development.
PEO 4	Present skills of entrepreneurship and leadership through incorporating the goals of the organization and through providing facilities for peer associates with defined objectives.
PEO 5	Acquire communication skills and exhibit commitment towards teamwork, which are necessary for functioning productively and professionally on multidisciplinary teams.

Mapping of the Mission of the School with the PEOs

	PEO1	**PEO2**	**PEO3**	**PEO4**
M1	**L**			
M2		**M**		
M3			**H**	
M4				**H**
M5				**H**

PROGRAMME OUTCOMES(POs) AND PROGRAMME SPECIFIC OUTCOMES(PSOs):

At the end of the programme, the students would be able to:

PO1 Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, check out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

PO2 Effective Communication: Speak, read, write, and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media, and technology.

PO3 Social Interaction: Elicit views of others, mediate disagreements, and help reach conclusions in group settings.

PO4 Effective Citizenship: Demonstrate empathetic social concern and equity centred national development and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

PO5 Ethics: Recognize different value systems, including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

PO6 Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

PO7 Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context of socio-technological changes.

PSO1 Recognize, devise, and resolve concerns related to the environment towards providing competent solutions.

PSO2 Evaluate and devise techniques and methods of varying intricacies in the emergent areas of pollution abatement.

PSO3 Provide a platform for involvement in research with proficient and ethical responsibilities towards meeting societal needs.

Curriculum Structure

(Choice Based Credit System)

UNIVERSITY CORE (UC)								
Course code	**Level**	**Course title**	**L**	**T**	**P**	**S**	**J**	**C**
CSEN1001	1	IT Productivity Tools^	0	0	2	0	0	1*
CLAD1001	1	Emotional Intelligence & Reasoning Skills (Soft Skills 1)	0	0	2	0	0	1
CLAD1011	1	Leadership Skills & Quantitative Aptitude (Soft Skills 2)	0	0	2	0	0	1
CLAD1021	1	Verbal Ability & Quantitative Ability (Soft Skills 3)	0	0	2	0	0	1
CLAD1031	1	Practicing Verbal Ability & Quantitative Aptitude (Soft Skills 4)	0	0	2	0	0	1
CLAD20XX	2	Soft skills 5A/5B/5C	0	0	2	0	0	1
CLAD20XX	2	Soft skills 6A/6B/6C	0	0	2	0	0	1
DOSP10XX	1	Sports 1#	0	0	0	2	0	2*
DOSL10XX	1	Club Activity#	0	0	0	2	0	2*
DOSL10XX	1	Community Service#	0	0	0	0	2	2*
ENVS1001	1	Environmental Studies^	3	0	0	0	0	3*
FINA3001	3	Personal Financial Planning#	0	0	2	0	0	1*
LANG1001	1	Communication Skills in English - Beginners	0	0	4	0	0	2*
LANG1011	1	Communication Skills in English	0	0	4	0	0	2
LANG1021	1	Advanced Communication Skills in English	0	0	4	0	0	2
MFST1001	1	Health & Wellbeing	0	0	2	0	0	1*
POLS1001	1	Indian Constitution and History	2	0	0	0	0	2*
PHPY1001	1	Gandhi for the 21st Century	2	0	0	0	0	2*
VEDC1001	1	Venture Development	0	0	0	2	0	2

* Pass/Fail courses
# Opt any three courses among the five
^ Online/Swayam/NPTEL Courses

Soft skills courses 5 and 6								
Course code	**Level**	**Course title**	**L**	**T**	**P**	**S**	**J**	**C**
CLAD2001	2	Preparation for Campus Placement-1 (Soft Skills 5A)	0	0	2	0	0	1
CLAD2011	2	Preparation for Higher Education (GRE/ GMAT)-1 (Soft Skills 5B)	0	0	2	0	0	1
CLAD2021	2	Preparation for CAT/ MAT - 1 (Soft Skills 5C)	0	0	2	0	0	1

CLAD2031	2	Preparation for Campus Placement-2 (Soft Skills 6A)	0	0	2	0	0	1
CLAD2041	2	Preparation for Higher Education (GRE/ GMAT)-2 (Soft Skills 6B)	0	0	2	0	0	1
CLAD2051	2	Preparation for CAT/ MAT - 2 (Soft skills 6C)	0	0	2	0	0	1

Sports Courses								
Course code	**Level**	**Course title**	**L**	**T**	**P**	**S**	**J**	**C**
DOSP1001	1	Badminton	0	0	0	2	0	2
DOSP1011	1	Chess	0	0	0	2	0	2
DOSP1021	1	Carrom	0	0	0	2	0	2
DOSP1031	1	Football	0	0	0	2	0	2
DOSP1041	1	Volleyball	0	0	0	2	0	2
DOSP1051	1	Kabaddi	0	0	0	2	0	2
DOSP1061	1	Kho Kho	0	0	0	2	0	2
DOSP1071	1	Table Tennis	0	0	0	2	0	2
DOSP1081	1	Handball	0	0	0	2	0	2
DOSP1091	1	Basketball	0	0	0	2	0	2
DOSP1101	1	Tennis	0	0	0	2	0	2
DOSP1111	1	Throwball	0	0	0	2	0	2

Club Activity Courses								
Course code	**Level**	**Course title**	**L**	**T**	**P**	**S**	**J**	**C**
DOSL1001	1	Club Activity (Participant)	0	0	0	2	0	2
DOSL1011	1	Club Activity (Member of the Club)	0	0	0	2	0	2
DOSL1021	1	Club Activity (Leader of the Club)	0	0	0	2	0	2
DOSL1031	1	Club Activity (Competitor)	0	0	0	2	0	2
Community Service Courses								
Course code	**Level**	**Course title**	**L**	**T**	**P**	**S**	**J**	**C**
DOSL1041	1	Community Services - Volunteer	0	0	0	0	2	2
DOSL1051	1	Community Services - Mobilizer	0	0	0	0	2	2

FACULTY CORE (FC)								
Course code	**Level**	**Course title**	**L**	**T**	**P**	**S**	**J**	**C**
CHEM1011	1	Chemistry I	3	0	0	0	0	3
CHEM1031	1	Chemistry II	3	0	0	0	0	3
CSCI1001	1	Basics of Information Technology	3	0	0	0	0	3
CHEM1021	1	Chemistry Lab I	0	0	2	0	0	1
CHEM1051	1	Chemistry III	3	0	0	0	0	3
PHYS1091	1	Biophysics	3	0	0	0	0	3
CHEM1041	1	Chemistry II Lab	0	0	2	0	0	1
PHYS1101	1	Biophysics Lab	0	0	2	0	0	1

Programme Core courses for B.Sc. Environmental Science								
Course code	**Level**	**Course Title**	**L**	**T**	**P**	**J**	**S**	**C**
ENVS1011	1	Understanding Environment & Ecology	3	0	0	0	0	3
ENVS1021	1	Understanding Environment & Ecology Lab	0	0	2	0	0	1
ENVS1031	1	Environmental Chemistry	3	0	0	0	0	3
ENVS1041	1	Environmental Chemistry Lab	0	0	2	0	0	1
ENVS2001	2	Air Pollution and Control	3	0	0	0	0	3
ENVS2021	2	Geological Sciences and its resources	3	0	0	0	0	3
ENVS2011	2	Air Pollution and Control Lab	0	0	2	0	0	1
ENVS2031	2	Geological Sciences and its resources Lab	0	0	2	0	0	1
ENVS2041	2	Environmental Microbiology	3	0	0	0	0	3
ENVS2051	2	Environmental Microbiology Lab	0	0	2	0	0	1
ENVS3001	3	Solid Waste Management and Soil Pollution	3	0	0	0	0	3
ENVS3021	3	Environmental Impact Assessment	3	0	0	0	0	3
ENVS3011	3	Solid Waste Management and Soil Pollution Lab	0	0	2	0	0	1
ENVS3031	3	Environmental Impact Assessment Lab	0	0	2	0	0	1
ENVS3041	3	Industrial Safety	3	0	0	0	0	3
ENVS3051	3	Industrial Safety Lab	0	0	2	0	0	1

Program Elective courses for **B.Sc. Environmental Science**								
Course code	**Level**	**Course Title**	**L**	**T**	**P**	**J**	**S**	**C**
ENVS2061	2	Biodiversity Conservation	3	0	0	0	0	3
ENVS2071	2	Biodiversity Conservation Lab	0	0	2	0	0	1
ENVS2081	2	Environmental Problems Indian context	3	0	0	0	0	3
ENVS2091	2	Environmental Problems Indian context Lab	0	0	2	0	0	1
ENVS2101	2	Industrial Waste Management	3	0	0	0	0	3
ENVS2121	2	Environmental Toxicology	3	0	0	0	0	3
ENVS2111	2	Water and Wastewater Treatment	3	0	0	0	0	3
ENVS2131	2	Environmental Biotechnology	3	0	0	0	0	3
ENVS3061	3	Global warming and climate change	3	0	0	0	0	3
ENVS3071	3	Remote Sensing and GIS	3	0	0	0	0	3
ENVS3091	3	Green Technologies	3	0	0	0	0	3
ENVS3081	3	Environment and Sanitation	3	0	0	0	0	3
Note 1: Students should acquire a minimum of 16 credits from the program elective courses								
Note 2: Theory and corresponding lab course are co-requisites (For example if a student opts to study ENVS2061 then he/she has to study ENVS2071 in the same semester)								
Open Elective (OE)* * opt eligible Programme Elective (PE) courses from other programmes as an open elective courses and earn 18 credits								

Eligible MINOR courses to be offered to the students of B.Sc. Environmental Science Program

Stream	Major course	Minor course (Select one)
Life Sciences	Environmental Science	Biochemistry
		Bioinformatics
		Microbiology
		Food Science and Technology.
		Biotechnology

Minor Courses in Biochemistry								
Course code	Level	Course Title	L	T	P	J	S	C
BCBI1021	1	Protein Chemistry and Enzymology	3	0	0	0	0	3
BCBI1031	1	Protein Chemistry and Enzymology Lab	0	0	2	0	0	1
BCBI2001	2	Metabolism and Bioenergetics	3	0	0	0	0	3
BCBI2021	2	Biochemical Techniques	3	0	0	0	0	3
BCBI2041	2	Molecular Biology	3	0	0	0	0	3
BCBI2051	2	Molecular Biology Lab	0	0	2	0	0	1
BCBI3001	3	Concepts of Genetic Engineering	3	0	0	0	0	3
BCBI3021	3	Clinical Biochemistry	3	0	0	0	0	3
BCBI3031	3	Clinical Biochemistry Lab	0	0	2	0	0	1
BCBI3041	3	Immunology	3	0	0	0	0	3
*** Offered to other than BSc Biochemistry**								

Minor Courses in Bioinformatics								
Course code	Level	Course Title	L	T	P	J	S	C
BCBI1081	1	Computational Biology	3	0	0	0	0	3
BCBI1091	1	Computational Biology Lab	0	0	2	0	0	1
CSCI1261	1	Basics of Python Programming	3	0	0	0	0	3
BCBI2241	2	Immunology and Immunoinformatics	3	0	0	0	0	3
CSCI2341	2	Fundamentals of Database Management System	3	0	0	0	0	3
BCBI2251	2	Genomics and Proteomics	3	0	0	0	0	3
BCBI2261	2	Genomics and Proteomics Lab	0	0	2	0	0	1

BCBI3151	3	Molecular Modeling and Structural Bioinformatics	3	0	0	0	0	3
BCBI3161	3	Molecular Modeling and Structural Bioinformatics Lab	0	0	2	0	0	1
BCBI3171	3	Drug Designing	3	0	0	0	0	3
Minor Courses in Microbiology								
MFST1051	1	Introductory Microbiology	3	0	0	0	0	3
MFST1061	1	Introductory Microbiology Practical	0	0	2	0	0	1
MFST1071	2	Microbial Genetics	3	0	0	0	0	3
MFST2061	2	Cell and Molecular Biology	3	0	0	0	0	3
MFST2071	2	Microbial Physiology and Biochemistry	3	0	0	0	0	3
MFST2081	2	Microbial Physiology and Biochemistry Practical	0	0	2	0	0	1
MFST3061	2	Immunology	3	0	0	0	0	3
MFST3071	3	Industrial Microbiology	3	0	0	0	0	3
MFST3091	3	Industrial Microbiology lab	0	0	2	0	0	1
MFST3101	3	Medical Microbiology	3	0	0	0	0	3
* Eligibility: This minor course is offered to the students of B.Sc. Biochemistry/Biotechnology/Food Science & Tech/Environmental Science/Chemistry								
Minor courses in Biotechnology								
BTSC1021	1	Cell Biology	3	0	0	0	0	3
BTSC1031	1	Cell Biology Lab	0	0	2	0	0	1
BTSC2011	2	Bioanalytical Techniques	3	0	0	0	0	3
BTSC2001	2	Enzymology & Metabolism	3	0	0	0	0	3
BTSC3011	3	General Immunology	3	0	0	0	0	3

BTSC2041	3	Molecular Biology & rDNA technology	3	0	0	0	0	3
BTSC2031	3	Molecular Biology & rDNA technology Lab	0	0	2	0	0	1
BTSC3001	3	Plant & Animal Biotechnology	3	0	0	0	0	3
BTSC3021	3	Plant & Animal Biotechnology Lab	0	0	2	0	0	1
BTSC3041	3	Industrial Biotechnology	3	0	0	0	0	3
* Eligibility: This minor course is offered to the students of B.Sc. Biochemistry/ Microbiology/ Food Science & Tech/ Environmental Science/Chemistry.								
Minor Courses in Food Science and Technology*								
MFST1001	1	Principles of Food Science	3	0	0	0	0	3
MFST1011	1	Principles of Food Science Practical	0	0	2	0	0	1
MFST1021	1	Fundamentals of Food Technology	3	0	0	0	0	3
MFST2001	2	Technology of Plantation Crops	3	0	0	0	0	3
MFST2011	2	Food Processing and Preservation Technology	3	0	0	0	0	3
MFST2031	2	Food Processing and Preservation Technology Practical	0	0	2	0	0	1
MFST2041	2	Food Microbiology	3	0	0	0	0	3
MFST3001	3	Technology of Animal Foods	3	0	0	0	0	3
MFST3021	3	Technology of Animal Foods Practical	3	0	0	0	0	3
MFST3011	3	Food Biochemistry	3	0	0	0	0	3
* Eligibility: This minor course is offered to the students of B.Sc. Biochemistry/Microbiology/ Biotechnology/ Environmental Science/Chemistry								

Allocation of credits for 3-year B.Sc. Program		
Type of Course	Credits	% Of Program (in credits)
University Core	12	10%
Faculty Core	18	15%
Major Core	32	26%
Major Electives	16	14%
Program Minor	24	20%
Open elective	18	15%
Total	120	100%

Course PO Mapping

Course Code	Course Name	**PO1**	**PO2**	**PO3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
ENVS1011	Understanding Environment & Ecology	L	M	M	H	L	M	H	L	H	M	H
ENVS1021	Understanding Environment & Ecology Lab	L	L	L	M	M	M	H	L	L	M	H
ENVS1031	Environmental Chemistry	M	L	M	M		H	H	H	M	L	M
ENVS1041	Environmental Chemistry Lab	L	L	L	L	L	M	H	L	M	M	H
ENVS2001	Air Pollution and Control	M	H		M		H	M		H	L	H
ENVS2021	Geological Sciences and its resources	M	H		M		H	M		H	L	H
ENVS2011	Air Pollution and Control Lab	L	L		H	H	L		H	H	M	H
ENVS2031	Geological Sciences and its resources Lab	M	M		H	H	M		H	H	M	H
ENVS2041	Environmental Microbiology	H	H		H		M	L		L	M	H
ENVS2051	Environmental Microbiology Lab	M	M		H	M	M		L	M	L	M
ENVS3001	Solid Waste Management	H	M		H		H	M		H	L	H

	and Soil Pollution											
ENVS3021	Environmental Impact Assessment	H	M		H		H	M		H	L	H
ENVS3011	Solid Waste Management and Soil Pollution Lab	H	H		H	H	H		H	H	M	H
ENVS3031	Environmental Impact Assessment Lab	H	H		H	H	H		H	H	M	H
ENVS3041	Industrial Safety	H	M		H		H	M		H	L	H
ENVS3051	Industrial Safety Lab	H	H		H	H	H		H	H	M	H
ENVS2061	Biodiversity Conservation	L	H	L	H	H	M	L	L	L	M	H
ENVS2071	Biodiversity Conservation Lab	L	M	M	H	H	M	M	M	L	M	H
ENVS2081	Environmental Problems Indian context	L	M	L	H	M	M	L	L	M	M	H
ENVS2091	Environmental Problems Indian context Lab	L	M	L	H	M	M	L	L	M	M	H
ENVS2101	Industrial Waste Management	M	L	M		H	L		M	M	H	L

ENVS2121	Environmental Toxicology	M	H	H	L	M	M		H	M	M	L
ENVS2111	Water and Wastewater Treatment		H		M	L	M	H	H	M	M	L
ENVS2131	Environmental Biotechnology	L	M	L	H	M	M	L	L	M	M	H
ENVS3061	Global warming and climate change	H	H		H		M	H		H	M	H
ENVS3071	Remote Sensing and GIS	H	L		M	M			L	L	L	L
ENVS3091	Green Technologies	M	M		H		H	M		H	M	L
ENVS3081	Environment and Sanitation		H		M	L	M	H	H	M	M	L

Syllabus

University Core

CSEN1001	IT PRODUCTIVITY TOOLS	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	Familiarity with Computer system and its operation.						

Course Description:

This course introduces all software tools that improve the productivity of a student in enhancing his learning experience with all the activities taken up as part of his coursework.

Course Educational Objectives:

- to impart the skill in preparing technical documents of professional quality using docs, sheets, and forms
- to involve the student in preparation of websites, analyzing data and acquaint the student with the skill of processing audio, images, documents etc.

List of Experiments:

1. Create a typical document consisting of text, tables, pictures, multiple columns, with different page orientations.
2. Create a technical paper / technical report consisting of table of contents, table of figures, table of tables, bibliography, index, etc.
3. Compose and send customized mail / e-mail using mail-merge.
4. Create / modify a power point presentation with text, multimedia using templates with animation.
5. Create spreadsheet with basic calculations with relative reference, absolute reference, and mixed reference methods.
6. Simple report preparation using filtering tool / advanced filtering commands / pivot tables in spreadsheet application.
7. Analyze the results of an examination student wise, teacher wise, course wise, institute-wise.
8. Collecting and consolidating data using collaborative tools like google docs, sheets, forms.
9. Create charts / pictures using online tools like: www.draw.io or smart draw
10. Create a website of his interest.

Text Books:

1. Katherine Murray, 'Microsoft Office 365 Connect and collaborate virtually anywhere, anytime', Microsoft Press, ISBN: 978-0-7356-5694-9
2. EXCEL 2021 The Comprehensive Beginners to Advanced Users Guide to Master Microsoft Excel 2021. Learn the Essential Functions, New Features, Formulas, Tips and Tricks, and Many More

3. https://drawio-app.com/tutorials/video-tutorials/
   Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics Fourth Edition ISBN-13: 978-1449319274

References

1. https://www.coursera.org/learn/introduction-to-computers-and-office-productivity-software
2. https://www.coursera.org/projects/analyze-data-pivot-tables-crosstabs-google-sheets
3. https://www.coursera.org/learn/excel-advanced#syllabus
4. https://www.coursera.org/learn/how-to-create-a-website
5. https://support.microsoft.com/en-us/office
6. https://www.diagrams.net/
7. https://edu.google.com/

Course Outcomes:

1. Create / alter documents / Technical Paper / Project report with text, pictures, graphs of different styles.
2. Create / modify power point presentations with text, multimedia and to add animation using / creating templates.
3. Perform basic calculations / retrieve data / create pivot tables / chart using a spreadsheet application.
4. Create simple diagrams / charts using online tools like: www.draw.io.
5. Manage documents, presentations, spreadsheets, and websites in collaborative mode.

Co-Po Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2	PSO 3	PSO 4
CO1					2				1	1	
CO2					2				1	1	
CO3	2	1	1		2				1	1	
CO4					2				1	1	
CO5					2				3	3	

APPROVED IN:

BOS :06-09-2021 **ACADEMIC COUNCIL:17-09-201**

SDG No. & Statement:4

Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

SDG Justification:

Emotional Intelligence and reasoning skills are essential for achieving inclusive and equitable education and lifelong learning opportunities for oneself and others.

CLAD1001	EMOTIONAL INTELLIGENCE & REASONING SKILLS (SOFT SKILLS 1)	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

Emotional intelligence is a set of skills that are thought to contribute to the appraisal of emotions in oneself and others. It can also help contribute to the effective regulation of emotions as well as feelings (Salovey & Mayer, 1990). In terms of emotional intelligence, self-awareness and self- management have to do with our ability to relate to ourselves. Social awareness and relationship management have to do with our ability to relate to others. Similarly, the ability to solve questions on Analytical Reasoning and Data Sufficiency is a critical area tested in all competitive examinations and admission tests. Upon completion, students should be able (1) to deal with their own emotions as well as the emotions of others and relate better with both. Using better knowledge of EI, students will also be able to set more meaningful goals for themselves, choose suitable time management techniques that work best for them and work in teams more effectively. (2) to apply different concepts, ideas, and methods to solve questions in reasoning and data sufficiency

Course Educational Objectives:

- Use EI to relate more effectively to themselves, their colleagues and to others. Apply self-awareness and self-assessment (SWOT) to better understand and manage their own emotions. Apply social awareness to empathize with others and build stronger relationships with others.
- Set meaningful goals based on their strengths and weaknesses and apply time management techniques, such as Q4 organizing to put first things first.
- Manage conflicts and work in teams in an emotionally intelligent manner.
- Solve questions on non-verbal and analytical reasoning, data sufficiency and puzzles

List of Activities & Tasks for Assessment:

Unit	Topics	Hours
1	Self-Awareness & Self-Regulation: Introduction to Emotional Intelligence, *Self-Awareness:* Self-Motivation, Accurate Self-Assessment (SWOT Analysis), Self-Regulation: *Self Control, Trustworthiness & Adaptability*	3

2	Importance, Practising Social Awareness, Building Relationships, Healthy and Unhealthy Relationships, Relationship Management Competencies-Influence, Empathy, Communication, Types of Conflicts, Causes, Conflict Management	3
3	Social Media: Creating a blog, use of messaging applications, creating a website to show case individual talent, creation of a LinkedIn Profile	2
4	Goal Setting & Time Management: Setting SMART Goals, Time Wasters, Prioritization, Urgent Vs Important, Q2 Organization	3
5	Teamwork: Team Spirit, Difference Between Effective and Ineffective Teams, Characteristics of High-Performance Teams, Team Bonding, Persuasion, Team Culture, Building Trust, Emotional Bank Account	4
6	Verbal Reasoning: Introduction, Coding-decoding, Blood relations, Ranking Directions, Group Reasoning	6
7	Analytical Reasoning: Cubes and Dices, Counting of Geometrical figures	3
8	Logical Deduction: Venn diagrams, Syllogisms, Data Sufficiency, Binary logic	4
9	Spatial Reasoning: Shapes, Paper Cutting/Folding, Mirror images, Water images and Rotation of figures	2

References:

1. Verbal Ability & Reading Comprehension by Arun Sharma and Meenakshi Upadhyay
2. Study material for CAT, SAT, GRE, GMAT by TIME, Career Launcher and IMS etc.
3. Quantitative Aptitude by R S Agarwal S Chand Publications
4. Quantitative Aptitude by Pearson Publications

Course Outcomes:

1. Students will be able to relate more effectively to themselves, their colleagues and to others
2. Students will be able to set their short term and long term goals and better manage their time
3. Students will be able to manage conflicts in an emotionally intelligent manner and work in teams effectively
4. Students will be able to solve questions based on non-verbal and analytical reasoning, data sufficiency and puzzle

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1		3	3				3				
CO2		3	3				3				
CO3		3	3				3				
CO4	3						3				
CO5											

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:

BOS :17-09-2021 **ACADEMIC COUNCIL:17-09-201**

SDG No. & Statement:4

Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

SDG Justification:

Emotional Intelligence and reasoning skills are essential for achieving inclusive and equitable education and lifelong learning opportunities for oneself and others.

CLAD1011	LEADERSHIP SKILLS & QUANTITATIVE APTITUDE (SOFT SKILLS 2)	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

Communication Skills is having the ability to convey information to others so that messages are understood, and outcomes delivered. Some essential qualities of Communication Skills include understanding the needs of others, clearly communicating messages, adapting the communication style, and using a range of communication methods. Presentation Skills is having the ability to confidently deliver an engaging message to a group of people which achieves the objectives. Some essential qualities of Presentation Skills include a thorough preparation of content, structuring content logically, managing nerves, engaging your audience, delivering presentation objectives, positively influencing the audience, and responding to audience needs. Tackling questions based on numbers, arithmetic, data interpretation and puzzles requires the application of different rules and concepts of numerical computation, numerical estimation, and data estimation.

Course Educational Objectives:

- Learn and apply, through different individual and group activities, different ideas, and skills to communicate in a positive and impressive manner.
- Apply the goal setting process (based on SWOT) and Q2 organizing for effective time management.
- Apply different concepts in numbers, numerical computation, and numerical estimation to solve questions that often appear in various competitive examinations and admission tests.
- Apply different concepts for tackling questions based on data interpretation, progression and series that are frequently given in various competitive examinations and admission tests.

List of Activities & Tasks for Assessment:

Unit	Topics	Hours
1	Communication Skills: The Communication Process, Elements of Interpersonal Communication, Non-Verbal Communication: Body Language, Posture, Eye Contact, Smile, Tone of Voice, Barriers to Communication. Effective Listening Skills: Active Listening, Passive Listening, Asking Questions, Empathizing, Being Non-Judgmental, Being	5

	Open Minded, Mass Communication: Design of Posters, Advertisements, notices, writing formal and informal invitations	
2	Focus on Audience Needs, focus on the Core Message, Use Body Language and Voice, Start Strongly, Organizing Ideas & Using Visual Aids: SPAM Model, Effective Opening and Closing Techniques, Guy Kawasaki's Rule (10-20-30 Rule), Overcoming Stage Fear, Story Telling	3
3	Problem Solving & Decision Making: Difference Between the Two, Steps in Rational Approach to Problem Solving: Defining the Problem, Identifying the Root Causes, Generating Alternative Solutions, Evaluating and Selecting Solutions, Implementing and Following-Up, Case Studies	3
4	Group Discussion: Understanding GD, Evaluation Criteria, Nine Essential Qualities for Success, Positive and Negative Roles, Mind Mapping, structuring a Response, Methods of Generating Fresh Ideas	4
5	Number Theory: Number System, Divisibility rules, Remainders and LCM & HCF	3
6	Numerical Computation and Estimation - I: Chain Rule, Ratio Proportions, Partnerships & Averages, Percentages, Profit-Loss & Discounts, Mixtures, Problem on Numbers & ages	6
7	Data Interpretation: Interpretation and analysis of data in Tables, Caselets, Line- graphs, Pie-graphs, Boxplots, Scatterplots and Data Sufficiency	3
8	Mental Ability: Series (Number, Letter and Alphanumeric), Analogy (Number, Letter and Alphanumeric) and Classifications	3

References:

1. Verbal Ability & Reading Comprehension by Arun Sharma and Meenakshi Upadhyay
2. Study material for CAT, SAT, GRE, GMAT by TIME, Career Launcher and IMS etc.
3. Quantitative Aptitude by R S Agarwal S Chand Publications
4. Quantitative Aptitude by Pearson Publications

Course Outcomes:

1. Students will be able to communicate 'one-on-one' and 'one-on-many' confidently using both verbal and non-verbal messages and deliver impressive talks/ presentations to a group both with and without the use of PPTs and create posters, advertisements, etc.
2. Students will be able to apply the rational model of problem solving and decision making in their problem solving and decision-making efforts.
3. Students will be able to solve questions based on numbers and arithmetic given in various competitive examinations
4. Students will be able to solve questions based on data interpretation, progressions, and series.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1		3	3				3				
CO2		3	3				3				
CO3	3						2				
CO4	3						2				
CO5											

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:

BOS :17-09-2021 **ACADEMIC COUNCIL:17-09-2021**

SDG No. & Statement:4

Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

SDG Justification:

Leadership and quantitative aptitude skills are essential skills for achieving inclusive and equitable education and lifelong learning opportunities for oneself and others.

CLAD1021	VERBAL ABILITY & QUANTITATIVE ABILITY (SOFT SKILLS 3)	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

Vocabulary is an important part of verbal ability. An understanding of word formation, prefixes, suffixes, and roots is necessary to remember and use a vast repository of words. Approaching words through word families and other ways of groupings is an effective way of gaining mastery over vocabulary. Understanding and getting acquainted with the different rules and exceptions in the use of grammar and structure, especially from the relevant examination point of view, is crucial to cracking questions given in many competitive tests. Similarly, improving reading comprehension skills and test taking abilities in this area takes time and effort, especially given the fact that most students do not possess strong reading habits. In so far as quantitative aptitude is concerned, students need to develop a strong foundation on the basic mathematical concepts of numerical estimation, geometry, mensuration, data sufficiency, etc. to be able to crack different round 1 tests of major recruiters and admission tests of top Indian and foreign universities.

Course Educational Objectives:

- List and discuss the different word formation methods, word denotation, connotation, collocation, etc. and introduce selected high frequency words, their antonyms, synonyms, etc.
- Apply different advanced reading skills to solve questions based on author's tone, main ideas and sub-ideas, inferences, Para jumbles, etc. that are frequently asked in various competitive exams and admission tests.
- Solve different types of questions based on vocabulary, such as word analogy; structure, grammar, and verbal reasoning; introduce common errors and their detection and correction.
- Solve questions on numerical estimation, mensuration, data sufficiency based on quantitative aptitude. This includes questions on time and work, time and distance, pipes and cisterns, lines and angles, triangles, quadrilaterals, polygons and circles, 2- & 3-dimensional mensuration.

‘

List of Activities & Tasks for Assessment:

1. **Vocabulary Builder:** Understanding Word Formation, Prefixes, Suffixes and Roots, Etymology, Word Denotation, Connotation and Collocation, Synonyms and Antonyms
2. **Reading Comprehension:** Advanced Reading Comprehension: Types of RC passages, Types of Text Structures, Types of RC Questions: Distinguishing Between Major Ideas and Sub Ideas, Identifying the Tone and Purpose of the Author, Reading Between the Lines and Beyond the Lines, Techniques for Answering Different Types of Questions
3. **Para Jumbles:** Coherence and Cohesion, Idea Organization Styles, Concept of Mandatory Pairs and Its Application: Transitional Words, Antecedent-Pronoun Reference, Article Reference, Cause and Effect, Chronological Order, General to Specify, Specify to General, Idea-Example, Idea-Explanation, Etc.
4. **Grammar Usage:** Rules Governing the Usage of Nouns, Pronouns, Adjectives, Adverbs, Conjunctions, Prepositions and Articles
5. **Numerical Computation and Estimation - II:** Time and Work, Pipes and Cisterns, Time and Distance, Problems on Trains, Boats and Streams, Races and Games of Skill, Simple Interest & Compound Interest
6. **Geometry:** Lines and Angles, Triangles, Quadrilaterals & Polygons, and Circles
7. **Mensuration:** 2-Dimensional Mensuration (Triangles, Quadrilaterals and Circles), 3-Dimensional Mensuration (Cubes, Cuboids, Cylinder, Cone, Sphere)

References:

1. Verbal Ability & Reading Comprehension by Arun Sharma and Meenakshi Upadhyay
2. Study material for CAT, SAT, GRE, GMAT by TIME, Career Launcher and IMS etc.
3. Quantitative Aptitude by R S Agarwal S Chand Publications
4. Quantitative Aptitude by Pearson Publications

Course Outcomes:

1. List and discuss word formation methods, selected high frequency words, their antonyms, synonyms, etc.
2. Analyze reading passages and quickly find out the correct responses to questions asked, including para jumbles, by using reading skills like skimming, scanning, reading between the lines, etc.
3. Solve different types of questions based on vocabulary, structure, grammar and verbal reasoning
4. Solve questions on numerical estimation, mensuration, data sufficiency based on quantitative aptitude

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1		2					2				
CO2		2					2				
CO3	3						2				
CO4	3						2				
CO5											

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:

BOS :17-09-2021 **ACADEMIC COUNCIL:17-09-2021**

SDG No. & Statement:4

Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

SDG Justification:

English language and quantitative aptitude skills are essential skills for achieving inclusive and equitable education and lifelong learning opportunities for oneself and others.

CLAD1031	PRACTICING VERBAL ABILITY & QUANTITATIVE APTITUDE (SOFT SKILLS 4)	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

A sound knowledge of the rules of English grammar, structure and style and its application in detecting errors in writing are important areas of Verbal Ability frequently tested as a part of the written test in many competitive examinations and admission tests of major recruiters and universities respectively. This module focuses on all important areas of grammar and structure commonly asked in major tests, such as GMAT, CAT, XLRI, CRT, etc. Similarly, in the area of Quantitative Aptitude, different kinds of questions are asked from Combinatorics (Permutations & Combinations, Probability], Cryptarithmetic & Modular Arithmetic (Cryptarithmetic, Application of base system (7, 24), Clocks (Base 24), Calendars (Base 7), and Mental Ability (Number series, Letter series & Alpha numeric series, Analogies (Numbers, letters), Classifications, Algebra (Exponents, Logarithms, Problems related to Equations, Special Equations, and Statistics) . This module focuses on all these areas by building on what the students already learnt in their earlier studies.

Course Educational Objectives:

- Apply the rules of grammar to solve questions in Error Detection, Sentence Correction and Sentence Improvement.
- Apply the rules of structure to solve questions in Error Detection, Sentence Correction and Sentence Improvement, Fill-in-blanks and Cloze Passages.
- Explain methods of solving problems in Combinatorics (Permutations & Combinations, Probability], Cryptarithmetic & Modular Arithmetic (Cryptarithmetic, Application of base system (7, 24), Clocks (Base 24), Calendars (Base 7)]
- Explain how to solve questions in Mental Ability (Number series, Letter series & Alpha numeric series, Analogies, Numbers, letters, Classifications] and Algebra (Exponents, Logarithms, Problems related to Equations, Special Equations, Statistics)

List of Activities & Tasks for Assessment:

1. Error Detection: Pronouns, Conjunctions, Prepositions and Articles
2. Error Detection: Tenses and their Uses
3. Sentence Correction: Subject-Verb Agreement, Antecedent-Pronoun Agreement, Conditional Clauses

4. Sentence Correction: Modifiers (Misplaced and Dangling) & Determiners, Parallelism & Word Order, and Degrees of Comparison
5. Combinatorics: Permutations & Combinations, Probability
6. Crypt arithmetic & Modular Arithmetic: Crypt arithmetic, Application of Base System (7, 24), Clocks (Base 24), Calendars (Base 7)
7. Algebra: Exponents, Logarithms, Word-problems related to equations, Special Equations, Progressions, Statistics

References:

1. Verbal Ability & Reading Comprehension by Arun Sharma and Meenakshi Upadhyay
2. Study material for CAT, SAT, GRE, GMAT by TIME, Career Launcher and IMS etc.
3. Quantitative Aptitude by R S Agarwal S Chand Publications
4. Quantitative Aptitude by Pearson Publications

Course Outcomes:

1. Identify and correct errors in English grammar and sentence construction
2. Identify and correct errors in Structure, Style and Composition
3. Solve problems in Combinatorics, Cryptarithmetic, and Modular Arithmetic
4. Solve problems in Mental Ability and Algebra

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1							3				
CO2							3				
CO3	3						3				
CO4	3						3				
CO5											

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:

BOS :17-09-2021 **ACADEMIC COUNCIL:17-09-2021**

SDG No. & Statement:4

Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

SDG Justification:

English language and quantitative aptitude skills are essential skills for achieving inclusive and equitable education and lifelong learning opportunities for oneself and others.

CLAD2001	PREPARATION FOR CAMPUS PLACEMENT -1 (SOFT SKILLS 5A)	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure							

Course Description:

The course addresses all relevant areas related to campus placements and readies them to ace their upcoming/ ongoing recruitment drives. Specifically, it focuses on students' career preparedness, interview skills, test preparedness, etc.

Course Educational Objectives:

Prepare the students for their upcoming/ ongoing campus recruitment drives.

List of Activities & Tasks for Assessment:

1. Career Preparedness: Resume & Cover Letter Writing, Interview Skills: Elevator Pitch, Making the First Impression, Being Other-Oriented, Being Positive and Curious, communicating with Confidence and Poise, Frequently Asked Questions & How to Answer Them, Pitfalls to Avoid, Etc. Etiquette: Hygiene, Courtesy, Culture differences, Workplace, use of cell phone, Profanity, Slang, Protocol.
2. Verbal Ability: Practicing Reading Comprehension, Error Detection, Sentence Completion, MCQs, FIBs, Para jumbles, Cloze Test, Critical Reasoning.
3. Quantitative Aptitude: Number Systems, Algebra, Geometry, Data Handling, Data Sufficiency, Word Problems
4. Reasoning: Logical and Verbal Reasoning

References:

1. Verbal Ability & Reading Comprehension by Arun Sharma and Meenakshi Upadhyay
2. Study material for CAT, SAT, GRE, GMAT by TIME, Career Launcher and IMS etc.
3. Quantitative Aptitude by R S Agarwal S Chand Publications
4. Quantitative Aptitude by Pearson Publications

Course Outcomes:

1. Write a power resume and covering letter
2. Answer interview questions with confidence and poise
3. Exhibit appropriate social mannerisms in interviews
4. Solve placement test questions on verbal ability, quantitative aptitude and reasoning

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1		1					3				
CO2		3					3				
CO3	3						3				
CO4	3						3				
CO5											

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:

BOS :17-09-2021 **ACADEMIC COUNCIL:17-09-2021**

SDG No. & Statement:4

Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

SDG Justification:

Quantitative aptitude, reasoning, verbal and language skills practiced during the preparation for campus placement tests provide essential skills for achieving inclusive and equitable education and lifelong learning opportunities for oneself and others.

CLAD2011	PREPARATION FOR HIGHER EDUCATION (GRE/ GMAT)-1 (SOFT SKILLS 5B)	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

The course offers a special track for students who aspire to go abroad in pursuit of their higher education for which a GRE/ GMAT score is a prerequisite. It covers all four topical areas of these tests and includes fully solved mock tests as well.

Course Educational Objectives:

- Prepare the students to solve questions from all four broad areas of GRE/ GMAT
- Orient the students for GRE/ GMAT through mock tests

List of Activities & Tasks for Assessment:

1. Verbal Reasoning: Reading Comprehension, Sentence Equivalence, Text Completion, Sentence Correction, Critical Reasoning
2. Quantitative Reasoning: Arithmetic, Algebra, Geometry, Data Analysis
3. Analytical Writing Assessment: Issue/ Argument
4. Integrated Reasoning

References:

1. Verbal Ability & Reading Comprehension by Arun Sharma and Meenakshi Upadhyay
2. Study material for CAT, SAT, GRE, GMAT by TIME, Career Launcher and IMS etc.
3. Quantitative Aptitude by R S Agarwal S Chand Publications
4. Quantitative Aptitude by Pearson Publications

Course Outcomes:

1. Solve questions from all four broad areas of GRE/ GMAT
2. Practice answering several mock tests

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3			2			3				
CO2	3			2			3				
CO3											
CO4											
CO5											

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:

BOS :17-09-2021 **ACADEMIC COUNCIL:17-09-2021**

SDG No. & Statement:4

Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

SDG Justification:

Quantitative aptitude, reasoning, verbal and language skills practiced during the preparation for GRE/GMAT tests provide essential skills for achieving inclusive and equitable education and lifelong learning opportunities for oneself and others.

CLAD2021	PREPARATION FOR CAT/ MAT – 1 (SOFT SKILLS 5C)	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

The course offers a special track for UG students who aspire to go for higher education in business management in India for which cracking CAT/ MAT/ other related test is mandatory. It covers all four topical areas of these tests and includes fully solved mock tests as well.

Course Educational Objectives:

- Prepare the students to solve questions from all four relevant areas of CAT/ XAT/ MAT, etc.
- Orient the students for CAT/ XAT, etc. through mock tests

List of Activities & Tasks for Assessment:

1. Quantitative Ability: Arithmetic, Algebra, Geometry, Mensuration, Calculus, Trigonometry
2. Data Interpretation: Data Interpretation and Data Sufficiency
3. Logical Reasoning: Data Management, Deductions, Verbal Reasoning and Non- Verbal Reasoning
4. Verbal Ability: Critical Reasoning, Sentence Correction, Para Completion, Para Jumbles, Reading Comprehension

References:

1. Verbal Ability & Reading Comprehension by Arun Sharma and Meenakshi Upadhyay
2. Study material for CAT, SAT, GRE, GMAT by TIME, Career Launcher and IMS etc.
3. Quantitative Aptitude by R S Agarwal S Chand Publications
4. Quantitative Aptitude by Pearson Publications

Course Outcomes:

1. Solve questions from all four relevant areas of CAT/ MAT as listed above
2. Practice test-cracking techniques through relevant mock tests

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3			2			3				
CO2	3			2			3				
CO3											
CO4											
CO5											

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:

BOS :17-09-2021 **ACADEMIC COUNCIL:17-09-2021**

SDG No. & Statement:4

Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

SDG Justification:

Quantitative aptitude, reasoning, verbal and language skills practiced during the preparation for CAT/ MAT tests provide essential skills for achieving inclusive and equitable education and lifelong learning opportunities for oneself and others.

CLAD2031	PREPARATION FOR CAMPUS PLACEMENT-2 (SOFT SKILLS 6A)	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

This course builds on the previous course and focuses on all four major areas of campus placements, including career preparedness, mock interviews, verbal ability, quantitative aptitude, and logical reasoning.

Course Educational Objectives:

- To comprehensively prepare all eligible and aspiring students for landing their dream jobs.
- To sharpen the test-taking skills in all four major areas of all campus drives

List of Activities & Tasks for Assessment:

1. Career Preparedness II: Mock Interviews, Feedback and Placement Readiness
2. Verbal Ability II: Practising Reading Comprehension, Error Detection, Sentence Completion, MCQs, FIBs, Para jumbles, Cloze Test, Critical Reasoning
3. Quantitative Aptitude II: Number Systems, Algebra, Geometry, Data Handling, Data Sufficiency, Word Problems
4. Reasoning II: Logical and Verbal Reasoning

References:

1. Verbal Ability & Reading Comprehension by Arun Sharma and Meenakshi Upadhyay
2. Study material for CAT, SAT, GRE, GMAT by TIME, CareerLauncher and IMS etc.
3. Quantitative Aptitude by R S Agarwal S Chand Publications
4. Quantitative Aptitude by Pearson Publications

Course Outcomes:

1. Demonstrate career preparedness and confidence in tackling campus interviews
2. Solve placement test questions of a higher difficulty level in verbal ability, quantitative aptitude and logical reasoning.
3. Practice test-taking skills by solving relevant questions accurately and within time.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1		3	3				3				
CO2							3				
CO3							3				
CO4											
CO5											

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:

BOS :17-09-2021 **ACADEMIC COUNCIL:17-09-2021**

SDG No. & Statement:4

Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

SDG Justification:

Quantitative aptitude, reasoning, verbal and language skills practiced during the preparation for campus placement tests provide essential skills for achieving inclusive and equitable education and lifelong learning opportunities for oneself and others.

CLAD2041	PREPARATION FOR HIGHER EDUCATION (GRE/GMAT)-2 (SOFT SKILLS 6B)	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

The course offers a special track for students who aspire to go abroad in pursuit of their higher education for which a GRE/ GMAT score is a prerequisite. It covers all four topical areas of these tests at a higher difficulty-level and includes fully solved mock tests as well.

Course Educational Objectives:

- Prepare the students to solve higher level questions from all four broad areas of GRE/ GMAT
- Orient the students for GRE/ GMAT through mock tests

List of Activities & Tasks for Assessment:

1. Verbal Reasoning II: Reading Comprehension, Sentence Equivalence, Text Completion, Sentence Correction, Critical Reasoning
2. Quantitative Reasoning II: Arithmetic, Algebra, Geometry, Data Analysis
3. Analytical Writing Assessment II: Issue/ Argument
4. Integrated Reasoning II

References:

1. Verbal Ability & Reading Comprehension by Arun Sharma and Meenakshi Upadhyay
2. Study material for CAT, SAT, GRE, GMAT by TIME, Career Launcher and IMS etc.
3. Quantitative Aptitude by R S Agarwal S Chand Publications
4. Quantitative Aptitude by Pearson Publications

Course Outcomes:

1. Solve higher level questions from all four broad areas of GRE/ GMAT
2. Practice answering several mock tests

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	2						3				
CO2	2						3				
CO3											
CO4											
CO5											

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:

BOS :17-09-2021 **ACADEMIC COUNCIL:17-09-2021**

SDG No. & Statement:4

Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

SDG Justification:

Quantitative aptitude, reasoning, verbal and language skills practiced during the preparation for GRE/GMAT tests provide essential skills for achieving inclusive and equitable education and lifelong learning opportunities for oneself and others.

CLAD2051	PREPARATION FOR CAT/ MAT – 2 (SOFT SKILLS 6C)	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

The course offers a special track for UG students who aspire to go for higher education in business management in India for which cracking CAT/ MAT/ other related test is mandatory. It covers all four topical areas of these tests at a higher level of difficulty and includes fully solved mock tests as well.

Course Educational Objectives:

- Prepare the students to solve all types of questions from all four relevant areas of CAT/ XAT/ MAT, etc.

List of Activities & Tasks for Assessment:

1. Quantitative Ability II: Arithmetic, Algebra, Geometry, Mensuration, Calculus, Trigonometry
2. Data Interpretation II: Data Interpretation and Data Sufficiency
3. Logical Reasoning II: Data Management, Deductions, Verbal Reasoning and Non-Verbal Reasoning
4. Verbal Ability II: Critical Reasoning, Sentence Correction, Para Completion, Para Jumbles, Reading Comprehension

References:

1. Verbal Ability & Reading Comprehension by Arun Sharma and Meenakshi Upadhyay
2. Study material for CAT, SAT, GRE, GMAT by TIME, Career Launcher and IMS etc.
3. Quantitative Aptitude by R S Agarwal S Chand Publications
4. Quantitative Aptitude by Pearson Publications

Course Outcomes:

1. Solve higher difficulty level questions from all four relevant areas of CAT/ MAT as listed above
2. Practice test-cracking techniques through relevant mock tests

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	2			2			3				
CO2	2			2			3				
CO3											
CO4											
CO5											

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:

BOS :17-09-2021 **ACADEMIC COUNCIL:17-09-2021**

SDG No. & Statement:4

Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

SDG Justification:

Quantitative aptitude, reasoning, verbal and language skills practiced during the preparation for CAT/ MAT tests provide essential skills for achieving inclusive and equitable education and lifelong learning opportunities for oneself and others.

DOSL1001	CLUB ACTIVITY – PARTICIPANT	L	T	P	S	J	C
		0	0	0	2	0	2
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

This course recognizes student participation in multiple activities organized by various student organizations that pursue specific co-curricular and extra-curricular interests. These activities allow students to engage in and identify and pursue their personal interests and hobbies.

Course Educational Objectives:

- Create opportunities for students to participate in a variety of non-academic experiences
- Interact with and learn from peers in a setting without an external performance pressure
- Allow exploration of interesting activities and reflection about these experiences
- Learn to manage time effectively

List of Student Club Activities:

1. Music (vocals, instruments, technical, recording, mixing, production, management)
2. Dance (Indian classical, western, jazz, Latin, contemporary, folk, production, event management)
3. Theatre (classical, experimental, one-act, street, production, direction, casting, etc.)
4. Arts (fine arts, painting, calligraphy, sketching, caricaturing, etc.)
5. Craft (origami, model making, sculpture, pottery, etc.)
6. Cooking (home-style, baking, confectionery, Indian, intercontinental, etc.)
7. Graffiti (street, mural, collage, multi media, etc.)
8. Workshops, quizzes, debates, elocution, etc.
9. Filmmaking (adventure, drama, film appreciation, documentary, etc.)
10. Photography (conventional, immersive (360), landscape, portrait, technical, editing, etc.)
11. College Fests
12. Designing (graphic design, landscape, interior, etc.)
13. Competitive coding
14. Recreational sports activities
15. Other club activities organized by student clubs

List of Activities:

1. Participation in various club-based activities
2. Weekly reflection paper
3. Portfolio (on social media using an Instagram account)
4. Two learning papers (one per semester)

Textbooks:

1. Small move: big Change (Caroline Arnold)
2. How to Win at College: Surprising Secrets for Success from the Country's Top Students (Cal Newport)

References:

1. Making the most of college: Students speak their minds (author - Richard Light)
2. Failing Forward: Turning Mistakes into Stepping Stones for Success (John C Maxwell)
3. The Last Lecture (Randy Pausch)
4. Lean in (Sheryl Sandberg)
5. YouTube- Introduction to various club activities

Course Outcomes:

Upon successful completion of the course, student will be able to

1. Identify personal interest areas
2. Learn from diverse perspectives and experiences
3. Gain exposure to various activities and opportunities for extra-curricular activities
4. Learn to manage time effectively
5. gain confidence

CO-PO Mapping:

	PO1		PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3		3	3	3	2		2				
CO2	3			3		2		2				
CO3			3	2		3	2					
CO4			3	3		2		3				
CO5	3			3		2		3				

Note: 1 - Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:

BOS :19-07-2021 **ACADEMIC COUNCIL:19-07-2021**

SDG No. & Statement:

SDG 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

SDG Justification:

This course recognizes student participation in non-academic events and activities which focus on inclusive partnerships and collaborations with all stakeholders by using all sustainable means to promote lifelong learning.

DOSL1011	CLUB ACTIVITY – MEMBER OF THE CLUB	L	T	P	S	J	C
		0	0	0	2	0	2
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

This course encourages and acknowledges student members' work in organizing events and activities organized by various student organizations that pursue specific co-curricular and extra- curricular interests. These activities allow students to actively learn from the process of conceptualizing and organizing such activities as part of a team.

Course Educational Objectives:

- Create opportunities for students to learn from organizing club activities
- Learn teamwork, leadership, planning and management of events and activities
- Learn to appreciate multiple perspectives, cultures, and individual capabilities
- Learn to manage time effectively

List of Student Club Activities:

1. Music (vocals, instruments, technical, recording, mixing, production, management)
2. Dance (Indian classical, western, jazz, Latin, contemporary, folk, production, event management)
3. Theatre (classical, experimental, one-act, street, production, direction, casting, etc.)
4. Arts (fine arts, painting, calligraphy, sketching, caricaturing, etc.)
5. Craft (origami, model making, sculpture, pottery, etc.)
6. Cooking (home-style, baking, confectionery, Indian, intercontinental, etc.)
7. Graffiti (street, mural, collage, multimedia, etc.)
8. Workshops, quizzes, debates, elocution, etc.
9. Filmmaking (adventure, drama, film appreciation, documentary, etc.)
10. Photography (conventional, immersive (360), landscape, portrait, technical, editing, etc.)
11. College Fests
12. Designing (graphic design, landscape, interior, etc.)
13. Competitive coding
14. Recreational sports activities
15. Other club activities organized by student clubs

List of Activities:

1. Be a member of a club and organize activities in that particular interest area
2. Learn from diverse perspectives and experiences
3. Learn to design and execute extra-curricular activities
4. Develop management skills through hands on experience
5. Explore different managerial roles and develop competencies

Textbooks:

1. Small move: big Change (Caroline Arnold)
2. How to Win at College: Surprising Secrets for Success from the Country's Top Students (Cal Newport)

References:

1. Making the most of college: Students speak their minds (author - Richard Light)
2. Failing Forward: Turning Mistakes into Stepping Stones for Success (John C Maxwell)
3. The Last Lecture (Randy Pausch)
4. Lean in (Sheryl Sandberg)
5. Youtube- Introduction to various club activities

Course Outcomes:

Upon successful completion of the course, student will be able to

- Be a member of a club and organize activities in that particular interest area
- Learn from diverse perspectives and experiences
- Learn to design and execute extra-curricular activities
- Develop management skills through hands on experience
- Explore different managerial roles and develop competencies

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	2		2				
CO2	3		3		2		2				
CO3		3	2		3	2					
CO4		3	3		2		3				
CO5	3		3		2		3				

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:

BOS :19-07-2021 **ACADEMIC COUNCIL:19-07-2021**

SDG No. & Statement:

SDG 16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

SDG17 : Strengthen the means of implementation and revitalize the global partnership for sustainable development

SDG Justification:

This course recognizes student participation in community service endeavours focussing on sustainable development, service to communities. This allows students to develop empathy, citizenship behaviour and inclusive community values.

DOSL1021	CLUB ACTIVITY – LEADER OF THE CLUB	L	T	P	S	J	C
		0	0	0	2	0	2
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

This course encourages and recognizes student members' work in leading the student organizations through various leadership roles. As leaders they work not just to organize events and activities in specific co-curricular and extra-curricular interests, but also lead the teams that form the core members of the clubs. These activities allow students to learn and practice leadership and management skills through real world experience.

Course Educational Objectives:

- Create opportunities for students to learn from organizing club activities
- Learn teamwork, leadership, planning and management of events and activities
- Learn to appreciate multiple perspectives, cultures, and individual capabilities
- Learn to manage time effectively

List of Student Club Activities:

1. Music (vocals, instruments, technical, recording, mixing, production, management)
2. Dance (Indian classical, western, jazz, Latin, contemporary, folk, production, event management)
3. Theatre (classical, experimental, one-act, street, production, direction, casting, etc.)
4. Arts (fine arts, painting, calligraphy, sketching, caricaturing, etc.)
5. Craft (origami, model making, sculpture, pottery, etc.)
6. Cooking (home-style, baking, confectionery, Indian, intercontinental, etc.)
7. Graffiti (street, mural, collage, multimedia, etc.)
8. Workshops, quizzes, debates, elocution, etc.
9. Filmmaking (adventure, drama, film appreciation, documentary, etc.)
10. Photography (conventional, immersive (360), landscape, portrait, technical, editing, etc.)
11. College Fests
12. Designing (graphic design, landscape, interior, etc.)
13. Competitive coding
14. Recreational sports activities
15. Other club activities organized by student clubs

List of Activities:

1. Be the leader of the club and implement the charter, vision and mission of the club
2. Learn from diverse perspectives and experiences
3. Learn to lead the team, design and execute extra-curricular activities
4. Develop management skills through hands on experience
5. Explore different managerial roles and develop competencies

Textbooks:

1. Small move: big Change (Caroline Arnold)
2. How to Win at College: Surprising Secrets for Success from the Country's Top Students (Cal Newport)

References:

1. Making the most of college: Students speak their minds (author - Richard Light)
2. Failing Forward: Turning Mistakes into Stepping Stones for Success (John C Maxwell)
3. The Last Lecture (Randy Pausch)
4. Lean in (Sheryl Sandberg)
5. you tube- Introduction to various club activities

Course Outcomes:

Upon successful completion of the course, student will be able to

- Be the leader of the club and implement the charter, vision and mission of the club
- Learn from diverse perspectives and experiences
- Learn to lead the team, design and execute extra-curricular activities
- Develop management skills through hands on experience
- Explore different managerial roles and develop competencies

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	2		2				
CO2	3		3		2		2				
CO3		3	2		3	2					
CO4		3	3		2		3				
CO5	3		3		2		3				

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:

BOS :19-07-2021 **ACADEMIC COUNCIL:19-07-2021**

SDG No. & Statement:

SDG 16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

SDG17 : Strengthen the means of implementation and revitalize the global partnership for sustainable development

SDG Justification:

This course recognizes student participation in community service endeavours focussing on sustainable development, service to communities. This allows students to develop empathy, citizenship behaviour and inclusive community values.

DOSL1031	CLUB ACTIVITY – COMPETITOR	L	T	P	S	J	C
		0	0	0	2	0	2
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

This course encourages and recognizes student members' work in leading the student organizations through various leadership roles. As leaders they work not just to organize events and activities in specific co-curricular and extra-curricular interests, but also lead the teams that form the core members of the clubs. These activities allow students to learn and practice leadership and management skills through real world experience.

Course Educational Objectives:

- Create opportunities for students to learn from organizing club activities
- Learn teamwork, leadership, planning and management of events and activities
- Learn to appreciate multiple perspectives, cultures, and individual capabilities
- Learn to manage time effectively

List of Student Club Activities:

1. Music (vocals, instruments, technical, recording, mixing, production, management)
2. Dance (Indian classical, western, jazz, Latin, contemporary, folk, production, event management)
3. Theatre (classical, experimental, one-act, street, production, direction, casting, etc.)
4. Arts (fine arts, painting, calligraphy, sketching, caricaturing, etc.)
5. Craft (origami, model making, sculpture, pottery, etc.)
6. Cooking (home-style, baking, confectionery, Indian, intercontinental, etc.)
7. Graffiti (street, mural, collage, multimedia, etc.)
8. Workshops, quizzes, debates, elocution, etc.
9. Filmmaking (adventure, drama, film appreciation, documentary, etc.)
10. Photography (conventional, immersive (360), landscape, portrait, technical, editing, etc.)
11. College Fests
12. Designing (graphic design, landscape, interior, etc.)
13. Competitive coding
14. Recreational sports activities
15. Other club activities organized by student clubs

List of Activities:

1. Be the leader of the club and implement the charter, vision and mission of the club
2. Learn from diverse perspectives and experiences
3. Learn to lead the team, design and execute extra-curricular activities
4. Develop management skills through hands on experience
5. Explore different managerial roles and develop competencies

Textbooks:

1. Small move: big Change (Caroline Arnold)
2. How to Win at College: Surprising Secrets for Success from the Country's Top Students (Cal Newport)

References:

1. Making the most of college: Students speak their minds (author - Richard Light)
2. Failing Forward: Turning Mistakes into Stepping Stones for Success (John C Maxwell)
3. The Last Lecture (Randy Pausch)
4. Lean in (Sheryl Sandberg)
5. YouTube- Introduction to various club activities

Course Outcomes:

Upon successful completion of the course, student will be able to

1. Be the leader of the club and implement the charter, vision and mission of the club
2. Learn from diverse perspectives and experiences
3. Learn to lead the team, design and execute extra-curricular activities
4. Develop management skills through hands on experience
5. Explore different managerial roles and develop competencies

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	2		2				
CO2	3		3		2		2				
CO3		3	2		3	2					
CO4		3	3		2		3				
CO5	3		3		2		3				

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:

BOS :19-07-2021 **ACADEMIC COUNCIL:19-07-2021**

SDG No. & Statement:

SDG 16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

SDG17 : Strengthen the means of implementation and revitalize the global partnership for sustainable development

SDG Justification:

This course recognizes student participation in community service endeavours focussing on sustainable development, service to communities. This allows students to develop empathy, citizenship behaviour and inclusive community values.

DOSL1041	COMMUNITY SERVICES - VOLUNTEER	L	T	P	S	J	C
		0	0	0	0	2	2
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

This course recognizes student participation in Community service activities organized by various student organizations and other Government and non-government organizations that exist for providing service to communities. These activities allow students to develop empathy, citizenship behavior and community values.

Course Educational Objectives:

- To help students develop empathy and citizenship behavior
- Enable students to develop an altruistic attitude and community development sensibility
- Allow exploration of community service activities and reflect about these experiences
- Learn to work in small and large teams for achieving community objectives

List of Community Service Activities:

1. Community Health Services
2. Swachh Bharat Abhiyan and other Cleanliness drives
3. Tree Plantation and similar environmental conservation initiatives
4. Rain water harvesting awareness and implementation
5. Fundraising and visits to Orphanages, Old-age homes, etc.
6. Health and disease awareness programs
7. Working with NGOs
8. Disaster mitigation and management training and relief work
9. Rural Upliftment projects
10. Campus awareness and action projects (cleanliness, anti-ragging, blood donation, etc)
11. Community investigations and surveys for development research
12. Educational support for underprivileged (remedial classes, coaching, training, etc)
13. Service camps
14. Advocacy and information literacy initiatives
15. Other activities serving local communities

List of Activities:

1. Participation in various community service activities
2. Weekly reflection paper
3. Portfolio (on social media using an instagram account)
4. Two learning papers (one per semester)

Text Books:

1. Soul of a citizen: living with conviction in Challenging times (author: Paul Roget Loeb)
2. Community Services intervention: Vera Lloyd

References:

1. A path appears: Transforming lives, creating opportunities (Nicholas Kristof and Sheryl Wu Dunn)
2. The story of My Experiments with Truth (author: M. K. Gandhi)

Course Outcomes:

1. Experience of volunteering in a variety of Community service activities
2. Gaining empathy for lesser privileged sections of society by experience
3. Understanding the process of generating community awareness
4. Understanding Disaster management and relief through training and experience
5. Developing environmental and sustainability awareness

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	3					2				
CO2		3	3				2				
CO3				3	3	2	2				
CO4		3	3								
CO5	3		3				3				

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:

BOS :19-07-2021 **ACADEMIC COUNCIL:19-07-2021**

SDG No. & Statement:

SDG 16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

SDG17 : Strengthen the means of implementation and revitalize the global partnership for sustainable development

SDG Justification:

This course recognizes student participation in community service endeavours focussing on sustainable development, service to communities. This allows students to develop empathy, citizenship behaviour and inclusive community values.

DOSL1051	COMMUNITY SERVICES - MOBILIZER	L	T	P	S	J	C
		0	0	0	0	2	2
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

This course recognizes student leadership in mobilizing community service activities as members of various student organizations or other Government and non-government organizations that exist for providing service to communities. These activities allow students to develop leadership, management skills, empathy, citizenship behaviour and community values.

Course Educational Objectives:

- To help students understand leadership in a community environment
- Enable students to develop an altruistic attitude and community development sensibility
- Allow deep understanding of community service through practical experience
- Learn to lead small and large teams for achieving community objectives

List of Community Service Activities:

1. Community Health Services
2. Swachh Bharat Abhiyan and other Cleanliness drives
3. Tree Plantation and similar environmental conservation initiatives
4. Rain water harvesting awareness and implementation
5. Fundraising and visits to Orphanages, Old-age homes, etc.
6. Health and disease awareness programs
7. Working with NGOs
8. Disaster mitigation and management training and relief work
9. Rural Upliftment projects
10. Campus awareness and action projects (cleanliness, anti-ragging, blood donation, etc.)
11. Community investigations and surveys for development research
12. Educational support for underprivileged (remedial classes, coaching, training, etc.)
13. Service camps
14. Advocacy and information literacy initiatives
15. Other activities serving local communities

List of Activities:

1. Organizing and leading teams in various community service activities
2. Fortnightly reflection paper
3. Portfolio (on social media using an Instagram account)
4. Two learning papers (one per semester)

Textbooks:

1. Soul of a citizen: living with conviction in Challenging times (author: Paul Roget Loeb)
2. Community Services intervention: Vera Lloyd

References:

1. A path appears: Transforming lives, creating opportunities (Nicholas Kristof and SherylWuDunn)
2. The story of My Experiments with Truth (author: M. K. Gandhi)
3. List of student run and other Government and non- government community service organizations

Course Outcomes:

1. Experience of mobilizing and executing Community service activities
2. Providing opportunities for community service volunteering for other fellow students
3. Understanding the process of mobilizing cash, kind and volunteer support
4. Building leadership and management skills
5. Building empathy and citizenship behavior

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	3					2				
CO2		3	3				2				
CO3				3	3	2	2				
CO4		3	3								
CO5	3		3				3				

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:

BOS :19-07-2021 **ACADEMIC COUNCIL:19-07-2021**

SDG No. & Statement:

SDG 16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

SDG17 : Strengthen the means of implementation and revitalize the global partnership for sustainable development

SDG Justification:

This course recognizes student participation in community service endeavours focussing on sustainable development, service to communities. This allows students to develop empathy, citizenship behaviour and inclusive community values.

DOSP1001	BADMINTON	L	T	P	S	J	C
		0	0	0	2	0	2
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

This course provides instruction and the opportunity for participation in sports and physical fitness activities. Skills, strategies, rules, and personal wellness goals are included as appropriate. This course will provide students with an understanding of the fundamental concepts of the physiological functions and training principles associated with the chosen sport.

Course Educational Objectives:

- Understand training principles used in the sport
- Demonstrate knowledge of the game in a recreational /competitive play setting
- Organize an event around the sport
- Demonstrate concepts of warm up, game conditioning, training plans

List of Activities:

1. Watch a sport documentary / training video / game history
2. On field coaching and demonstration session
3. Guided practice and play
4. Event management & game officiating
5. Friendly competitions and structured matches

Instructional Plan:

1. Introduction to Badminton - History and development
2. Rules of the Game, Play Area & dimensions
3. Fundamental Skills - Badminton: Grips - Racket, shuttle
4. Sports Specific fitness and warmup drills
5. Stances and footwork
6. Badminton Gameplay: Service, Forehand, Backhand
7. Preparatory Drills and Fun Games
8. Game Variations: Singles/ Doubles/ Mixed

References:

1. Handbook of the Badminton World Federation (BWF)

Course Outcomes:

1. Learn to play Badminton
2. Understanding of the fundamental concepts such as rules of play, game variations
3. Understanding of the governing structure and administration of the sport
4. Understand the event management of the sport
5. Apply sport concepts into an active physical lifestyle

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2				3				
CO2							2				
CO3							2				
CO4		3	3		2		2				
CO5				3	2		3				

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

BOS :19-07-2021 **ACADEMIC COUNCIL:19-07-2021**

SDG No. & Statement:4

Good Health and Well-being: Ensure healthy lives and promote well-being for all at all ages.

SDG Justification:

The nature of the course facilitates students to engage in various forms of fitness activities and sports-related movements that work on their overall health and wellness. The course focuses on inculcating active living as a lifestyle by making sports fun, engaging and meaningful.

DOSP1011	CHESS	L	T	P	S	J	C
		0	0	0	2	0	2
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

This course provides instruction and the opportunity for participation in sports and physical fitness activities. Skills, strategies, rules, and personal wellness goals are included as appropriate. This course will provide students with an understanding of the fundamental concepts of the physiological functions and training principles associated with the chosen sport.

Course Educational Objectives:

- Understand training principles used in the sport
- Demonstrate knowledge of the game in a recreational /competitive play setting
- Organize an event around the sport
- Demonstrate concepts of warm up, game conditioning, training plans

List of Activities:

1. Watch a sport documentary / training video / game history
2. On field coaching and demonstration session
3. Guided practice and play
4. Event management & game officiating
5. Friendly competitions and structured matches

Instructional Plan:

1. Introduction to Chess - History and development
2. Rules of the Game, Play Area & dimensions
3. Fundamental Skills - Chess: Pieces & functions, basic play
4. Chess board moves & terminology
5. Chess Gameplay: Openings, castling, strategies & tactics
6. Preparatory Drills and Fun Games
7. Game Variations & Officiating

References:

1. International Chess Federation (FIDE) Handbook

Course Outcomes:

1. Learn to play Chess
2. Understanding of the fundamental concepts such as rules of play, game variations
3. Understanding of the governing structure and administration of the sport
4. Understand the event management of the sport
5. Apply sport concepts into an active physical lifestyle

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2				3				
CO2							2				
CO3							2				
CO4		3	3		2		2				
CO5				3	2		3				

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:

BOS :19-07-2021 **ACADEMIC COUNCIL:19-07-2021**

SDG No. & Statement:4

Good Health and Well-being: Ensure healthy lives and promote well-being for all at all ages.

SDG Justification:

The nature of the course facilitates students to engage in various forms of fitness activities and sports-related movements that work on their overall health and wellness. The course focuses on inculcating active living as a lifestyle by making sports fun, engaging and meaningful.

DOSP1021	CARROM	L	T	P	S	J	C
		0	0	0	2	0	2
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

This course provides instruction and the opportunity for participation in sports and physical fitness activities. Skills, strategies, rules, and personal wellness goals are included as appropriate. This course will provide students with an understanding of the fundamental concepts of the physiological functions and training principles associated with the chosen sport.

Course Educational Objectives:

- Understand training principles used in the sport
- Demonstrate knowledge of the game in a recreational /competitive play setting
- Organize an event around the sport
- Demonstrate concepts of warm up, game conditioning, training plans

List of Activities:

1. Watch a sport documentary / training video / game history
2. On field coaching and demonstration session
3. Guided practice and play
4. Event management & game officiating
5. Friendly competitions and structured matches

Instructional Plan:

1. Introduction to Carrom - History and development
2. Rules of the Game, Board components & dimensions
3. Fundamental Skills - Carrom: - Striking
4. Gameplay – General
5. Preparatory Drills and Fun Games
6. Game Variations: Singles/ Doubles/ Mixed
7. Preparatory Drills and Fun Games

References:

1. Indian Carrom Federation Handbook – Laws

Course Outcomes:

1. Learn to play Carrom
2. Understanding of the fundamental concepts such as rules of play, game variations
3. Understanding of the governing structure and administration of the sport
4. Understand the event management of the sport
5. Apply sport concepts into an active physical lifestyle

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2				3				
CO2							2				
CO3							2				
CO4		3	3		2		2				
CO5				3	2		3				

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:

BOS :19-07-2021 **ACADEMIC COUNCIL:19-07-2021**

SDG No. & Statement:4

Good Health and Well-being: Ensure healthy lives and promote well-being for all at all ages.

SDG Justification:

The nature of the course facilitates students to engage in various forms of fitness activities and sports-related movements that work on their overall health and wellness. The course focuses on inculcating active living as a lifestyle by making sports fun, engaging and meaningful.

DOSP1031	Football	L	T	P	S	J	C
		0	0	0	2	0	2
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

This course provides instruction and the opportunity for participation in sports and physical fitness activities. Skills, strategies, rules, and personal wellness goals are included as appropriate. This course will provide students with an understanding of the fundamental concepts of the physiological functions and training principles associated with the chosen sport.

Course Educational Objectives:

- Understand training principles used in the sport
- Demonstrate knowledge of the game in a recreational /competitive play setting
- Organize an event around the sport
- Demonstrate concepts of warm up, game conditioning, training plans

List of Activities:

1. Watch a sport documentary / training video / game history
2. On field coaching and demonstration session
3. Guided practice and play
4. Event management & game officiating
5. Friendly competitions and structured matches

Instructional Plan:

1. Introduction to Football – History and development
2. Rules of the Game, Play Area & dimensions
3. Fundamental Skills – Kicking, heading, ball control, Keeping
4. Movement, throwing, tackling, defense, scoring, defense
5. Gameplay- Formations, passing, FKs, CKs, PK, tactics
6. Preparatory Drills and Fun Games
7. Game Variations: Small sided games, 7v7, 11v11

References:

1. FIFA Laws of the Game

Course Outcomes:

1. Learn to play Football
2. Understanding of the fundamental concepts such as rules of play, game variations
3. Understanding of the governing structure and administration of the sport
4. Understand the event management of the sport
5. Apply sport concepts into an active physical lifestyle

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2				3				
CO2							2				
CO3							2				
CO4		3	3		2		2				
CO5				3	2		3				

Note: 1 – Low Correlation 2 – Medium Correlation 3 – High Correlation

APPROVED IN:

BOS :19-07-2021 **ACADEMIC COUNCIL:19-07-2021**

SDG No. & Statement:4

Good Health and Well-being: Ensure healthy lives and promote well-being for all at all ages.

SDG Justification:

The nature of the course facilitates students to engage in various forms of fitness activities and sports-related movements that work on their overall health and wellness. The course focuses on inculcating active living as a lifestyle by making sports fun, engaging and meaningful.

DOSP1041	VOLLEYBALL	L	T	P	S	J	C
		0	0	0	2	0	2
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

This course provides instruction and the opportunity for participation in sports and physical fitness activities. Skills, strategies, rules, and personal wellness goals are included as appropriate. This course will provide students with an understanding of the fundamental concepts of the physiological functions and training principles associated with the chosen sport.

Course Educational Objectives:

- Understand training principles used in the sport
- Demonstrate knowledge of the game in a recreational /competitive play setting
- Organize an event around the sport
- Demonstrate concepts of warm up, game conditioning, training plans

List of Activities:

1. Watch a sport documentary / training video / game history
2. On field coaching and demonstration session
3. Guided practice and play
4. Event management & game officiating
5. Friendly competitions and structured matches

Instructional Plan:

1. Introduction to Volley – History and development
2. Rules of the Game, Play Area & dimensions
3. Fundamental Skills – Striking, Ball control, Lifting
4. Sports Specific fitness and warmup drills
5. Stances and footwork
6. Preparatory Drills and Fun Games
7. Gameplay: Jumps, strikes, layoffs, attack, defense

References:

FIVB – Official Volleyball Rules

Course Outcomes:

1. Learn to play Volleyball
2. Understanding of the fundamental concepts such as rules of play, game variations
3. Understanding of the governing structure and administration of the sport
4. Understand the event management of the sport
5. Apply sport concepts into an active physical lifestyle

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2				3				
CO2							2				
CO3							2				
CO4		3	3		2		2				
CO5				3	2		3				

Note: 1 – Low Correlation 2 – Medium Correlation 3 – High Correlation

APPROVED IN:

BOS :19-07-2021 **ACADEMIC COUNCIL:19-07-2021**

SDG No. & Statement:4

Good Health and Well-being: Ensure healthy lives and promote well-being for all at all ages.

SDG Justification:

The nature of the course facilitates students to engage in various forms of fitness activities and sports-related movements that work on their overall health and wellness. The course focuses on inculcating active living as a lifestyle by making sports fun, engaging and meaningful.

DOSP1051	KABADDI	L	T	P	S	J	C
		0	0	0	2	0	2
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

This course provides instruction and the opportunity for participation in sports and physical fitness activities. Skills, strategies, rules, and personal wellness goals are included as appropriate. This course will provide students with an understanding of the fundamental concepts of the physiological functions and training principles associated with the chosen sport.

Course Educational Objectives:

- Understand training principles used in the sport
- Demonstrate knowledge of the game in a recreational /competitive play setting
- Organize an event around the sport
- Demonstrate concepts of warm up, game conditioning, training plans

List of Activities:

1. Watch a sport documentary / training video / game history
2. On field coaching and demonstration session
3. Guided practice and play
4. Event management & game officiating
5. Friendly competitions and structured matches

Instructional Plan:

1. Introduction to Kabaddi – History and development
2. Rules of the Game, Play Area & dimensions
3. Fundamental Skills – Raiding, catching
4. Sports Specific fitness and warmup drills
5. Stances and footwork
6. Preparatory Drills and Fun Games
7. Gameplay: Chain system movement

References:

1. Amateur Kabaddi Federation of India (AKFI) – Official Rules
2. Rules of Kabaddi – International Kabaddi Federation

Course Outcomes:

1. Learn to play Kabaddi
2. Understanding of the fundamental concepts such as rules of play, game variations
3. Understanding of the governing structure and administration of the sport
4. Understand the event management of the sport
5. Apply sport concepts into an active physical lifestyle

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2				3				
CO2							2				
CO3							2				
CO4		3	3		2		2				
CO5				3	2		3				

Note: 1 – Low Correlation 2 – Medium Correlation 3 – High Correlation

APPROVED IN:

BOS :19-07-2021 **ACADEMIC COUNCIL:19-07-2021**

SDG No. & Statement:4

Good Health and Well-being: Ensure healthy lives and promote well-being for all at all ages.

SDG Justification:

The nature of the course facilitates students to engage in various forms of fitness activities and sports-related movements that work on their overall health and wellness. The course focuses on inculcating active living as a lifestyle by making sports fun, engaging and meaningful.

DOSP1061	KHO KHO	L	T	P	S	J	C
		0	0	0	2	0	2
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

This course provides instruction and the opportunity for participation in sports and physical fitness activities. Skills, strategies, rules, and personal wellness goals are included as appropriate. This course will provide students with an understanding of the fundamental concepts of the physiological functions and training principles associated with the chosen sport.

Course Educational Objectives:

- Understand training principles used in the sport
- Demonstrate knowledge of the game in a recreational /competitive play setting
- Organize an event around the sport
- Demonstrate concepts of warm up, game conditioning, training plans

List of Activities:

1. Watch a sport documentary / training video / game history
2. On field coaching and demonstration session
3. Guided practice and play
4. Event management & game officiating
5. Friendly competitions and structured matches

Instructional Plan:

1. Introduction to Kho Kho – History and development
2. Rules of the Game, Play Area & dimensions
3. Fundamental Skills: Sitting, giving Kho, Pole dive
4. Sports Specific fitness and warmup drills
5. Stances and footwork: Running, sitting
6. Gameplay: Running strategies, ring method, chain method
7. Preparatory Drills and Fun Games

References:

1. Khelo India Official Rulebook of Kho Kho

Course Outcomes:

1. Learn to play Kho Kho
2. Understanding of the fundamental concepts such as rules of play, game variations
3. Understanding of the governing structure and administration of the sport
4. Understand the event management of the sport
5. Apply sport concepts into an active physical lifestyle

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2				3				
CO2							2				
CO3							2				
CO4		3	3		2		2				
CO5				3	2		3				

Note: 1 – Low Correlation 2 – Medium Correlation 3 – High Correlation

APPROVED IN:

BOS :19-07-2021 **ACADEMIC COUNCIL:19-07-2021**

SDG No. & Statement:4

Good Health and Well-being: Ensure healthy lives and promote well-being for all at all ages.

SDG Justification:

The nature of the course facilitates students to engage in various forms of fitness activities and sports-related movements that work on their overall health and wellness. The course focuses on inculcating active living as a lifestyle by making sports fun, engaging and meaningful.

DOSP1071	TABLE TENNIS	L	T	P	S	J	C
		0	0	0	2	0	2
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

This course provides instruction and the opportunity for participation in sports and physical fitness activities. Skills, strategies, rules, and personal wellness goals are included as appropriate. This course will provide students with an understanding of the fundamental concepts of the physiological functions and training principles associated with the chosen sport.

Course Educational Objectives:

- Understand training principles used in the sport
- Demonstrate knowledge of the game in a recreational /competitive play setting
- Organize an event around the sport
- Demonstrate concepts of warm up, game conditioning, training plans

List of Activities:

1. Watch a sport documentary / training video / game history
2. On field coaching and demonstration session
3. Guided practice and play
4. Event management & game officiating
5. Friendly competitions and structured matches

Instructional Plan:

1. Introduction to Table Tennis – History and development
2. Rules of the Game, Play Area & dimensions
3. Fundamental Skills – TT: Grips – Racket, ball
4. Stances and footwork
5. TT Gameplay- Forehand, Backhand, Side Spin, High Toss. Strokes-Push, Chop, Drive, Half Volley, Smash, Drop-shot, Balloon, Flick, Loop Drive.
6. Preparatory Drills and Fun Games
7. Game Variations: Singles/ Doubles/ Mixed

References:

1. Handbook of the International Table Tennis Federation (ITTF)

Course Outcomes:

1. Learn to play Table Tennis
2. Understanding of the fundamental concepts such as rules of play, game variations
3. Understanding of the governing structure and administration of the sport
4. Understand the event management of the sport
5. Apply sport concepts into an active physical lifestyle

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2				3				
CO2							2				
CO3							2				
CO4		3	3		2		2				
CO5				3	2		3				

Note: 1 – Low Correlation 2 – Medium Correlation 3 – High Correlation

APPROVED IN:

BOS :19-07-2021 **ACADEMIC COUNCIL:19-07-2021**

SDG No. & Statement:4

Good Health and Well-being: Ensure healthy lives and promote well-being for all at all ages.

SDG Justification:

The nature of the course facilitates students to engage in various forms of fitness activities and sports-related movements that work on their overall health and wellness. The course focuses on inculcating active living as a lifestyle by making sports fun, engaging and meaningful.

DOSP1081	HANDBALL	L	T	P	S	J	C
		0	0	0	2	0	2
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

This course provides instruction and the opportunity for participation in sports and physical fitness activities. Skills, strategies, rules, and personal wellness goals are included as appropriate. This course will provide students with an understanding of the fundamental concepts of the physiological functions and training principles associated with the chosen sport.

Course Educational Objectives:

- Understand training principles used in the sport
- Demonstrate knowledge of the game in a recreational /competitive play setting
- Organize an event around the sport
- Demonstrate concepts of warm up, game conditioning, training plans

List of Activities:

1. Watch a sport documentary / training video / game history
2. On field coaching and demonstration session
3. Guided practice and play
4. Event management & game officiating
5. Friendly competitions and structured matches

Instructional Plan:

1. Introduction to Handball – History and development
2. Rules of the Game, Play Area & dimensions
3. Fundamental Skills – Handball: Throwing, Ball control, Movement
4. Sports Specific fitness and warmup drills
5. Stances and footwork: Jumps, dribbles, catching, throws
6. Gameplay: Shots, throws, movements, attack, defines
7. Preparatory Drills and Fun Games

References:

1. International Handball Federation – Rules of the Game & Regulations

Course Outcomes:

1. Learn to play Handball
2. Understanding of the fundamental concepts such as rules of play, game variations
3. Understanding of the governing structure and administration of the sport
4. Understand the event management of the sport
5. Apply sport concepts into an active physical lifestyle

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2				3				
CO2							2				
CO3							2				
CO4		3	3		2		2				
CO5				3	2		3				

Note: 1 – Low Correlation 2 – Medium Correlation 3 – High Correlation

APPROVED IN:

BOS :19-07-2021 **ACADEMIC COUNCIL:19-07-2021**

SDG No. & Statement:4

Good Health and Well-being: Ensure healthy lives and promote well-being for all at all ages.

SDG Justification:

The nature of the course facilitates students to engage in various forms of fitness activities and sports-related movements that work on their overall health and wellness. The course focuses on inculcating active living as a lifestyle by making sports fun, engaging and meaningful.

DOSP1091	BASKETBALL	L	T	P	S	J	C
		0	0	0	2	0	2
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

This course provides instruction and the opportunity for participation in sports and physical fitness activities. Skills, strategies, rules, and personal wellness goals are included as appropriate. This course will provide students with an understanding of the fundamental concepts of the physiological functions and training principles associated with the chosen sport.

Course Educational Objectives:

- Understand training principles used in the sport
- Demonstrate knowledge of the game in a recreational /competitive play setting
- Organize an event around the sport
- Demonstrate concepts of warm up, game conditioning, training plans

List of Activities:

1. Watch a sport documentary / training video / game history
2. On field coaching and demonstration session
3. Guided practice and play
4. Event management & game officiating
5. Friendly competitions and structured matches

Instructional Plan:

1. Introduction to Basketball – History and development
2. Rules of the Game, Play Area & dimensions
3. Fundamental Skills – Passing, Receiving, Dribbling
4. Sports Specific fitness and warmup drills
5. Stances and footwork: Jumps, dribbles, catching, throws
6. Preparatory Drills and Fun Games
7. Gameplay: Shots, throws, movements, attack, defense

References:

1. FIBA Basketball Official Rules

Course Outcomes:

1. Learn to play Basketball
2. Understanding of the fundamental concepts such as rules of play, game variations
3. Understanding of the governing structure and administration of the sport
4. Understand the event management of the sport
5. Apply sport concepts into an active physical lifestyle

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2				3				
CO2							2				
CO3							2				
CO4		3	3		2		2				
CO5				3	2		3				

Note: 1 – Low Correlation 2 – Medium Correlation 3 – High Correlation

APPROVED IN:

BOS :19-07-2021 **ACADEMIC COUNCIL:19-07-2021**

SDG No. & Statement:4

Good Health and Well-being: Ensure healthy lives and promote well-being for all at all ages.

SDG Justification:

The nature of the course facilitates students to engage in various forms of fitness activities and sports-related movements that work on their overall health and wellness. The course focuses on inculcating active living as a lifestyle by making sports fun, engaging and meaningful.

DOSP1101	TENNIS	L	T	P	S	J	C
		0	0	0	2	0	2
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

This course provides instruction and the opportunity for participation in sports and physical fitness activities. Skills, strategies, rules, and personal wellness goals are included as appropriate. This course will provide students with an understanding of the fundamental concepts of the physiological functions and training principles associated with the chosen sport.

Course Educational Objectives:

- Understand training principles used in the sport
- Demonstrate knowledge of the game in a recreational /competitive play setting
- Organize an event around the sport
- Demonstrate concepts of warm up, game conditioning, training plans

List of Activities:

1. Watch a sport documentary / training video / game history
2. On field coaching and demonstration session
3. Guided practice and play
4. Event management & game officiating
5. Friendly competitions and structured matches

Instructional Plan:

1. Introduction to Tennis – History and development
2. Rules of the Game, Play Area & dimensions
3. Fundamental Skills – Tennis: Grips – Racket, ball
4. Stances and footwork
5. Gameplay- Forehand, Backhand, Service, volley, smash
6. Preparatory Drills and Fun Games
7. Game Variations: Singles/ Doubles/ Mixed

References:

1. Handbook of the International Tennis Federation (ITF)

Course Outcomes:

1. Learn to play Tennis
2. Understanding of the fundamental concepts such as rules of play, game variations
3. Understanding of the governing structure and administration of the sport
4. Understand the event management of the sport
5. Apply sport concepts into an active physical lifestyle

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2				3				
CO2							2				
CO3							2				
CO4		3	3		2		2				
CO5				3	2		3				

Note: 1 – Low Correlation 2 – Medium Correlation 3 – High Correlation

APPROVED IN:

BOS :19-07-2021 **ACADEMIC COUNCIL:19-07-2021**

SDG No. & Statement:4

Good Health and Well-being: Ensure healthy lives and promote well-being for all at all ages.

SDG Justification:

The nature of the course facilitates students to engage in various forms of fitness activities and sports-related movements that work on their overall health and wellness. The course focuses on inculcating active living as a lifestyle by making sports fun, engaging and meaningful.

DOSP1111	THROWBALL	L	T	P	S	J	C
		0	0	0	2	0	2
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure							

Course Description:

This course provides instruction and the opportunity for participation in sports and physical fitness activities. Skills, strategies, rules, and personal wellness goals are included as appropriate. This course will provide students with an understanding of the fundamental concepts of the physiological functions and training principles associated with the chosen sport.

Course Educational Objectives:

- Understand training principles used in the sport
- Demonstrate knowledge of the game in a recreational /competitive play setting
- Organize an event around the sport
- Demonstrate concepts of warm up, game conditioning, training plans

List of Activities:

1. Watch a sport documentary / training video / game history
2. On field coaching and demonstration session
3. Guided practice and play
4. Event management & game officiating
5. Friendly competitions and structured matches

Instructional Plan:

1. Introduction to Throwball – History and development
2. Rules of the Game, Play Area & dimensions
3. Fundamental Skills – Throwing, Receiving
4. Sports Specific fitness and warmup drills
5. Stances and footwork
6. Preparatory Drills and Fun Games
7. Gameplay: Shots, throws, movements, control

References:

1. World Throwball Federation – Rules of the Game

Course Outcomes:

1. Learn to play Throwball
2. Understanding of the fundamental concepts such as rules of play, game variations
3. Understanding of the governing structure and administration of the sport
4. Understand the event management of the sport
5. Apply sport concepts into an active physical lifestyle

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2				3				
CO2							2				
CO3		3	3				2				
CO4					2		2				
CO5				3	2		3				

Note: 1 – Low Correlation 2 – Medium Correlation 3 – High Correlation

APPROVED IN:

BOS :19-07-2021 **ACADEMIC COUNCIL:19-07-2021**

SDG No. & Statement:4

Good Health and Well-being: Ensure healthy lives and promote well-being for all at all ages.

SDG Justification:

The nature of the course facilitates students to engage in various forms of fitness activities and sports-related movements that work on their overall health and wellness. The course focuses on inculcating active living as a lifestyle by making sports fun, engaging and meaningful.

ENVS1001	ENVIRONMENTAL STUDIES	L	T	P	S	J	C
		3	0	0	0	0	3*
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

The course enables the students to adapt eco-centric thinking and actions rather than human-centric thinking on natural resources, their utilization and conservation. The course also focuses on the importance of ecosystems, biodiversity and their degradation led to pollution. This course helps in finding solutions through application of control measures to combat pollution and legal measures to achieve sustainable development.

Course Educational Objectives:

- To impart knowledge on natural resources and its associated problems.
- To familiarize learners about ecosystem, biodiversity, and their conservation.
- To introduce learners about environment pollution.
- To acquaint learners on different social issues such as conservation of water, green building concept.
- To make learners understand about the present population scenario, its impacts and role of informational technology on environment and human health.
- To make learners understand about the importance of field visit.

UNIT 1 Multidisciplinary nature of environmental studies & Natural Resources **10 hours**

Multidisciplinary nature of environmental studies Definition, scope and importance. Need for public awareness. Natural resources and associated problems. Uses and over exploitation of Forest resources, Water resources, Mineral resources, Food resources, Energy resources. Role of an individual in conservation of natural resources.

Activity:

1. Planting tree saplings
2. Identification of water leakage in house and institute-Rectify or report
3. Observing any one day of a week as Car/bike/vehicle free day.

UNIT 2 Ecosystem and biodiversity 10 hours

Ecosystem: Structure components of ecosystem: Biotic and Abiotic components. Functional components of an ecosystem: Food chains, Food webs, Ecological pyramids, Energy flow in the ecosystem (10% law), Ecological succession.

Biodiversity: Definition, Biogeographical classification of India, Values of biodiversity: consumptive use, productive use, social, ethical, aesthetic. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching, man wildlife conflicts. Conservation of biodiversity: In – situ and Ex-situ

Activity:

1. Visit to Zoological Park-Noting different ecosystem
2. Biodiversity register- Flora and fauna in the campus

UNIT 3 Environmental Pollution 10 hours

Definition Causes, effects, and control measures of: -Air pollution. Water pollution. Soil pollution. Marine pollution. Noise pollution. Nuclear hazards. Solid waste Management: Causes, effects, and control measures. Role of an individual in prevention of pollution. Pollution case studies.

Activity:

1. Visit to treatment plant and documentation.
2. Documentation of segregation of solid waste-Dry and Wet

UNIT 4 Social Issues and the Environment 10 hours

From Unsustainable to Sustainable development Urban problems related to energy. Water conservation, rainwater harvesting, watershed management. Environmental ethics: Issues and possible solutions. Green building concept.

Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies.

Activity:

1. Observing zero hour at individual level-documentation.
2. Eco friendly idols.
3. Rainwater harvesting-creating storage pits in nearby area.

UNIT 5 Human Population and the Environment and Environment Protection Act and Field work **10 hours**

Population growth, variation among nations. Environment and human health. HIV/AIDS, Human rights. Value Education. Women and Child Welfare. Role of Information Technology in Environment and human health. Environment Legislation. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Environmental Protection Act, Issues involved in enforcement of environmental legislation.

Activity:

1. Visit to a local polluted site-industry/agriculture
2. Identifying diseases due to inappropriate environmental conditions

Text Book(s):

1. Erach Bharucha. Textbook of environmental studies for undergraduates courses-Universities Press, India Private Limited. 2019.
2. Kaushik A and Kaushik C.P. Perspectives in Environmental Studies. New Age International Publishers Edition-VI. 2018.
3. Dave D Katewa S.S. Textbook of Environmental Studies, 2nd Edition. Cengage Learning India. 2012.

Additional Reading:

1. Benny Joseph. Textbook of Environmental Studies 3rd edition, McGraw Hill Publishing company limited. 2017.

Reference Book(s):

1. McKinney M.L., Schoch R.M., Yonavjak L. Mincy G. Environmental Science: Systems and Solutions. Jones and Bartlett Publishers. 6th Edition. 2017.
2. Botkin D.B. Environmental Science: Earth as a Living Planet. John Wiley and Sons. 5th edition. 2005.

Journal(s):

1. https://www.tandfonline.com/loi/genv20
2. https://library.lclark.edu/envs/corejournals

Website(s):

https://www.ugc.ac.in/oldpdf/modelcurriculum/env.pdf From Climate Science to Action | Coursera

Course Outcomes:

After the completion of the course student will be able to

1. List different natural resources and their uses
2. Summarize the structure and function of terrestrial and aquatic ecosystems.
3. Identify causes, effects, and control measures of pollution (air, water & soil).
4. Function of green building concept.
5. Adapt value education

CO-PO Mapping:

	PO2	PO1	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2							2		
CO2		2				1		2		
CO3			1						1	
CO4				2						1
CO5	1								1	
CO6					2					1

Note: 1 – Low Correlation 2 – Medium Correlation 3 – High Correlation

APPROVED IN: BOS

BOS: 04-07-22 **ACADEMIC COUNCIL:14-07-22**

SDG No. & Statement:

1.SDG-6-Clean water and Sanitation

2. SDG-7-Affordable and clean energy

3. SDG-13 – Climate change

4. SDG-14 – Life below water

5. SDG-15 – Life on Land

SDG Justification:

1. The learner will understand the importance of clean water and sanitation through this course and apply in their daily activities – SDG-6

2. The learner will make use of renewable resources to reduce pollution achieves SDG-7

3. The learner will understand present situation in climate change and takes appropriate steps to combat climate change – SDG-13

4. The learner will understand the existence of life below water – SDG-14

5. The learner will understand to promote sustainable terrestrial ecosystem – SDG15

FINA3001	PERSONAL FINANCIAL PLANNING	L	T	P	S	J	C
		0	0	2	0	0	1*
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	Risk Management in personal financing Fundamentals of Investing Saving money for the future Personal and Family Financial Planning Introduction to Personal Finance Portfolio Selection and Risk Management						

Course Description:

Personal Financial Planning is one of the most significant factors in our lives. It is essential that funds are available as and when required at various stages of life. Unavailability of funds at critical stages of our life leads to financial distress and leads to many medical and non- medical problems. There are certain planned and unplanned events in our life. On the one hand, education of our children, their marriage, our retirement etc. are some of the planned events of our life, but at the same time, some medical urgency, accident or death of an earning member might be some unplanned events. Many of these events are beyond our control, but the availability of funds can be planned to avoid any financial distress. In other words, we cannot stop the rain but can plan for an umbrella.
This course looks at the many challenges an individual faces in a complex financial environment and the rising uncertainties of one's life. It focuses on achieving long-term financial comfort of individual and family through goal setting, developing financial and life strategies, acquiring personal financial planning knowledge and managing risk throughout one's life.

Course Educational Objectives:

- To build students' ability to plan for long-term financial comfort of individual and family through goal setting, developing financial and life strategies.
- To provide students with knowledge on terms, techniques to evaluate investment avenues.
- To build the skill set of the student to enable them to file their tax returns.

UNIT 1 **Basics of Financial Planning**

Financial Planning Meaning, Need, Objectives, Financial Planning Process, Time Value of Money and its application using excel (NP)

UNIT 2 **Risk and Insurance Management**

Need for insurance, Requirement of insurance interest, Role of insurance in personal finance, Steps in insurance planning, Life and Non-life insurance products, Life insurance needs analysis (NP)

UNIT 3 **Investment Products and Measuring Investment Returns**

Investment Products: Small Saving Instruments, Fixed Income Instruments, Alternate Investments, Direct Equity

Measuring Investment Returns: Understanding Return and its concept, Compounding concept, Real vs Nominal Rate of Return, Tax Adjusted Return, Risk-Adjusted Return (NP)

UNIT 4 **Retirement Planning**

Introduction to the retirement planning process, estimating retirement corpus, Determining the retirement corpus, Retirement Products (NP)

UNIT 5 **Tax Planning**

Income Tax: Income tax principles: Heads of Incomes, Exemptions and Deductions, Types of Assesses, Rates of Taxation, Obligations for Filing and Reporting, Tax aspects of Investment Products, Wealth Tax

Textbooks:

1. National Institute of Securities Management (NISM) Module 1 & XA
2. Madhu Sinha, Financial Planning, 2 Edition, McGraw Hill India
3. Simplified Financial Management by Vinay Bhagwat, The Times Group

References:

1. Personal Financial Planning (Wealth Management) by S Murali and K R Subbakrishna, Himalaya Publishing House.
2. Mishra K.C., Doss S, (2009). Basics of Personal Financial Planning 1e. National Insurance Academy, New Delhi: Cengage Learning.
3. Risk Analysis, Insurance and Retirement Planning by Indian Institute of Banking and Finance.

Course Outcomes:

1. Describe the financial planning process and application of time value of money
2. Application of life and non-life insurance products in financial planning
3. Understand the investment avenues and analysis of investment returns
4. Understand the retirement planning and its application
5. Describe and analysis the Tax Planning

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	1	1	0	0	1	0	0	3	1	1	3
CO2	2	2	0	0	1	1	1	3	1	1	2
CO3	3	2	1	0	1	0	0	3	2	2	3
CO4	3	2	0	1	1	0	1	2	2	3	2
CO5	3	3	0	1	1	1	2	1	2	2	3

Note: 1 – Low Correlation 2 – Medium Correlation 3 – High Correlation

APPROVED IN:

BOS :30-04-2021 **ACADEMIC COUNCIL: 17-09-2021**

SDG No. & Statement:

SDG Justification:

LANG1001	COMMUNICATION SKILLS IN ENGLISH – BEGINNERS	L	T	P	S	J	C
		0	0	4	0	0	2*
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

Communication Skills in English (Beginner) is the first of the three-level courses for a developmental enhancement of learners' communication skills in English. This course focuses on giving learners exposure to factual level of comprehension (listening and reading) and application of the learning (Speaking/Writing) with an awareness for social and personality-based variations in communication. In addition to the LSRW skills, the focus of the course is on schematic thinking skills. This course is activity-based and practice-oriented in terms of procedural knowledge of vocabulary and grammatical structure. This syllabus is carefully developed to enable learners to engage in communication in English avoiding errors and be prepared for next level of learning English.

Course Educational Objectives:

- Train learners to listen actively, follow what is spoken in standard English, and answer questions to demonstrate their understanding of the main points of the speech, repeat part of what someone has said to confirm mutual understanding, though occasionally, there may be a need to ask for repetition or clarification. (Bloom's Taxonomy Level/s: 2 & 3)
- Equip learners with the skills to read and comprehend straightforward texts and simple argumentative writing to identify the topic, the desired/relevant information, the main points of the argument, and the major conclusion/s. (Bloom's Taxonomy Level/s: 2 & 4)
- Help learners apply their knowledge and language skills to make mini oral presentations and produce short coherent written texts using appropriate cohesive devices, suitable vocabulary, and grammatical structures. (Bloom's Taxonomy Level/s:3)
- Enable learners to communicate with reasonable accuracy in familiar contexts with adequate fluency and generally good control by equipping them with a repertoire of frequently used vocabulary, structures, and speech patterns. (Bloom's Taxonomy Level/s: 2 & 3)

List of Activities & Tasks for Assessment:

1. Listening to others and getting to know their experiences, interests and opinions
2. Introducing oneself: Salutation, basic information, relating to the context
3. Starting a conversation: Salutation, expressing purpose, expressing gratitude
4. Sharing one's experiences, interests and opinions

5. Reading short newspaper articles for gist
6. Picking new words from an article and working on them to know the meaning and usage
7. Using the new (unknown) words in own sentences
8. Sharing news with others – initiate, sustain and conclude
9. Understanding the relevance of intonation to meaning from recorded conversations, and applying the learning in pair work (role play)
10. Writing a summary of a story/personal narrative after listening to it twice and making individual notes
11. Reading graphs, charts and maps for specific information, making note of the important information and talking briefly about it within a small peer group
12. Writing a paragraph about oneself: a brief profile including major successes, failures, and goals. Giving compliments/gratitude to others
13. Writing a paragraph (descriptive, complimentary) about others (Family, friends, role model, etc.)
14. Correcting each other's' drafts: errors in language – word choice, structure, and conventions/etiquette
15. Writing a short structured descriptive/narrative essay in 3 paragraphs, reading others' essays, and sharing feedback

References:

1. V. Sasikumar, P. Kiranmayi Dutt, Geetha Rajeevan. (2007). Listening and Speaking – Foundation Books Cunninhum, S. & Moor, P. (nd). New Cutting Hedge (Intermediate). Longman
2. Cambrdige Academic English: An Integrated Skills Course for EAP (Intermediate) By Craig Thaine, CUP (2012)
3. Rutherford, Andrea J. (2007). Basic Communication Skills for Technology: Second Edition. Delhi: Pearson Education.
4. McCarthy, M., O'Dell, F., Mark, G. (2005). English Vocabulary in Use. Spain: Cambridge University Press.
5. New Headway Academic Skills: Reading, Writing, and Study Skills Student's Book, Level-1 by Sarah Philpot. OUP
6. Philpot, S. & Curnick, L. (2017). Headway: Academic Skills: Reaing, Writing, and Study Skills. Introductory Level. OUP.
7. Thaine, C. (2012). Cambridge Academic English: An Integrated Skills for EAP. Intermediate. CUP.

Online References:

- www.teachingenglish.org.uk
- learnenglishteens.britishcouncil.org
- https://eslflow.com/
- https://www.englishclub.com/
- https://www.oxfordlearnersdictionaries.com/
- https://dictionary.cambridge.org/
- learnenglishteens.britishcouncil.org
- https://freerice.com/categories/nglish-vocabulary

Course Outcomes:

1. Listen actively, understand and extract the essential information from short talks/conversations/discussions that are delivered in clear, standard speech. (Bloom's Taxonomy Level/s: 2 & 3)
2. Read, understand, and extract specific information from straightforward factual and simple argumentative texts on general topics and subjects of interest. (Bloom's Taxonomy Level/s: 2 & 3)
3. Speak clearly with some confidence on matters related to his/her interests and academic work and make short structured oral presentations on topics of personal interest. (Bloom's Taxonomy Level/s: 3)
4. Write short straightforward connected texts on a range of familiar/general topics using appropriate linking devices to achieve a clear sequence of ideas. (Bloom's Taxonomy Level/s: 3)
5. Acquire sufficient language competency to express oneself in speech and writing with some confidence, using appropriate vocabulary and simple grammatical structures though lexical limitations and/or difficulty with formulation might be evident at times. (Bloom's Taxonomy Level/s: 2 & 4)

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	0	2	2	3	0	0	0				
CO2	0	2	2	3	0	0	0				
CO3	0	0	0	3	0	0	0				
CO4	0	0	0	3	0	0	0				
CO5	0	4	2	0	2	2	4				

Note: 1 – Low Correlation 2 – Medium Correlation 3 – High Correlation

APPROVED IN:

BOS :30-04-2021 **ACADEMIC COUNCIL: 17-09-2021**

SDG No. & Statement:

SDG No. 4: Statement: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

SDG Justification:

The course aims to remove inequalities among admitted students with regard to basic communication skills in English and provide them communication as well as learning skills that are useful throughout their lives.

LANG1011	COMMUNICATION SKILLS IN ENGLISH	L	T	P	S	J	C
		0	0	4	0	0	2
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

Communication Skills in English (Intermediate) is the second of the three-level graded courses for a developmental enhancement of communication skills in English. Based on the learning outcomes set in the beginner level syllabus, this course focuses on giving learners more exposure to the use of language for communicative purposes and equip them with next level skills (ref. Bloom's taxonomy) and practice in terms of complexity and cognitive engagement. This course also includes inferential level of comprehension (listening and reading) that involves analysis and application of the language skills and decision-making skills while speaking/writing with an awareness for social and personality-based variations in communication. This course emphasizes guided writing through adequate tasks with pre and post context building. The focus is on stimulation and application of critical thinking in addition to schematic thinking for communication in real-life situations.

Course Educational Objectives:

- Train learners to actively listen to short audio texts with familiar content; guided activity like question-making and responding to others' questions based on the audio text would help learners engage in transactional dialogue; extended activities like extrapolating/critiquing the responses would help learners enhance their schematic thinking. (Bloom's Taxonomy Level/s: 2 & 4)
- Equip learners with strategies to read actively and critically and understand the writers' viewpoints and attitude by providing reading comprehension tasks using authentic texts such as op-ed articles from newspapers, and reports on contemporary problems. (Bloom's Taxonomy Level/s: 4 & 5)
- Help learners understand various aspects and techniques of effective presentations (group/individual) through demonstration and modelling, and enabling them to develop their presentation skills by providing training in using the tips and strategies given. Learners would be encouraged to observe and express opinion on teacher-modelling. Reflection on issues like anxiety, stage-fear, confidence, and levels of familiarity with topic and audience would be addressed. Practice would be given on tone, pitch, clarity and other speech aspects. Detailed peer feedback and instructor's feedback would cover all the significant aspects. (Bloom's Taxonomy Level/s: 2 & 4)
- Enable learners to become aware of the structure and conventions of academic writing through reading, demonstration, scaffolding activities, and discussion. Corrective individual feedback would be given to the learners on their writing. (Bloom's Taxonomy Level/s: 2 & 3)

List of Tasks and Activities:

S.No.	Tasks	Activities
1	Listening to subject related short discussions/ explanations/ speech for comprehension	Pre-reading group discussion, Silent reading (Note-making), Modelling (questioning), Post-reading reflection / Presentation
2	Asking for information: asking questions related to the content, context maintaining modalities	Group role-play in a con text (i.e. Identifying the situation and different roles and enacting their roles)
3	Information transfer: Verbal to visual (familiar context), demonstration by teacher, learners' task (guided with scaffolding), learners' task (free), presentation and feedback	Pair work for discussion & feedback, Presentations, question-answer
4	Information transfer: Visual to verbal (unfamiliar context); demonstration by teacher, learners' task (guided with scaffolding), learners' task (free), presentation and feedback	Pre-reading game/modelling, discussion in small groups, individual writing, and feedback
5	Introducing officials to peers and vice versa – Formal context	AV support, noticing, individual performance (3- 4), pair work (in context), teacher modelling, group work for Introducing self and others in a formal context
6	Introducing friends to family and vice versa – Informal context	Teacher modelling/AV support, noticing structure & note-taking, Introducing friends and family in an informal context
7	Vocabulary in context: Find clues in a text and use them to guess the meaning of words/ phrases. Apply the newly learnt vocabulary in communication (speaking and writing).	Comprehending verbal communication: Identifying the contextual clues in oral and written texts; guessing the meaning of words/phrases in context while reading texts and listening to discussions/talks
8	A five-day journal (diary) writing based on learners reading from newspaper on a single relevant/ current social issue. Individual oral presentation and feedback from peers and instructor.	Note-making (group work), Discussion, Feedback
9	Follow the essentials of lectures, talks, discussions, reports and other forms of academic presentations and mak2 individual and group	Making power point presentation aided with images, audio, video, etc. with a small group by listening to academic lectures/talks/ discussions, etc.

	presentations aided with images, audio, video, tabular data, etc.	
10	Self-reflection: Re-reading one's own drafts, identifying errors, correcting the errors, and giving rationalize the changes	Pre-task discussion/modelling, Editing the texts by careful reading and identifying the errors, peer-exchange (Pair work), feedback/consolidation
11	Collaborative work (speaking and writing) in small groups of 3 or 4 learners: discussing a general/ discipline-specific topic: creating outline, assigning specific roles to members of the group; and group presentation followed by peer and instructor feedback	Pre-task modelling (peer/teacher), general discussion on structure, group work (collaboration), feedback
12	Independent reading of different text types using appropriate reference sources by adapting suitable reading styles and speed. Focus on active reading for vocabulary: low-frequency collocations and idiomatic expressions.	Brain-storming, mapping of key terms (content specific), reading and note-making (individual), oral questioning, discussion
13	Role-play (specific social and academic situations): planning (making notes), understanding nuances of speaking in context, coordinating with situational clues and fellow speakers/participants	Peer discussion for outline, A-V support, observing (teacher modelling), role play (guided), role-play (free), feedback
14	Writing instructions: Guidelines – Flowcharts – Procedures to be followed	Pre-task reading, pair work, teacher/peer- discussion, feedback
15	Speaking spontaneously on topics of interest and writing short structured essays on the same topics adopting appropriate academic conventions and grammatical accuracy.	Reading for task preparation, note-making, speaking, reflection and corrective peer and teacher feedback

Reference Books:

1. P. Kiranmayi Dutt, Geetha Rajeevan. (2007). Basic Communication Skills. Foundation Books. CUP
2. Harmer, J. (1998). How to teach English. Longman
3. Sanjay Kumar & Pushp Lata. (2018). Communication Skills: A Workbook. OUP.
4. Cambridge IGCSE: English as a Second Language Teacher's Book Fourth Edition. By Peter Lucantoni. CUP (2014).

5. Cambrdige Academic English: An Integrated Skills Course for EAP (Upper Intermediate) By Martin Hewings, CUP (2012)
6. Richards, J.C. and Bohlke, D. (2012). Four Corners-3. Cambridge: CUP.
7. Headway Academic Skills: Reading, Writing, and Study Skills Student's Book, Level-2 by Sarah Philpot. OUP
8. Latham-Koenig, C. & Oxenden, C. (2014). American English File. Oxfor: OUP.
9. McCarthy, M. & O' Dell. F. (2016). Academic Vocabulary in Use. Cambridge: CUP

Online Resources:

1. https://www.grammarly.com/blog/
2. https://www.nationalgeographic.org/education/
3. https://www.bbc.co.uk/teach/skillswise/english/zjg4scw
4. https://www.englishclub.com/
5. https://www.oxfordlearnersdictionaries.com/
6. https://dictionary.cambridge.org/
7. learnenglishteens.britishcouncil.org
8. https://freerice.com/categories/nglish-vocabulary
9. http://www.5minuteenglish.com/
10. https://breakingnewsenglish.com/
11. https://www.digitalbook.io/
12. https://librivox.org/

Course Outcomes:

1. Understand the speaker's point of view in fairly extended talks on general or discipline-specific topics, and follow simple lines of argument in discussions on familiar contemporary issues. (Bloom's Taxonomy Level/s: 3)
2. "Read and demonstrate understanding of articles and reports on limited range of contemporary issues in which the writers adopt particular stances. Also provide samples of written communication containing fairly complex information and reasons for choices/opinions/stances. (Bloom's Taxonomy Level/s: 2 & 3)"
3. Make short presentations on a limited range of general topics using slides, and engage in small group discussions sharing experiences/views on familiar contemporary issues and give reasons for choices/opinions/plans. (Bloom's Taxonomy Level/s: 3 & 4)
4. Write clear, fairly detailed text (a short essay) on a limited range of general topics, and subjects of interest, and communicate clearly through email/letter to seek/pass on information or give reasons for choices/opinions/plans/actions. (Bloom's Taxonomy Level/s: 3)
5. Reflect on others' performance, give peer feedback on fellow learners' presentations, responses to writing tasks and reading comprehension questions. (Bloom's Taxonomy Level/s: 5)

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	0	3	0	3	0	3	0				
CO2	0	2	0	3	2	2	0				
CO3	4	3	3	3	3	3	4				
CO4	0	3	3	3	3	3	0				
CO5	5	0	5	0	0	0	0				

Note: 1 – Low Correlation 2 – Medium Correlation 3 – High Correlation

APPROVED IN:

BOS :30-04-2021 **ACADEMIC COUNCIL: 17-09-2021**

SDG No. & Statement:

SDG No. 4: Statement: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

SDG Justification:

The course aims to remove inequalities among admitted students with regard to basic communication skills in English and provide them communication as well as learning skills that are useful throughout their lives.

LANG1021	ADVANCED COMMUNICATION SKILLS IN ENGLISH	L	T	P	S	J	C
		0	0	4	0	0	2
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

Communication Skills in English (Advanced) is the third of the three-level graded courses for a developmental enhancement of communication skills in English. Based on the learning outcomes set in the upper-intermediate syllabus, this course focuses on giving learners exposure to higher level of skills/input processing (ref. Bloom's taxonomy) and practice in terms of complexity and cognitive engagement. This course includes advanced level of comprehension i.e. analytical, evaluative and extra-pollutive processing (listening and reading) and involves problem-solving, logical reasoning and decision-making skills in terms of application of the learning (speaking/writing) with an awareness for social and personality based variations in communication. This course provides opportunities with activity-based practice of advanced oral and written communicative skills besides building awareness on the finer nuances of language use for various purposes. This course emphasizes free writing through meaningfully engaging tasks with a pre and post context building. There is ample scope for application of critical thinking through simulated activities for effective communication in real life situations.

Course Educational Objectives:

- Enable learners to listen actively become aware of tone and attitude in speech, and demonstrate their comprehension of fairly complex lines of argument presented by a variety of speakers in talks/presentations/discussions. (Bloom's Taxonomy Level/s: 2 & 4)
- Enable learners to become aware of tone and attitude in written texts, and demonstrate their comprehension of fairly complex lines of argument and points of view presented in a variety of texts by equipping them with upper intermediate to advanced level reading skills and strategies. (Bloom's Taxonomy Level/s:2 & 3)
- Make effective presentations, engage in formal group discussions, and write structured essays/ short reports to highlight the significance of actions/decisions/experiences, and sustain views by providing relevant evidence and argument. (Bloom's Taxonomy Level/s: 3 & 4)
- Equip learners with the skills and strategies to communicate effectively in speech and writing using the language with a degree of fluency, accuracy and spontaneity, and fairly good grammatical control adopting a level of formality appropriate to the context. Encourage learners to apply their knowledge of language and their communication skills in real life situations. (Bloom's Taxonomy Level/s:3 & 5)

List of Activities & Tasks for Assessment:

S.No.	Tasks	Activities	CO
1	Evaluative and extrapolative reading of a long text/short texts on a current topic related to technology and society, identifying and questioning the author's intention, post- reading discussion in small groups, maintaining group dynamics, arriving at a consensus	Pre-reading group discussion, silent reading (Note-making), modelling (questioning), post-reading reflection and brief presentation of thoughts/ideas/opinions on the theme of the text	3
2	Debate in pairs based on listening to two recorded contemporary speeches by well- known leaders in different fields. Peer feedback and instructor feedback.	Pre-recorded audio/video for listening, student checklist for noticing key words/concepts, pre-task orientation (by teacher), pair work, feedback	1
3	Information transfer: Verbal to visual (unfamiliar context); demonstration by teacher, learners' task (guided with scaffolding), learners' task (free), presentation, question-answer (among students), modification and feedback before the final version is done	Pair work for discussion and feedback, presentations, question-answer	2
4	Information transfer: Visual to verbal (unfamiliar context); demonstration by teacher, learners' task (guided with scaffolding), learners' task (free), presentation, question-answer(among students), modification, editing, proofreading, and feedback before the final version is done	Pre-reading game/ modelling, discussion in small groups, independent writing and feedback	4
5	Expressing opinion on a short argumentative text (e.g. a journal article or a newspaper editorial) and justifying one's opinion/stance; focus on the use of appropriate	Listening to group discussions/ debates, reading news-paper articles on the current issues and expressing opinions in favour or	3

	conventions of formal and polite speech, and managing bias	against the topic (in GDs, debates or writing argumentative essays).	
6	Role-play (complex social and academic/professional situations): Focus on significant aspects of delivery including clarity, tone, and use of contextually appropriate vocabulary and conventions, observation, reflective discussion, and self- reflective writing	Reading newspaper/ magazine articles/ blog posts on current social issues, listening to talks/ discussions/ debates etc. and participating in role-plays using expressions appropriate to the context.	1
7	Collaborative writing in groups of 3 - 4 on topics that would require data collection and reading followed by recorded peer-reflection and peer-feedback, group presentation and feedback	Pre-task modelling (peer), general discussion on structure, group work (collaboration), presentation, peer feedback, Open-class discussion	5
8	Formal Group Discussion on topics of current interest and relevance; focus on effective participation, reflection on control over argument/ counter argument, and adherence to the conventions of formal GD	Noticing strategies from AV modelling, teacher scaffolding though open-house discussion, Note-making (Group work), Group Discussion (free), post performance discussion, Feedback	2
9	Mind-mapping for advanced reading, making correlations across texts, extending author's point of view	Reading texts on abstract topics and comprehending the author's perspective by inferring the unknown words' meaning in the context and making notes using mind-map strategy and presenting it orally.	3
10	Handling question and answer sessions after presentations: justifying arguments, taking counter-arguments, agreeing and disagreeing with rationale	Listening to some lectures, talks, and presentations in the academic seminars and adapting some strategies to handle the Q&A sessions using polite and formal expressions to agree or disagree with the statements.	1

11	Modelling an interview: with a panel of four judges (peers)	Pre-task activity for orientation/ strategies (controlled/guided), Model interview (AV support), Group work (role play), interview in pair (one-to-one), Interview in group (many -to-one), oral corrective feedback (peer/ teacher)	2
12	Writing a short reflective report of an event – incident/ meeting/ celebration	Writing a report on meetings/ celebrations/ events etc. by actively involving in such events and giving a short oral presentation on the same.	4
13	Speaking on abstract and complex topics beyond his/her own area of interest/field of study, using the language flexibly and effectively.	Reading texts on abstract topics and comprehending the author's perspectives. Similarly, listening to talks and discussions on an abstract topic of other discipline and making short oral presentation by sharing views and opinions.	3
14	Self-reflection on own speech in context(recorded): tone, pitch, relevance, content; extending the reflections/ideas to others	Listening to selected general discussions (audios and videos) and observing the language production. Recording own speech on some general topic and providing a critical review (self-reflection) on it by focusing on the tone, expressions and relevance of the content, etc.	1
15	Collaborative and individual task: planning, preparing (preparing an outline, structure, setting objectives and presenting the plan of action) and executing a mini-project, and submitting a brief report on the same peer and instructor feedback after the planning stage and on completion of the mini project	Pre-task modelling (peer/teacher), general discussion on structure, group work (collaboration), oral corrective, task distribution, presentation, feedback	5

Reference Books:

1. Latham-Koenig, C. & Oxenden, C. (2014). American English File-5. Oxford: OUPRichards,
2. J.C. and Bohlke, D. (2012). Four Corners-4. Cambridge: CUP.
3. Cambrdige Academic English: An Integrated Skills Course for EAP (Advanced) By Martin Hewings and Craig Thaine, CUP (2012)
4. Berlin, A. (2016). 50 Conversation Classes: 50 Sets of Conversation Cards with an Accompanying Activity Sheet Containing Vocabulary, Idioms and Grammar. Poland: CreateSpace Independent Publishing Platform
5. Zemach, D. E., Islam, C. (2011). Writing Paragraphs: From Sentence to Paragraph. Germany: Macmillan Education.
6. Stewart, J. P., Fulop, D. (2019). Mastering the Art of Oral Presentations: Winning Orals, Speeches, and Stand-Up Presentations. United Kingdom: Wiley.
7. Kroehnert, Gary. (2010). Basic Presentation Skills. Sidney: McGraw Hill.
8. Cunninghum, S. & Moor, P. (nd). Cutting Edge (Advanced) With Phrase Builder. Longman Publishers. CUP
9. McCarthy, M & O'Dell, F. (2017). English Idioms in Use (Advanced). Cambridge: CUP.

Online Resources:

1. https://www.grammarly.com/blog/
2. https://www.nationalgeographic.org/education/
3. https://www.bbc.co.uk/teach/skillswise/english/zjg4scw
4. https://www.englishclub.com/
5. https://www.oxfordlearnersdictionaries.com/
6. https://dictionary.cambridge.org/
7. learnenglishteens.britishcouncil.org
8. https://freerice.com/categories/nglish-vocabulary
9. http://www.5minuteenglish.com/
10. https://breakingnewsenglish.com/
11. https://www.digitalbook.io/
12. https://librivox.org/

Course Outcomes:

1. Listen to extended lectures, presentations, and discussions on a wide range of contemporary issues and demonstrate understanding of relatively complex lines of argument. (Bloom's Taxonomy Level/s: 2)
2. Make presentations using suitable AV aids and engage in formal group discussions on a wide range of topics of contemporary interest, demonstrating awareness of standard/widely accepted conventions. (Bloom's Taxonomy Level/s: 3)
3. Read and demonstrate understanding of the writer's stance/viewpoint in articles and reports on a wide range of contemporary issues and discipline-specific subjects. (Bloom's Taxonomy Level/s: 2 & 4)

4. Write analytical essays on a wide range of general topics/subjects of interest, and engage in written communication (emails/concise reports) to exchange relatively complex information, giving reasons in support of or against a particular stance/point of view. (Bloom's Taxonomy Level/s: 3 & 4)
5. Complete a mini project that necessitates the use of fairly advanced communication skills to accomplish a variety of tasks and submit a report in the given format. (Bloom's Taxonomy Level/s: 4 & 5)

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	0	2	2	0	2	2	0				
CO2	3	3	0	3	0	0	3				
CO3	2	4	0	4	2	2	0				
CO4	3	4	0	4	0	0	3				
CO5	0	4	0	4	0	0	0				

Note: 1 – Low Correlation 2 – Medium Correlation 3 – High Correlation

APPROVED IN:

BOS :30-04-2021 **ACADEMIC COUNCIL: 17-09-2021**

SDG No. & Statement:

SDG No. 4: Statement: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

SDG Justification:

The course aims to remove inequalities among admitted students with regard to basic communication skills in English and provide them communication as well as learning skills that are useful throughout their lives.

MFST1001	HEALTH & WELLBEING	L	T	P	S	J	C
		0	0	2	0	0	1*
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

The course provides the students a better understanding of the role of a proper diet in maintenance of human health. This course emphasizes the composition of the food, and will help to understand how to exercise, the role of sports and physical fitness in development of a good health. The course also focuses on the importance of emotional well-being and mindfulness. This course helps in teaching the role of yoga in maintenance of physical balance.

Course Educational Objectives:

- To provide an understanding of the relationship between food and nutrition
- To emphasize the role of exercise, sports and physical fitness in obtaining a good health
- To explain about the mindfulness and emotional well being
- To teach the role of yoga and meditation in maintaining the body balance

UNIT 1

Understand the relationship between Food and Nutrition and how food composition affects nutritional characteristics. Knowledge about regulatory principles in determining diets and recommended daily allowances. Understand how to create personalised diet/nutrition plans.

UNIT 2

Understand how exercise, activity and sports helps in developing good health. Experiential exposure to the role of proper, specific nutritional interventions along with structured activities on developing proper physical health. Practical exercises and assignments in sports and exercise regimes.

UNIT 3

Introduction to emotional wellbeing and mindfulness. Teaching of mindfulness practices to reduce stress, increase relaxation and improve mental wellbeing.

UNIT 4

Introduction to Yoga theory and how Yoga helps in maintaining balance in the body. Practice of Yoga and meditation to improve overall emotional and physical balance. Practical yoga exercises and meditation techniques

Course Outcomes:

By the end of the course, student will

1. Learn the role of nutrition and diet in maintaining a good health
2. understand how the exercise, sports and physical activities will improve health
3. learn mindfulness practices for reducing stress
4. know the importance of yoga and meditation

Note: 1 – Low Correlation 2 – Medium Correlation 3 – High Correlation

APPROVED IN:

BOS :30-04-2021 **ACADEMIC COUNCIL: 17-09-2021**

SDG No. & Statement:

SDG Justification:

PHPY1001	GANDHI FOR THE 21ST CENTURY	L	T	P	S	J	C
		2	0	0	0	0	2*
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

This course provides the students with basic knowledge on Gandhi's early life, transformations in South Africa and his entry into India's national movement. While going through the social-political, economic, and educational philosophies of Gandhi, the course analyses how his ideologies are relevant even in the 21st century.

Course Educational Objectives:

The objectives of the course are;

- To provide the students with the basic knowledge on Gandhi's life and his philosophies
- To understand the early influences and transformations in Gandhi
- To analyze the role of Gandhi in India's national movement
- To apply Gandhian Ethics while analyzing the contemporary social/political issues
- To appreciate the conflict resolution techniques put forward by Gandhi and its significance in the current scenario.

UNIT 1 MK Gandhi: Childhood and Education

M K Gandhi, Formative Years (1869-1893): Early childhood – study in England – Indian influences, early Western influences.

UNIT 2 From Mohan to Mahatma-South African Experiences

Gandhi in South Africa (1893-1914): South African Experiences – civil right movements in South Africa – invention of Satyagraha – Phoenix settlement- Tolstoy Farm – experiments in Sarvodaya, education, and sustainable livelihood.

UNIT 3 Gandhi and Indian National Movement

Gandhi and Indian National Movement (1915-1947): Introduction of Satyagraha in Indian soil -non- cooperation movement – call for women's participation – social boycott – Quit-India movement – fighting against un-touch ability – Partition of India- independence.

UNIT 4 Gandhi and Sustainable Development

Gandhian Constructive Programs-Eleven Vows-Sarvodaya-Seven Social Sins-Gandhian Economics and Sustainable Development

UNIT 5 Gandhi and Contemporary Issues

Conflict Resolution Techniques of Gandhi-Ecological Challenges and Gandhian solutions-Gandhian Ethics-An Analysis

References:

1. Gandhi, M K. (1941). *Constructive Programme*. Ahmadabad: Navjivan Publishing House
2. Gandhi, M. K. (1948). *The Story of My Experiments with Truth*. Ahmadabad: Navjivan Publishing House
3. Gandhi, M K. (1968). *Satyagraha in South Africa*. Ahmadabad: Navjivan Publishing House.
4. Khoshoo, T N (1995). *Mahatma Gandhi: An Apostle of Applied Human Ecology*. New Delhi:TERI
5. Kripalani, J.B. (1970). *Gandhi: His Life and Thought*. New Delhi: Publications Division.
6. Narayan, Rajdeva (2011). *Ecological Perceptions in Gandhism and Marxism*. Muzaffarpur: NISLS
7. Pandey, J. (1998). *Gandhi and 21st Century*. New Delhi: Concept.
8. Weber, Thomas (2007).Gandhi as Disciple and Mentor. New Delhi: CUP

Course Outcomes:

After the successful completion of the course the students will be able to;

1. Understand the life of Gandhi
2. Appreciate the role of Gandhian non-violence and Satyagraha in India's freedom struggle.
3. Critically examine the philosophy of Gandhi on Education, Sarvodaya, and Satyagraha
4. Analyse the contemporary significance of Gandhian constructive programmes and eleven vows
5. Examine the possible solutions for some of the contemporary challenges like environmental issues, moral degradation and ethical dilemmas.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	3	3	3	3	3	3	2	2
CO2	3	3	2	3	2	3	3	3	3	2	3
CO3	3	3	3	2	3	2	2	3	3	2	2
CO4	3	2	2	3	3	2	2	3	3	2	3
CO5	3	3	2	2	3	3	3	3	3	3	2

Note: 1 – Low Correlation 2 – Medium Correlation 3 – High Correlation

APPROVED IN:

BOS :30-04-2021 **ACADEMIC COUNCIL: 17-09-2021**

SDG No. & Statement:

SDG Justification:

POLS1001	INDIAN CONSTITUTION AND HISTORY	L	T	P	S	J	C
		2	0	0	0	0	2*
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

This course analyses the basic structure and operative dimensions of the Indian Constitution. It explores various aspects of the Indian political and legal system from a historical perspective highlighting the various events that led to the making of the Indian Constitution. The course also deals with various challenges faced by the constitution and its coping mechanisms. Broadly, the students would understand and explain the working of different institutions and political debates ensuing from the operation of the Indian constitution in action.

Course Educational Objectives:

- To introduce constitutional history of India.
- To explain the process of making Indian constitution
- To analyze Fundamental of Rights, Duties and other principles in constitution
- To create familiarity with political developments which shaped the constitution.

UNIT 1 **India as a Nation** **6 hours**

Khilani, S. (2004). *Introduction, The Idea of India*, Chapter 1. New Delhi: Penguin Books,

pp. 1-15.

Rowat, D. (1950). 'India: The Making of a Nation', International Journal, 5(2), 95-108. Doi:10.2307/40194264

Brass, P. (2018). 'Continuities and Discontinuities between pre- and post-Independence India', Chapter 1.

The Politics of Idea since independence, New Delhi: Cambridge University Press. Pp. 1-30.

UNIT 2 **Understanding the Constitution** **6 hours**

Mehta, U.S. (2011). 'Constitutionalism' in *The Oxford Companion to Politics in India*, (ed) by Nirja Gopal Jayal, and Pratap Bhanu Mehta, New Delhi: Oxford University Press. Pp. 15-27.

Austin, G. (2016), 'The Constituent Assembly: Microcosm in Action' *in The Indian Constitution: Cornerstone of a Nation*, New Delhi: Oxford University Press, pp. 1-25.

Beteille, Andre (2008): "Constitutional Morality," *Economic and Political Weekly*, Vol 43, Issue No 40

Prahladan, Vivek (2012): "Emergence of the Indian Constitution," *Economic and Political Weekly*, Vol 47, Issue No 07.

UNIT 3 The Preamble, Fundamental Rights and Directive Principles of State Policy 6 hours

Bhakshi, P.M. (2011). 'Preamble' in *The Constitution of India*, New Delhi: Universal Law. Pp. 1-5. Laxmikanth, M. (2017). 'Chapter IV: Preamble of the Constitution' in *Indian Polity*, Chennai: McGraw Hills.

Kumar, Virendra (2007): "Basic Structure of The Indian Constitution: Doctrine of Constitutionally Controlled Governance [From Kesavananda Bharati to I.R. Coelho]" *Journal of the Indian Law Institute*, Vol 49, No 3, pp 365-398.

Austin, G (2016), ' ' in *The Indian Constitution: Cornerstone of a Nation*, New Delhi: Oxford University Press, pp.63-105.

Reddy, S (1980). Fundamental Ness of Fundamental Rights and Directive Principles in the Indian Constitution. *Journal of the Indian Law Institute*, 22(3), pp. 399-407.

Bhatia, Gautam (2017): "The Supreme Court's Right to Privacy Judgement," *Economic and Political Weekly*, Vol 52, Issue No 44

UNIT 4 Citizenship 6 hours

Jayal, N.G. (2019). 'Reconfiguring citizenship in contemporary India' in *South Asia Journal of South Asian Studies*, pp.33-58.

Roy, Anupama. (2010). 'Chapter I: Enframing the citizen in contemporary times' in *Mapping Citizenship in India*, New Delhi: Oxford University Press.

Das, Veena (2010): "State, Citizenship and the Urban Poor," *Citizenship Studies,* Vol 15, pp 319- 333.Valerian Rodrigue

UNIT 5 Separation and Distribution of Powers 6 hours

Pal, Ruma. (2016). 'Separation of Powers' in *The Oxford Handbook of the Indian Constitution*, (ed) by Sujit Choudhry, Madhav Khosla, and Pratap Bhanu Mehta, Delhi: Oxford University Press.

Bakshi, P. (1956). 'Comparative Law: Separation of Powers in India'. *American Bar Association Journal, 42*(6), 553-595.

Rao, P. (2005). 'Separation of Powers in a Democracy: The Indian Experience'. *Peace Research, 37*(1), 113-122.

Kumar, Ashwani (2019): "Constitutional Rights, Judicial Review and Parliamentary Democracy,"

Economic and Political Weekly, Vol 51, Issue 15

Tillin, Louise. (2015). 'Introduction' in *Indian Federalism*. New Delhi: Oxford University Press. Pp. 1-30.

Chakrabarty, Bidyut and Rajendra Kumar Pandey. (2008). *Federalism' in Indian Government and Politics*, New Delhi: Sage Publications. Pp. 35-53.

Arora, B. and Kailash, K. K. (2018). 'Beyond Quasi Federalism: Change and Continuity in Indian Federalism', in *Studies in Indian Politics*, pp. 1-7.

Agrawal, Pankhuri (2020): "COVID-19 and dwindling Indian Federalism," *Economic and Political Weekly,* Vol 55, Issue No 26

Recommended Readings:

De, Rohit. (2018). *A People's Constitution – The Everyday Life of Law in the Indian Republic*, USA: Princeton University Press.

Granville Austin, *The Indian Constitution: Cornerstone of a Nation*, Oxford University Press, Oxford, 1966.

Lahoti, R.C. (2004). *Preamble: The Spirit and Backbone of the Constitution of India*. Delhi: Eastern Book Company.

Rajeev Bhargava (ed), *Ethics and Politics of the Indian Constitution*, Oxford University Press, New Delhi, 2008.

Subhash C. Kashyap, *Our Constitution*, National Book Trust, New Delhi, 2011. Tillin, Louise. (2015). *Indian Federalism*. New Delhi: Oxford University Press.

Zoya Hassan, E. Sridharan and R. Sudarshan (eds), *India's Living Constitution: Ideas, Practices, Controversies*, Permanent Black, New Delhi, 2002.

Course Outcomes:

On the successful completion of the course students would be able to:

1. Demonstrate an understanding of the Constitution of India and how constitutional governance is carried out in India
2. Interpret knowledge of the Fundamental Rights and Duties of the Citizens as well as the Obligation of the state towards its citizens
3. Correlate familiarity with key political developments that have shaped the Constitution and amended it from time to time.
4. Equip themselves to take up other courses in law after having done a foundation course on Indian Constitution

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	1	2	1	2	2	3	3	2	3	1	2
CO2	1	1	2	1	2	2	3	2	3	1	2
CO3	1	2	1	2	2	2	3	1	3	1	1
CO4	1	1	1	2	2	2	3	1	3	1	1
CO5	1	1	1	2	2	2	3	2	3	1	2

Note: 1 – Low Correlation 2 – Medium Correlation 3 – High Correlation

APPROVED IN:

BOS :30-04-2021 **ACADEMIC COUNCIL: 17-09-2021**

SDG No. & Statement:

SDG Justification:

VEDC1001	VENTURE DEVELOPMENT	L	T	P	S	J	C
		0	0	0	2	0	2
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

India as part of its "Make in India" initiative has been focusing on creating incubation centers within educational institutions, with an aim to generate successful start-ups. These start-ups will become employment creators than employment seekers, which is the need of the hour for our country. This common course (university core) for all the disciplines is a foundation on venture development. It is an experiential course that starts with students discovering their deeper self in terms of how they might contribute to society by creating exciting new products and services that can become the basis of real businesses. The students learn about the emerging areas of knowledge that are the foundations of any successful company. They will learn how to develop insight into the problems and desires of different types of target customers, and from this, to identify the design drivers for a specific innovation. Students will learn specific design methods for new products and services. The students will learn that as important as the product or service itself, is a strategy for monetizing the innovation – for generating revenue, structuring the operating costs, and creating the operating profit needed to support the business, hire new employees, and expand forward. This course is aimed to be the beginning of what might be the most important journey of personal and career discovery so far in a student's life, one with lasting impact. This is not just a course, but potentially, an important milestone in life that a student remembers warmly in the years to come.

Course Educational Objectives:

Students have the opportunity to:

- Discover who they are – Values, Skills, and Contribution to Society
- Understand how creativity works and permeates the innovation process
- Learn the basic processes and frameworks for successful innovation.
- Gain experience in going through the innovation process.
- Conduct field research to test or validate innovation concepts with target customers.

UNIT 1 PERSONAL DISCOVERY 4 hours

Personal Values, Excite & Excel, Build a Team, Define Purpose, Mission Statement

UNIT 2	IDEATION	10 hours

Ideation & Impact, User Insights - Frameworks, Customer Interviews, Interpreting Results

UNIT 3	SOLUTION DISCOVERY	8 hours

Concept Design, Competitive Analysis, Product Line Strategy, Prototyping Solutions, Reality Check

UNIT 4	BUSINESS MODEL DISCOVERY	4 hours

Understand the Industry, Types of Business Model, Define Revenue Models, Define Operating Models, Define Customer Journey, Validate Business Model

UNIT 5	DISCOVERY INTEGRATION	4 hours

Define Company Impact, Create Value, Tell Your Story

Textbooks:

1. Meyer and Lee, “Personal Discovery through Entrepreneurship”, The Institute for Enterprise Growth, LLC. Boston, MA., USA.

References:

1. Adi Ignatius (Editor-in-Chief), “Harvard Business Review”, Harvard Business Publishing, Brighton, Massachusetts,2021

Course Outcomes:

1. Identify one’s values, strengths and weaknesses and their will to contribute to the society
2. Formulate an idea and validate it with customers
3. Demonstrate prototyping and analyse the competition for the product
4. Create business models for revenue generation and sustainability of their business
5. Come up with a pitch that can used as the basis for actually starting a company based on an impactful innovation and societal impact

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1						3	1				
CO2		3		3	1	3	2				
CO3	1	3	3		3		3				
CO4					1	1	3				
CO5					3	3					

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:

BOS :30-04-2021 **ACADEMIC COUNCIL: 17-09-2021**

SDG No. & Statement:

4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

17. Strengthen the means of implementation and revitalize the global partnership for sustainable development.

SDG Justification:

4. The course involves identifying one's personal values and working on real-life problems, thus forming the base to work on their passions even past the collegiate life.

17. The course is developed in collaboration with North-eastern University, USA and the training for the champions is being by North-eastern University.

Faculty Core

CHEM1011	Chemistry 1	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

The students of undergraduate program in science studying chemistry course need to be conversant with the various fields of chemistry. Therefore, one module each on in general, physical and organic chemistry is introduced which helps the student familiarize with the concepts of chemistry essential for allied and interdisciplinary fields of science.

Course Educational Objectives:

To introduce the concepts of general chemistry. The students will be conversant with the chemistry of all the elements that is closely knitted with analytical chemistry, physical chemistry and organic chemistry.

1. To introduce the concepts of atomic theory and arrangement of electrons in orbital level
2. To understand about bonding and energy calculations in molecules
3. To know about the reaction mechanism, reactive species in organic chemistry and concept of aromaticity.
4. To expose the students to concepts of chirality, configuration, isomerism in organic chemistry.
5. To discuss synthetic reactions, mechanism and properties of aromatic alcohol, aromatic and aliphatic ether, aldehydes, and ketones

Section A: Inorganic Chemistry-1

Unit-I **9 Hours**

Atomic Structure: Review of: Bohr's theory and its limitations, dual behavior of matter and

radiation, de Broglie's relation, Heisenberg Uncertainty principle. What is Quantum mechanics? Time independent Schrodinger equation and meaning of various terms in it. Significance of ψ and ψ2, Schrödinger equation for hydrogen atom. Graphical representation

of 1s, 2s, 2p, 3s, 3p and 3d orbitals. Rules for filling electrons in various orbitals, Electronic configurations of the atoms. Stability of half-filled and completely filled orbitals, concept of exchange energy.

Unit-II **9Hours**

Chemical Bonding and Molecular Structure

Ionic Bonding: General characteristics of ionic bonding. Energy considerations in Ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Statement of Born-Landé equation for calculation

of lattice energy. Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment and percentage ionic character.

Covalent bonding: VB Approach: Shapes of some inorganic molecules and ions on the Basis of VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements.

Unit-III **9 Hours**

Section B: Organic Chemistry-1

Fundamentals of Organic Chemistry

Physical Effects, Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance

and Hyperconjugation. Cleavage of Bonds: Homolysis and Heterolysis. Structure, shape and reactivity of organic molecules: Nucleophiles and electrophiles. Reactive Intermediates: Carbocations, Carbanions and free radicals. Aromaticity: Benzenoids and Hückel's rule.

Unit-IV **9 Hours**

Stereochemistry

Conformations with respect to ethane, butane and cyclohexane. Inter conversion of Wedge Formula, Newmann, Sawhorse and Fischer representations. Concept of chirality (upto two carbon atoms). Configuration: Geometrical and Optical isomerism; Enantiomerism, Diastereomerism and Meso compounds). Threo and erythro; D and L; cis – trans nomenclature; CIP Rules: R/ S (for upto 2 chiral carbon atoms) and E / Z Nomenclature (for

upto two C=C systems).

Unit- V **9 Hours**

Aliphatic Hydrocarbons

Functional group approach for the following reactions (preparations & reactions) to be studied.

Alkanes: (Upto 5 Carbons). Preparation: Catalytic hydrogenation, Wurtz reaction. Reactions: Free radical Substitution: Halogenation.

Alkenes: (Upto 5 Carbons) Preparation: Elimination reactions: Dehydration of alkenes and dehydrohalogenation of alkyl halides (Saytzeff's rule); cis alkenes (Partial catalytic hydrogenation) and trans alkenes (Birch reduction). Addition of HX (Markownikoff's and anti-Markownikoff's addition.

Alkynes: (Upto 5 Carbons) Preparation: Acetylene from CaC2and conversion into Higher alkynes; by dehalogenation of tetra halides and dehydrohalogenation of vicinal dihalides.

Reactions: formation of metal acetylides, addition of bromine.

Reference Books:

1. Lee, J.D. Concise Inorganic Chemistry ELBS, 1991.
2. Cotton, F.A., Wilkinson, G. & Gaus, P.L. Basic Inorganic Chemistry, 3rd ed., Wiley. Huheey, J.E., Keiter, E.A., Keiter, R.L. & Medhi, O.K. Inorganic
3. Chemistry:Principles of Structure and Reactivity, Pearson Education India, 2006.
4. McMurry, J.E. Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning India Edition, 2013.
5. Sykes, P. A Guidebook to Mechanism in Organic Chemistry, Orient Longman, New Delhi (1988).
6. Eliel, E.L. Stereochemistry of Carbon Compounds, Tata McGraw Hill education, 2000.
7. Finar, I.L. Organic Chemistry (Vol. I & II), E.L.B.S.
8. Morrison, R.T. & Boyd, R.N. Organic Chemistry, Pearson, 2010.
9. Bahl, A. & Bahl, B.S. Advanced Organic Chemistry, S. Chand, 2010.

Course Outcomes:

On successful completion of this course, students will be able to:

1. Explain the concepts of atomic theory and arrangement of electrons in orbital level
2. Compare/contrast the properties of molecular and ionic compounds.
3. Write the various reaction mechanisms in organic chemistry and concept of aromaticity.
4. Differentiate the properties of aromatic alcohol, aromatic and aliphatic ether, aldehydes and ketones.
5. To discuss synthetic reactions, mechanism and properties of aromatic alcohol, aromatic and aliphatic ether, aldehydes, and ketones

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	1	1	2	2	2	3	1	3	2	2
CO2	3	2	1	1	3	3	3	1	3	3	1
CO3	3	2	1	1	2	3	2	3	1	2	2
CO4	3	2	2	1	2	3	3	3	2	2	2
CO5	2	2	1	2	3	3	2	3	1	2	1

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:

BOS : 27/08/2021 **ACADEMIC COUNCIL: 17/09/2021**

SDG 3: Ensure healthy lives and promote well-being for all at all ages.

Statement: The given modules and topics included in this course to design and development of new organic molecules as drugs to combat against diseases to establish sustainable health

CHEM1031	CHEMISTRY-II	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

The students of undergraduate programs in science need to be conversant with the various aspects of solution chemistry, phase equilibrium, electrochemistry and Functional group chemistry forms the foundation for training undergraduate students as analytical and synthetic chemists.

Course Educational Objectives:

1. To introduce the concept of solution and phase chemistry in physical chemistry
2. To introduce functional group chemistry in organic chemistry
3. To impart knowledge on the essential functional groups in organic chemistry.
4. To impart knowledge on the essential functional groups reactions
5. To impart knowledge on the essential functional groups properties

UNIT 1 **Section A: Physical Chemistry-1** **8 hours**

Solutions

Thermodynamics of ideal solutions: Ideal solutions and Raoult's law, deviations from Raoult's law – non-ideal solutions. Vapor pressure-composition and temperature composition curves of ideal and non-ideal solutions. Distillation of solutions. Lever rule. Azeotropes.

Phase Equilibrium

Phases, components and degrees of freedom of a system, criteria of phase equilibrium. Gibbs Phase Rule and its thermodynamic derivation. Derivation of Clausius – Clapeyron equation and its importance in phase equilibria.

UNIT 2 **Title Conductance** **8 hours**

Conductance

Conductivity, equivalent and molar conductivity and their variation with dilution for weak and strong electrolytes. Kohlrausch law of independent migration of ions.

Transference number and its experimental determination using Hittorf and Moving boundary methods. Ionic mobility. Applications of conductance measurements: determination of degree of ionization of weak electrolyte, solubility and solubility products of sparingly soluble salts, ionic product of water, hydrolysis constant of a salt. Conductometric titrations (only acid base).

UNIT 3 **Section B: Organic Chemistry-3** **8 hours**

Carboxylic acids and their derivatives-Carboxylic acids (aliphatic and aromatic) Preparation: Acidic and Alkaline hydrolysis of esters. Reactions: Hell – Vohlard - Zelinsky Reaction.

Carboxylic acid derivatives (aliphatic): (Upto 5 carbons)- Preparation: Acid chlorides, Anhydrides, Esters and Amides from acids and their interconversion. Reactions: Comparative study of nucleophilicity of acyl derivatives. Reformatsky Reaction.

Amines and Diazonium Salts- Amines (Aliphatic and Aromatic): (Upto 5 carbons)

Preparation: from alkyl halides, Hofmann Bromamide reaction.

Reactions: Carbylamine test, Hinsberg test. Electrophilic substitution (case aniline): nitration, bromination, sulphonation.

UNIT 4 **Amino Acids, Peptides and Proteins** **8 hours**

Preparation of Amino Acids: Strecker synthesis using Gabriel's phthalimide synthesis. Zwitterion, Isoelectric point and Electrophoresis.

Reactions of Amino acids: ester of –COOH group, acetylation of –NH2 group, ninhydrin test. Overview of Primary, Secondary, Tertiary and Quaternary Structure of proteins.

Synthesis of simple peptides (up to dipeptides) by N-protection (t-butyloxycarbonyl and phthaloyl) & C activating groups and Merrifield solid-phase synthesis.

UNIT 5 **Carbohydrates** **8 hours**

Carbohydrates: Classification, and General Properties, Glucose and Fructose (open chain and cyclic structure), Determination of configuration of monosaccharides, absolute configuration of Glucose and Fructose, Mutarotation, ascending and descending in monosaccharides. Structure of disaccharides (sucrose, cellobiose, maltose, lactose) and polysaccharides (starch and cellulose) excluding their structure elucidation.

Textbooks:

1. Barrow, G.M. Physical Chemistry Tata McGraw-Hill (2007).
2. Morrison, R. T. & Boyd, R. N. Organic Chemistry,
3. Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

References:

1. Finar, I. L. Organic Chemistry (Volume 1),
2. Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
3. Finar, I. L. Organic Chemistry (Volume 2),

Course Outcomes

On successful completion of this course, students will be able to:

1. Apply phase rule to one component and two component systems
2. Use the thermodynamic properties: G, H and S from EMF data.
3. Explain the synthesis and reactions carboxyl Functional group and derivatives.
4. Select correct method aminao acid preparation and differentiate the primary, secondary and tertiary amino acids
5. Classify the different carbohydrates

Text Books:

1. Barrow, G.M. Physical Chemistry Tata McGraw-Hill (2007).
2. Morrison, R. T. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
3. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
4. Finar, I. L. Organic Chemistry (Volume 2), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
5. Nelson, D. L. & Cox, M. M. Lehninger's Principles of Biochemistry 7th Ed., W. H. Freeman.
6. Berg, J.M., Tymoczko, J.L. & Stryer, L. Biochemistry, W.H. Freeman, 2002.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1	3	3	3	1	3	2	1
CO2	3	1	1	2	2	2	3	1	3	2	1
CO3	3	2	1	1	2	3	3	3	2	1	2
CO4	2	2	1	2	2	2	3	3	1	3	3
CO5	2	2	1	1	3	3	3	3	1	2	3

3 - High Correlation, 2 – Medium Correlation, 1- Low Correlation

APPROVED IN:

BOS : 27/08/2021 **ACADEMIC COUNCIL: 17/09/2021**

SDG 4: Ensuring an inclusive and equitable quality education for all persons and promoting lifelong learning opportunities.

Statement: The modules and topics mentioned in this course are designed to ensure all-inclusive and thorough education with equity to all persons and promote learning opportunities at all times.

CHEM1021	CHEMISTRY-I LAB	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

The students of undergraduate program in science in Chemistry need to be conversant with the various basic methodologies of chemistry. Therefore, one module each in inorganic, physical and organic chemistry is introduced which helps the student familiarize with the techniques essential for developing the foundation of practical chemistry.

Course Educational Objectives:

To make student develop the fundamental skill required for quantitative and qualitative analysis in inorganic and organic chemistry.

1. To know about the practical idea about Estimations of unknown concentrations of acids or bases using neutralization reactions
2. To learn about principle involved in different redox reactions like permanganometry, micrometry and Iodometry
3. To understand the method of detection of extra elements in organic compounds
4. To demonstrate the practical concepts involved in working of chromatography
5. To expose the methods to separate mixture of amino acids using paper chromatography

Section A: Inorganic Chemistry - Volumetric Analysis

1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.

2. Estimation of oxalic acid by titrating it with KMnO4.

3. Estimation of water of crystallization in Mohr's salt by titrating with KMnO4.

4. Estimation of Fe (II) ions by titrating it with K2Cr2O7 using internal indicator.

5. Estimation of Cu (II) ions iodometrically using Na2S2O3.

Section B: Organic Chemistry

1.Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing upto two extra elements)

2. Separation of mixtures by Chromatography: Measure the Rf value in each case (combination of two compounds to be given)

Identify and separate the components of a given mixture of 2 amino acids (glycine, aspartic acid, glutamic acid, tyrosine or any other amino acid) by paper chromatography

Identify and separate the sugars present in the given mixture by paper chromatography.

Course Outcomes:

On successful completion of this course, students will be able to:

1. Estimations of unknown concentrations of acids or bases using neutralization reactions
2. Distinguish the permanganometry, dichrometry and Iodometry
3. Choose the method of detection of extra elements in organic compounds
4. To separate mixture of aminoacids using paper chromatography

Reference Books:

1. Svehla, G. Vogel's Qualitative Inorganic Analysis, Pearson Education, 2012.

2. Mendham, J. Vogel's Quantitative Chemical Analysis, Pearson, 2009.

3. Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., Textbookof Practical Organic Chemistry, Prentice-Hall, 5th edition, 1996.

4. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry Orient-Longman, 1960.

B.Sc. Physical Science

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1	3	3	3	1	3	3	1
CO2	3	1	1	2	2	3	3	1	3	3	1
CO3	2	2	1	2	2	3	3	3	2	1	2
CO4	3	2	1	2	2	2	3	3	1	3	3
CO5	3	2	1	1	3	2	3	3	1	3	3

3 - High Correlation, 2 – Medium Correlation, 1- Low Correlation

APPROVED IN:

BOS : 27/08/2021 **ACADEMIC COUNCIL: 17/09/2021**

SDG 3: Ensure healthy lives and promote well-being for all at all ages.

Statement: The given modules and topics included in this course to design and development of new organic molecules as drugs to combat against diseases to establish sustainable health

CHEM1051	CHEMISTRY-III	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

This course enables the students to apply the various statistical tools in the analysis and acquire the basic principles of atomic, molecular techniques, Electro-analytical methods and separation methods and their applications. The knowledge gained in this course can be applied to the latest developments in technology.

Course Educational Objectives:

1. To familiarize the students with various types of basic statistical tools.
2. To study about the basic principles of atomic, molecular techniques and separation methods.
3. To emphasize the importance of UV Vis spectroscopy and atomic spectroscopy in quantitative determination of Metal ions.
4. To impart knowledge on the basic concepts of pH metry and conductometry.
5. To compare the different separation methods like chromatography and solvent extraction.

Unit -I **9 Hours**

Qualitative and quantitative aspects of analysis

Evaluation of analytical data, errors, accuracy and precision, methods of their expression, statistical test of data; F, Q and t test, rejection of data, and confidence intervals. Optical methods of analysis Origin of spectra, interaction of radiation with matter, fundamental laws of spectroscopy and selection rules, validity of Beer-Lambert's law.

Unit -II **9 Hours**

UV-Visible Spectrometry: Basic principles of instrumentation (choice of source, monochromator and detector) for single and double beam instrument; Infrared Spectrometry: Basic principles of instrumentation (choice of source, monochromator& detector) for single and double beam instrument.

Unit-III **9 Hours**

Flame Atomic Absorption and Emission Spectrometry: Basic principles of Instrumentation (choice of source, monochromator, detector, choice of flame and Burner designs. Techniques for the quantitative estimation of trace level of metal ions from water samples.

Unit-IV **9 Hours**

Thermal methods of analysis Theory of thermogravimetry (TG), basic principle of instrumentation. Electroanalytical methods Classification of electroanalytical methods, basic principle of pH metric, potentiometric and conductometric titrations.

Unit-V **9 Hours**

Separation techniques

Solvent extraction: Classification, principle and efficiency of the technique. Mechanism of extraction: extraction by solvation and chelation. Technique of extraction: batch, continuous

and counter current extractions. Chromatography: Classification, principle, and efficiency of the technique. Mechanism of separation: adsorption, partition & ion exchange. Development of chromatograms: frontal, elution and displacement methods.

Text Books:

1. Mendham, J., A. I. Vogel's Quantitative Chemical Analysis 6thEd., Pearson, 2009.
2. Willard, H.H. et al.: Instrumental Methods of Analysis, 7th Ed. Wardsworth Publishing Company, Belmont, California, USA, 1988.
3. Christian, G.D. Analytical Chemistry, 6th Ed. John Wiley & Sons, New York, 2004.
4. Harris, D.C.: Exploring Chemical Analysis, 9th Ed. New York, W.H. Freeman, 2016.
5. Khopkar, S.M. Basic Concepts of Analytical Chemistry. New Age International Publisher, 2009.\
6. Skoog, D.A. Holler F.J. & Nieman, T.A. Principles of Instrumental Analysis, Cengage Learning India Ed.
7. Mikes, O. Laboratory HandBook of Chromatographic & Allied Methods, Elles Harwood Series on Analytical Chemistry, John Wiley & Sons, 1979.
8. Ditts, R.V. Analytical Chemistry; Methods of separation, van Nostrand, 1974

Course Outcomes:

After the completion of the course, the student will be able to

1. list various types of statistical tools and the instruments for chemical analysis.
2. explain the role of various parts of instrumentation of atomic and molecular techniques
3. identify suitable analytical technique for chemical analysis.
4. distinguish atomic and molecular techniques.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3				2		1				3
CO2	3				3		1			1	3
CO3	3				2		1			1	3
CO4	3				3		1			2	3
CO5	3				2		1				3

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:

BOS : 27/08/2021 **ACADEMIC COUNCIL: 17/09/2021**

SDG No. & Statement:

SDG 4: Ensuring an inclusive and equitable quality education for all persons and promoting lifelong learning opportunities.

SDG Justification:

CHEM1041	CHEMISTRY-II LAB	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

The students of undergraduate programs in science in Chemistry need to be conversant with the various basic methodologies of chemistry. Therefore, one module each on in inorganic, physical and organic chemistry is introduced which helps the student familiarize with the techniques essential for developing the foundation of practical chemistry

Section A: Physical Chemistry

Distribution

Study of the equilibrium of one of the following reactions by the distribution method:

I2(aq) + I-(aq) I3-(aq)

Cu2+(aq) + xNH2(aq) [Cu(NH3)x]2+

Conductance

I. Determination of cell constant

II. Determination of equivalent conductance, degree of dissociation and dissociation

constant of a weak acid.

III. Perform the following conductometric titrations:

i. Strong acid vs. strong base

ii. Weak acid vs. strong base

Potentiometry

Perform the following potentiometric titrations:

i. Strong acid vs. strong base

ii. Weak acid vs. strong base

iii. Potassium dichromate vs. Mohr's salt

Section B: Organic Chemistry I

Systematic Qualitative Organic Analysis of Organic Compounds possessing mono functional groups (-COOH, phenolic, aldehydic, ketonic, amide, nitro, amines) and preparation of one derivative.

1. Separation of amino acids by paper chromatography

2. Determination of the concentration of glycine solution by formylation method.

3. Titration curve of glycine

4. Action of salivary amylase on starch

5. Effect of temperature on the action of salivary amylase on starch.

6. Differentiation between a reducing and a nonreducing sugar.

Reference Books:

1. Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., Textbook ofactical Organic Chemistry, Prentice-Hall, 5th edition, 1996.
2. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry Orient-Longman, 1960.
3. Khosla, B. D.; Garg, V. C. & Gulati, Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi (2011).
4. Ahluwalia, V.K. & Aggarwal, R. Comprehensive Practical Organic Chemistry, Universities Press

Course Outcomes

On successful completion of this course, students will be able to:

1. Select the correct the practical application of solution, phase and electrochemistry for quantitative analysis
2. Estimate the unknown concentrations of acids using conductometer and potentiometer.
3. Choose the correct method to detect the functional group of an organic compound.
4. Separate mixture of aminoacids using paper chromatography
5. Differentiate between reducing and non-reducing sugars by qualitative analysis.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	1	1	1	3	1	3	3
CO2	3	2	1	1	3	3	3	1	3	3	1
CO3	2	2	1	2	2	3	3	3	2	1	2
CO4	3	2	1	1	3	2	3	3	1	3	3
CO5	3	3	3	1	2	1	1	3	2	3	3

3 - High Correlation, 2 – Medium Correlation, 1- Low Correlation

APPROVED IN:

BOS : 27/08/2021 ACADEMIC COUNCIL: 17/09/2021

SDG 4: Ensuring an inclusive and equitable quality education for all persons and promoting lifelong learning opportunities.

Statement: The modules and topics mentioned in this course are designed to ensure all-inclusive and thorough education with equity to all persons and promote learning opportunities at all times.

CSCI1001	BASICS OF INFORMATION TECHNOLOGY	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

This course features about the technology of computer and understanding the prerequisites for learning signals converting to output data. This course helps students learn about network and how the data can be retrieved and also understand operating systems types, and applications

Course Educational Objectives:

1. To learn computer data processing
2. To understand audio-video and data storage
3. To gain knowledge on computer memory
4. To learn about operating systems types
5. To gain knowledge on internet-www

UNIT 1 Data and Information, Acquisition of Numbers and Textual Data and Acquiring Image Data 8 hours

Data and Information: Introduction, Types of data, Simple model of a computer, Data processing using a computer, Desktop computer.
Acquisition of Numbers and Textual Data: Introduction, input units, internal representation of numeric data, Representation of characters in computers, Error Detecting codes.
Acquiring Image Data: Introduction, acquisition of textual data, acquisition of pictures, storage formats for pictures, Image compression fundamentals, Image acquisition with a digital camera.

UNIT 2 Acquiring Audio Data, Acquisition of Video and Data storage 8 hours

Acquiring Audio Data - Basics of Audio Signals, Acquiring and storing Audio Signals, Compression of Audio Signals.

Acquisition of Video: Computing a moving Scene with a video camera, Compression of Video Data, MPEG Compression standard.
Data storage: Introduction, Storage cell, Physical devices used as storage cells, Random access memory, Read only memory, Secondary storage, Compact disk read only memory (CDROM), Archival store.

UNIT 3 Central Processing Unit and Output Devices 8 hours

Central Processing Unit: Introduction, Structure of a central processing unit, Specifications of a CPU, Interconnection of CPU with memory and I/O units, Embedded processors.
Output Devices: Video Display Devices, Touch Screen, E-ink display, Printers, Audio Output.

UNIT 4 Computer Networks and Computer Software 8 hours

Computer Networks: Introduction, Local Area Network (LAN), Applications of LAN, Wide Area Network (WAN), Internet, Naming computers connected to Internet, Future of Internet Technology.
Computer Software: Introduction, Operating system, Programming languages, Classification of programming languages, Classification of Programming Languages based on applications.

UNIT 5 Data organization and Some Internet Applications 8 hours

Data organization: Introduction, Organizing a database, Structure of a database, Database Management System, Example of database design, Non-text databases, Archiving databases. Processing Numerical Data: Introduction, Use of spreadsheets, Numerical computation examples.
Some Internet Applications: Introduction, Email, World Wide Web, Information Retrieval from the WWW, Other facilities provided by Browsers, Audio on the internet, Accessing pictures and video via internet

Textbooks:

1. Introduction to Information Technology by V. Rajaraman, PHI Learning Pvt.Ltd. 2013.

References:

2. Computing Fundamentals by Peter Norton, Tata Mc. Graw Hill, 6th edition, 2006.
3. Fundamentals of Computers by E.Balagurusamy, Tata McGraw Hill, 2009

Course Outcomes:

On successful completion of this course, students will be able to:

1. To learn computer data processing
2. To understand audio-video and data storage
3. To gain knowledge on computer memory
4. To learn about operating systems types
5. To gain knowledge on internet-www

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	2	2	3	3	2	2	1	2	2	2	2
CO2	2	2	2	3	2	1	2	2	2	2	2
CO3	1	2	2	2	3	2	1	2	2	1	3
CO4	3	3	3	3	2	2	2	2	2	2	3
CO5	3	3	3	3	2	2	2	2	2	2	3

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:

BOS : 22-08-22 **ACADEMIC COUNCIL: 22-08-22**

SDG No. & Statement: 4

4. Aims at ensuring inclusive and equitable quality education and promote lifelong learning opportunities for all

SDG Justification:

The course involves identifying one's personal values and working on real-life problems, thus forming the base to work on their passions even past the collegiate life.

PHYS1091	BIOPHYSICS	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

The subject of Biophysics is one of the important interdisciplinary areas in teaching, training and learning which is considered to be important in terms of human resource development and National development. The main emphasis of biophysics is on the quantitative analysis of the physical and chemical aspects of the functions of biological molecules, organisms and entities. The techniques and methodologies that biophysics relies on are closer to Physics and Chemistry, but areas of application are in the biological, medical and related sciences.

Course Educational Objectives:

1. To learn about radiation biophysics
2. To understand transport phenomenon
3. To study UV-visible, and other important techniques like NMR, ESR etc.
4. To gain knowledge on microscopic techniques
5. To understand the concepts of thermodynamics

UNIT 1 **Radiation Biophysics** **8 hours**

Ionizing radiation, Interaction of radiation with matter, Measurement of Radiation, Radioactive isotopes. Types of Radioactivity-Natural, Artificial and induced Radioactivity and radioactive decay law. Measurement of Radioactivity -Geiger Muller counter, proportional counter and scintillation counter. Biological effects of radiation and radiation protection and therapy.

UNIT 2 **Transport process** **8 hours**

Light scattering, Diffusion –factors affecting diffusion, Fick's law, diffusion of electrolytes, accelerated diffusion and biological significance sedimentation, osmosis, viscosity, chromatography and electrophoresis and optical activity .Biophysical phenomena in biochemical studies-pH meter - principle, electrode system and factors affecting in its measurement.

UNIT 3 Physical Techniques in structure determination 8 hours

Ultraviolet and Visible spectroscopy, fluorescence and phosphorescence methods, Infrared spectroscopy- bending, near, mid and far infrared region. Raman spectra- principle and instrumentation. NMR, ESR Instrumentation.

UNIT 4 Microscopies 8 hours

Optical microscope, Electron microscopy, emerging trends in microscopy. X ray diffraction-diffraction of x rays, structure determination, phase determination procedures. Laser-characteristics, population inversion, stimulated and spontaneous and relation (no derivation) and Holography

UNIT 5 Biomolecular structures, Bioenergetics and Biological systems 8 hours

Biomolecular structures-Concepts of classical physics and limitations, quantum principles of atomic
Structure. Bioenergetics-Thermodynamics-reversible thermodynamics and irreversible thermodynamics. Photo bioenergetics and chemo bioenergetics. Biological systems: Neuro biophysics-Molecular transport across cell membrane and nerve impulse generation.

Textbooks:

1. Essentials of Biophysics: P.Narayanan.New Age India Intl.
2. Handbook of Radiobiology by KT Jaypee Brothers, Medical Publishers Pvt. Ltd.

References:

1. An Introduction to radiation protection by A Martin & SA Harbison, 4th Edition, Springer Publishers.
2. Laser Tissue Interactions: Fundamentals and Applications by MH Niemz, Springer Publishers.
3. Understanding biophotonics- Fundamentals, Advances and Applications by K Tsia, 1st Edition, CRC press.

Course Outcomes:

On successful completion of this course, students will be able to:

1. To learn about radiation biophysics
2. To understand transport phenomenon
3. To study UV-visible, and other important techniques like NMR, ESR etc.
4. To gain knowledge on microscopic techniques
5. To understand the concepts of thermodynamics

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	1	1	2	1	2	1	2	1
CO2	2	2	2	1	1	2	1	3	2	1	1
CO3	2	2	2	1	1	2	1	2	2	2	1
CO4	3	3	3	3	2	2	3	3	2	3	3
CO5	2	2	2	1	1	2	1	2	1	2	1

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:

BOS : 22-08-22 **ACADEMIC COUNCIL: <<date>>**

SDG No. & Statement: 4

4. Aims at ensuring inclusive and equitable quality education and promote lifelong learning opportunities for all

SDG Justification:

The course involves identifying one's personal values and working on real-life problems, thus forming the base to work on their passions even past the collegiate life.

PHYS1101	BIOPHYSICS LAB	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

The subject of Biophysics is one of the important interdisciplinary areas in teaching, training and learning which is considered to be important in terms of human resource development and National development. The main emphasis of biophysics is on the quantitative analysis of the physical and chemical aspects of the functions of biological molecules, organisms and entities. The techniques and methodologies that biophysics relies on are closer to Physics and Chemistry, but areas of application are in the biological, medical and related sciences.

Course Educational Objectives:

1. Plateau characteristics of radioactive source
2. Intensity variation of radioactive material
3. Wavelength of colors using spectrometer
4. Determination of wavelength of LASER
5. Optical activity
6. X-ray diffraction – determination of interplanar spacing from X-ray spectra
7. Analysis of infrared spectra - Identification of various groups
8. Analysis of UV spectra -Identification wavelength corresponding to absorption

Textbooks:

1. Radiation Biophysics, Second Edition - by Edward L. Alpen
2. Physical Chemistry: Principles and Applications in Biological Sciences by Tinoco. I. et al..

References:

1. Physics of the Life Sciences by Newman, J.
2. Drenth, J. (2010) Principles of Protein X-ray Crystallography, Spri

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	1	1	2	1	2	1	2	1
CO2	2	2	2	1	1	2	1	3	2	1	1
CO3	2	2	2	1	1	2	1	2	2	2	1
CO4	3	3	3	3	2	2	3	3	2	3	3
CO5	2	2	2	1	1	2	1	2	1	2	1

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:

BOS : 22-08-22 **ACADEMIC COUNCIL: <<date>>**

SDG No. & Statement: 4

4. Aims at ensuring inclusive and equitable quality education and promote lifelong learning opportunities for all

SDG Justification:

The course involves identifying one's personal values and working on real-life problems, thus forming the base to work on their passions even past the collegiate life.

ENVS1011	UNDERSTANDING ENVIRONMENT & ECOLOGY	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

Understanding Environment mainly focuses on the fundamental concepts. It provides basic knowledge on Environment and its components including environmental ethics. This course also helps in understanding the current environmental problems.

Course Educational Objectives:

- To enable the student to understand the environment and its measurements.
- To familiarize learners about the environment and its segments.
- To introduce learners about basic concepts of ecology.
- To acquaint learners with the historical background of ecology.
- To make learners understand the climate factors influencing ecology

UNIT-I **Introduction to Environmental Science** **12 hours**

Definition, principles background and scope of environmental science, Understanding of environment and measurements. Environmental Science and technology, Media and people, decision making and applications of Environmental Science.

UNIT – II **Environment and its Segments** **12 hours**

Segments of environment- Air, Water, Soil, Biosphere, Major regions of atmosphere- Troposphere, stratosphere, mesosphere, ionosphere, exosphere. Water-surface and groundwater (confined and unconfined aquifer), Soil-Layers of soil, profile of soil. Biosphere and its role in the environment.

UNIT – III **Ecological Concepts** **12 hours**

Basic concepts of ecology, Historical background of ecology, Cybernetic nature of ecosystems. Structural components (Abiotic and Biotic, Ecological pyramids), Functional components (Trophic structure, food chain, food web, biogeochemical cycles).

UNIT – IV **Ecology and Climate** **12 hours**

Climatic factors; Environmental complex; Interaction of Ecological factors - Light factor, Temperature factor; Precipitation (rainfall); Humidity of air; Atmosphere-gasses; wind factor: fire factor, Topographic factors: Height of mountain chains; Direction of mountains and valleys; steepness of slope; Exposure of slope

UNIT – V **Evolutionary Ecology** **12 hours**

Evolutionary Ecology: Natural Selection and its ecological significance, modern concept of species, adaptation; Significance of mutation, isolating mechanism and ecological role and other evolutionary processes in ecology. Ecological sustainability.

Textbooks:

1. Chapman J. L. & Reiss M. J. Ecology: Principles and Applications' Cambridge University Press,U. K, 2nd Edition.1988
2. Cunningham W. & Cunningham M.. Environmental Science: A Global Concern' WCB, McGraw
3. Hill, 1st Edition. 2021.
4. Santra S.C., Environmental Science, New Central Book Agency (P) LTD, 3rd Edition. 2011.
5. M Asthana & D K Asthana Environment: Problems and Solutions S. Chand & Company. 2015
6. Asthana D.K. Introduction to Problems & Solutions S. Chand Publishing. 1998.

References:

1. Kaushik A and Kaushik C.P. Perspectives in Environmental Studies. New Age International Publishers Edition-VI. 2018.
2. Planka E. Evolutionary Ecology. 5th Edition. Pearson.1997.

Course Outcomes:

Upon Completion of the course student will be able to

- Relate theoretical knowledge of the environment on its measurement.
- Classify the regions of the atmosphere.
- Interpret the relationship between organisms and the environment.
- Utilize ecological concepts for its sustenance.
- Assesses the evolutionary processes in ecology.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	1						1	1			
CO2									2		
CO3									1		1
CO4							2				2
CO5			1								

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:

BOS :04-07-2022 **ACADEMIC COUNCIL: 14-07-2022**

SDG No. SDG-13 Climate change
SDG-15 **& Statement:** Life on land

SDG Justification:

1.The students will learn the climate change issues and implement the knowledge for reducing the impact of climate change-SDG-13
2.The students will learn about the ecosystem and its services for conservation of our natural resources-SDG-15

ENVS1021	UNDERSTANDING ENVIRONMENT & ECOLOGY LAB	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

This course enables the students to acquire knowledge on various aspects of understanding Environment and ecology. The course focuses on using different instruments for sampling water and soil. The knowledge gained in this course can be applied to understand the quality of water and soil.

Course Educational Objectives:

- To recall principles and working pH for analyzing water and soil samples.
- To illustrate conductivity of water and soil samples.
- To demonstrate the minimum number of quadrants.
- To introduce determining frequency, density and abundance of different species present in the
  Community.
- To estimate moisture content of soil.

List of Experiments:

1. Understanding environment and ecology laboratory protocol.
2. Determination of pH of collected water sample
3. Determination of pH of the soil sample
4. Estimation of DO of the water.
5. Estimation of chlorides in the collected water sample.
6. Determination of conductivity of water sample.
7. Determination of conductivity of soil sample.
8. Estimation of moisture content of the soil sample.
9. Determination minimum size of quadrate by species – area curve method.
10. A study of pond ecosystems.
11. Determination the minimum number of quadrats to be laid down in the fields
12. Study the community by Quadrat Method by determining frequency, density and

abundance of different species present in the community

Textbooks:

1. Scheiner S. Design and Analysis of Ecological Experiments. Chapman and Hall/CRC. 2019.

References:

1. Scheiner S. Design and Analysis of Ecological Experiments. Chapman and Hall/CRC. 2019.

Course Outcome:

Upon Completion of the course student will be able to

- To learn how pH works.
- To learn how conductivity works.
- To demonstrate the moisture content of soil.
- To learn the minimum size of quadrate by species.
- To understand frequency, density, and abundance of different species.

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CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	1									1	1
CO2								1	2		
CO3							2				
CO4				2							1
CO5											

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN: **BOS**

BOS :04-07-2022 **ACADEMIC COUNCIL: 14-07-2022**

SDG No. SDG-15 **& Statement:** Life on land

SDG Justification:

The students will learn about the water and soil for conservation of our natural resources- SDG-15

ENVS1031	ENVIRONMENTAL CHEMISTRY	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

This course is designed to provide a foundation in understanding the chemistry of environmental pollution. Students are taught to attain the ability to understand the chemical nature of pollutants and their fate.

Course Educational Objectives:

- To prepare students with the knowledge of the chemical properties of elements and compounds
- Provides the existence of cycling and accumulation of pollutants in the environment.
- The course addresses the chemistry of elements and compounds in the atmosphere, water and soil,
- Describes the lays special emphasis on the processes that define the connections and the dependence between individual segments of environment
- To gain understanding on relationships among natural and man-made systems.

UNIT 1 **Pollution Chemistry** **12 hours**

Pollutant, Contaminant, Receptor, Sink, Pathways of a pollutant. Biospheric chemistry - Bioaccumulation of pollutants - Chemical contaminants and eco-toxicology

UNIT 2 **The Atmospheric Chemistry** **12 hours**

Chemical composition of the atmosphere; Chemical and photochemical reactions in the atmosphere - formation of smog, PAN, acid rain. Oxygen and ozone chemistry: Catalytic decomposition process of ozone, Concept of atmospheric aerosol chemistry, Greenhouse gasses and their effects.

UNIT 3 **Water Chemistry** **12 hours**

Unusual physical properties, water as a solvent and solvent properties, changes in water properties by addition of solute. Water quality parameters – physical, chemical, and biological parameters. Concept of D.O, B.O.D and C.O. D

UNIT 4 **Soil Chemistry** **12 hours**

Soil Composition and Characteristics Physical properties of soil. Chemical properties – Cation exchange capacity, pH, macro, and micro-nutrients

UNIT 5 **Chemistry in day-to-day Life** **12 hours**

Food Adulteration: Common adulterants found in food and their effects on human beings Milk: Chemical composition of milk. Adulteration in milk like Sugar, Urea, Starch.

Textbooks:

1. Engineering Chemistry by Jain & Jain, Dhanpat Rai Publishing Company. 15th Edition
2. Chemistry for Environmental Engineering by Sawyer & McCarty, 5th Edition. Additional Reading

References:

1. Environmental Chemistry by A. K. De, New Age International Publication, New Delhi 3rd Edition.
2. Environmental Chemistry by P. S. Sindhu, New Age International. 2nd Edition.

Course Outcomes:

Upon the completion of this course, students will be able to:

- Gain knowledge on the chemical properties of elements and compounds.
- Provides the existence of the cycling and accumulation of pollutants in the environment.
- Address the chemistry of elements and compounds in the atmosphere, water and soil.
- Describe and lays special emphasis on the processes that define the connections and the dependence between individual segments of the environment.
- Understand the relationships among natural and man-made systems.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	2	1				2	3	3	2		3
CO2	2		1	2		3	3	3	2	1	3
CO3	1		2			2	3	2	2	1	2
CO4	1		1	1		3	3	2	2	2	2
CO5	1	1	1	1		3	3	2	2		2
CO6	2	2	2			3	3	3	3	3	2

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN: **BOS**

BOS :04-07-2022 **ACADEMIC COUNCIL:**14-07-2022

SDG No. & Statement:

Goal 3	Good Health and Well-being
GOAL 6:	Clean Water and Sanitation
GOAL 13:	Climate Action

SDG Justification:

Goal 6 and 13 applicable for pollution chemistry, atmospheric, water and soil chemistry.

Goal 3 applicable for Chemistry in day-to-day Life

ENVS1041	ENVIRONMENTAL CHEMISTRY LAB	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

This course enables the students to gain knowledge on various reactions in the chemistry lab which is useful to day-to-day life. The course tours the students through different titrations The course enables the students to gain knowledge on various, instrumental methods of analysis, measurements of physical parameters, volumetric analysis, preparation of polymers, analysis of water, and chromatographic separation techniques. The knowledge gained in this course can be applied to develop various applications to different chemicals, reagents etc.,

Course Objectives

- To familiarize the reactions in between two solutions.
- To illustrate the Environmental analysis by taking the different samples those are collected from various places.
- To train designing mathematical calculations related to various analysis.
- Identify different ores (Fe & Cu) and their usage in different fields (industry, software devices, and electronic goods).
- Experiment with the physical parameter of inorganic compounds.

S.No	Topics	Type(Experiment, Project, Exercise) Chooseanitem
1.	Oxidation– Reduction Titrations	● Estimation of Copper Sulfate using standard solution of Sodium Thiosulphate. ● Estimation of Potassium dichromate using a standard solution of Mohr's salt.
2.	Argentometric titrations	Determination of chloride by Mohr method
3.	Iodo metric titrations	Determination of available chlorine
4.	Complexometric titrations	Determination of calcium and magnesium in the mixture.

Textbooks:

1. Mendham.J, Denney RC, Barnes JD, Thomas M and Sivasankar B. Vogel's quantitative Chemical Analysis,6/e, Pearson publishers,2000.

References:

1. N.K Bhasin and Sudha Rani Laboratory Manual on Engineering,

Course Outcomes:

Upon completion of this course, students will be able to:

- familiarize the reactions in between two solutions.
- illustrate the Environmental analysis by taking the different samples that are collected from various places.
- train designing mathematical calculations related to various analysis.
- identify different ores (Fe & Cu) and their usage in different fields (industry, software devices and electronic goods).
- experiment with the physical parameter of inorganic compounds.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	1	1	1	1	2	3	2	2	2	2
CO2	3	1	1	1	1	2	3	3	3	2	2
CO3	2	1	1	1	1	2	3	2	2	2	2
CO4	1	1	1	1	1	2	3	2	3	2	3
CO5	2	1	1	1	1	2	3	3	3	3	3
CO6	3	1	1	1	1	2	3	3	1	1	1

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:

BOS :<<04-07-2022 >> **ACADEMIC COUNCIL: <<14-07-2022>>**

SDG No. & Statement: Clean Water and Sanitation

SDG Justification: The learner will be able to understand different chemical changes and estimation methods of various samples.

ENVS2001	AIR POLLUTION AND CONTROL	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

The main objective of this course is to make students understand the problems, effects, and the scenario of air pollution in the present world, air pollutants and their available control technologies for air pollution. This course examines impacts of air, water, soil, noise pollution among others. Sources of pollutants are examined along with their control methods.

Course Educational Objectives:

- To explain the different types of air pollutants, sources, effects, and classification of pollutants.
- To acquire knowledge on the classification of air pollutants, sources, and factors affecting air pollution.
- To be able to understand the concept of locating an industrial plant, city planning, plume behavior and the effect of air pollution on living beings.
- To be able to understand the procedures of air sampling, equipment used for sampling and control equipment for air pollution.
- To identify the major components of control technologies for air pollution.

UNIT 1 Introduction of Air pollution 12 hours

Introduction – Definition, Sources, classification of air pollutants, Natural contaminants, Gasses, Primary and secondary air pollutants. Stationary and mobile sources.
Meteorology: Meteorology and air pollution, primary parameters – Wind direction and speed, temperature, atmospheric stability, mixing height, secondary parameters – precipitation, Humidity, solar radiation, visibility. Methods of measurement of meteorological variables.

UNIT 2 Industrial plant location and city planning 12 hours

Industrial plant location and city planning: Introduction, Factors to be considered for industrial plant location, Existing levels of air contaminants, Potential effects on the surrounding area, meteorological factors and climate, topographical features, planning and zoning, and City planning.

UNIT 3 **Plume behavior** **12 hours**

Plume behavior: Single stack and multiple source pollution, wind rose, Stack effluent dispersion theories, effect of dilution, plume rise.
Dispersion model: wind tunnel method. Stack height. Effects of air pollution on human health, plants, animals, and properties.
Major air pollution disasters: Meuse valley (Belgium), Donora (USA), London, Bhopal gas tragedy.

UNIT 4 **Air Sampling** **10 hours**

Sampling procedures: classification of sampling methods, instruments for sampling waste gasses and for atmospheric sampling, duration and sampling sites, sampling methods, high volume sampler and respirable dust sampler.

UNIT 5 **Automobile Air Pollution** **10 hours**

Automobile air pollution: exhaust emissions; crankcase emission, evaporative emissions, air-fuel ratio. Spark timing, control of exhaust emissions. Air quality and emission standards, air pollution legislation and regulations.

Textbooks:

1. Air pollution MN Rao & HVN Rao. Tata McGraw-Hill Publishing Company Limited. New Delhi
2. Textbook of Air Pollution and control Technologies. Y. Anjaneyulu, Allied Publishers (P) Limited, New Delhi.

References:

1. Air Pollution Control Technology Handbook Karl B. Schnelle, Jr., Charles A. Brown, CRC Press.
2. Environmental Pollution Control Engineering, CS Rao, New Age International publishers.
3. Air Pollution & Control KVSG Murali Krishna Published by Kaushal & Co.

Course Outcomes:

Upon Completion of the course student will be able to

1. Define air pollution and its effects
2. Make a group and scale air pollution sources, list effects of air pollution on living and nonliving things.
3. Solve combustion problems and calculate amounts of pollutants emitted.
4. Plan measurement and monitoring of air pollutants.
5. Select sampling and monitoring sites, select best sampling method according to properties of sampling location and parameters.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	2								3		
CO2		3							2		
CO3				2						1	
CO4						3					
CO5							2				3

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN: BOS

BOS :04-07-2022 **ACADEMIC COUNCIL: 14-07-2022**

SDG No. 11 and 13 **& Statement:** Sustainable Cities and Communities
Climate Action

SDG Justification: The learner will know the importance of Sustainable Cities and Communities and action to combat climate change and its impacts.

ENVS2011	AIR POLLUTION CONTROL LAB	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

This course enables the students to acquire knowledge on various aspects of Air pollution Monitoring. This course uses different instruments for estimating the pollutants present in air and collects weather data and develops wind roses. The knowledge gained in this course can be applied to enumerate the monitoring of air quality and stack monitoring.

Course Educational Objectives:

- To understand the Indian government standards (CPCB and SPCB's) to monitor air pollution.
- To learn how to monitor air pollutants with the instruments like High volume sampler and respirable dust sampler.
- Illustrate the comparative analysis of air sampling in clean and polluted areas.
- To estimate the pollutants like SO2, NOX, and particulate matter from air monitoring.
- To demonstrate the data collection for preparation of wind rose.
- To demonstrate stack monitoring and its analysis.

List of Experiments:

1. Introduction to Ambient air quality standards.

2. Meteorology parameters – Wind direction and speed, temperature, precipitation, Humidity, solar radiation

3. Demonstration of High-volume sampler

4. Demonstration of Respirable dust sampler

5. Dust fall jar experiment

6. Estimation of Particulate matter in ambient air by using respirable dust Sampler.

Textbooks:

1. Guidelines for Ambient Air Quality Monitoring, Central Pollution Control Board, Ministry of Environment and Forest -Laboratory manual -2003

Course Outcomes:

Upon Completion of the course student will be able to

1. Classify and identify the sources of air pollutants, predict the effects of air pollutants on human health and environment.
2. Meteorological studies in relation to air pollution
3. Apply and relate the significance of various air pollutants
4. Analyze the air quality relate with air pollution regulations
5. Application of various air pollution monitoring equipment and evaluate its uses.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	2							3			
CO2		2							1		
CO3				3							3
CO4					3				3		
CO5						2				2	

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:	**BOS**
BOS :04-07-22	**ACADEMIC COUNCIL: 14-07-22**
SDG No. 11 & 13 Statement:	Sustainable Cities and Communities & Climate Action
SDG Justification:	The learner will know the importance of Sustainable Cities and Communities and action to combat climate change and its impacts.

ENVS2021	GEOLOGICAL SCIENCES AND ITS RESOURCES	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

Description of Rocks & Minerals is an inclusive course covering integrated approaches to Earth Science studies. The course begins with the structure and composition of earth, waste lands and its management, conservation of natural resources: - Land Resources, Mineral resources, Water Resources and Energy Resources and their proper management.

Course Educational Objectives:

- To describe about the structure and composition of the Earth
- To illustrate the types of rocks and their formation
- Explain the concepts of conservation of resources
- To describe the economic importance of the minerals and their extraction
- Acquire knowledge on advanced electricity generating methods by using Renewable resources

UNIT 1 Energy Resources 8 hours

Energy Resources: Fossil fuels. Nuclear energy, Hydel power, Geothermal and Tidal Energy, Wind Energy and Solar Energy. Advantages and disadvantages of Energy Resources.

UNIT 2 Land Resources 8 hours

Land Topography and Resources: Types of Rocks, Igneous rocks, Sedimentary Rocks and Metamorphic Rocks. Description of rocks. Land Hazards Like Earthquakes and Volcanoes.
Land Degradation: Land Degradation, Land use pattern, Land conservation, Types of Wastelands, and their management.

UNIT 3 Water Resource 8 hours

Water Resources: Types of Water sources, Ground Water, Hydrological properties, Hydrological cycle, Surface Water etc, Water Conservation, Watershed Management, Cloud seeding for artificial rains.

UNIT 4 Mineral Resources and Economic mineral Resources 8 hours

Mineral Resources: Silicate Minerals and Non-Silicate Minerals, Description of Minerals like Pyroxenes, Amphiboles, Feldspar.
Economic mineral Resources: Economic Minerals like Gold, Copper, Aluminum, Iron, Manganese, Chromium, Coal, Petroleum, Lead and Zinc.

UNIT 5 Climate Change and its Consequences 8 hours

Structure of Atmosphere, Green House Effect, Ozone depletion, Climate change and its Consequences

Textbooks:

1. A textbook of Geology by PK Mukerjee. Publisher: CBS Publishers & Distributors. ISBN: 9788123900131.
2. An Introduction to the Rock forming minerals by WA Deen, RA Howie & J. Zusman Longman Group Limited, Longman House. Publisher: Mineralogical Society of Great Britain & Ireland. ISBN: 9780903056274.
3. Energy Resources G.D.Rai. Publisher: Khanna Publishers. ISBN: 9788174090737.
4. Perspectives in Environmental Studies by Anubha Kaushik and C P Kaushik. (Sixth Edition). New Age International Publishers. ISBN: 9789386418630.
5. Economic Geology Economic Mineral Deposits by Umeshwar Prasad. Second edition. CBS Publishers and Distributors PVT Ltd. ISBN: 9788123904603**.**

References:

1. Rutlys Elements of Mineralogy. Publisher: CBS Publishers & Distributors. IS 9788123909165. 27th Edition
2. Environmental Science, S.C. Santra- Publisher New Central Book Agency (P) Ltd. IS 9788173814044.
3. Principles of Engineering Geology by K.M.Bangar. Publisher: Standard Publishers.

Journal(s):

Course Outcomes

Upon Completion of the course student will be able to

1. Recognize the importance of the Land conservation methods and land use pattern.
2. Apply advanced technological methods in generating electricity by using renewable and non-renewable resources.
3. Gain knowledge on effective utilization of the economic minerals and their role in improving our countries wealth.
4. Design and implement the water conservation strategies to strengthen the availability of the water resources.
5. Identify and solve the issues related to the radioactive waste by implementing innovative disposal methods.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	2								3		
CO2		3							2		
CO3				2						1	
CO4						3					
CO5							2				3

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:	**BOS**
BOS :04-07-2022	**ACADEMIC COUNCIL: 14-07-2022**
SDG No. 15 **& Statement:**	Life on Land
SDG Justification:	The learner will be able to understand Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss for everyone.

ENVS2031	GEOLOGICAL SCIENCES AND ITS RESOURCES LAB	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

Description of Rocks & Minerals is an inclusive course covers integrated approach of Earth Science studies. The course begins with the individual description of the Igneous, sedimentary and Metamorphic rocks. The study of conservation of natural mineral resources with its Physical and chemical properties. This also includes the description of the physical, chemical properties and Economic importance of the metallic minerals.

Course Objectives

- To illustrate the types of igneous rocks and their Physical properties
- To describe the economic importance of the metals and their distribution in different states
- To understand the physical properties of the different group of minerals
- Acquire knowledge on Analysis of selected heavy metals in ores.
- To understand the individual description of the different types of sedimentary and metamorphic rocks

i. Igneous Rocks

Granite Dunite
Syenite Rhyolite
Gabbro Basalt
Dolarite Andesite
Peridotite Diorite

Sedimentary Rocks

Sand Stone, Lime Stone, Shale, Conglomerate, Coal, Brescia, Arkose

Metamorphic Rocks

Marble, Schist, Quartzite, Gneiss, Amphibolite

ii. Identification of Minerals (MegaScopic)

Pyroxenes, Amphiboles, Feldspars

iii. Identification of Economic Minerals (MegaScopic)

Bauxite, Manganese, Chromium, Iron, Lead and Zinc.

iv Estimation of Heavy Metals content in Ores

Textbooks:

1. A textbook of Geology by PK Mukerjee. Publisher: CBS Publishers & Distributors. ISBN: 9788123900131.
2. An Introduction to the Rock forming minerals by WA Deen, RA Howie & J. Zusman Longman Group Limited, Longman House. Publisher: Mineralogical Society of Great Britain & Ireland. ISBN: 9780903056274.
3. Energy Resources G.D.Rai. Publisher: Khanna Publishers. ISBN: 9788174090737.
4. Perspectives in Environmental Studies by Anubha Kaushik and C P Kaushik. (Sixth Edition). New Age International Publishers. ISBN: 9789386418630.
5. Economic Geology Economic Mineral Deposits by Umeshwar Prasad. Second edition CBS Publishers and Distributors PVT Ltd. ISBN: 9788123904603.

References:

1. Rutlys Elements of Mineralogy. Publisher: CBS Publishers & Distributors. ISBN: 9788123909165. 27th Edition
2. Environmental Science, S.C. Santra- Publisher New Central Book Agency (P) Ltd. ISBN: 9788173814044.
3. Principles of Engineering Geology by K.M.Bangar. Publisher: Standard Publishers.

Course Outcomes:

Upon Completion of the course student will be able to

- Illustrate the types of rocks and their distribution.
- Comprehend the structures features and classification of the igneous sedimentary and metamorphic rocks
- Illustrate the role of minerals, different types of minerals and their occurrence.
- Apprehend the physical properties of the different group of minerals.
- Grasp chemical properties of the Pyroxenes minerals

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	2							3			
CO2		2							1		
CO3				3							3
CO4					3				3		
CO5						2				2	

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:

BOS :04-07-2022 **ACADEMIC COUNCIL: 14-07-2022**

SDG No. 7 & Statement: Affordable and Clean Energy

SDG Justification: The learner will be able to understand affordable, reliable, sustainable and modern energy for everyone.

ENVS2041	ENVIRONMENTAL MICROBIOLOGY	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

This course aimed to focus on miniscule organisms which rule the world. Makes the student understand a group of microbes in a better way. This course gives information about fundamentals of microbiology, microbial ecology and microbial relationships. This course gives insights to students about how microbes are friends as well as foes to human beings.

Course Educational Objectives:

- To impart knowledge on the role of historians in the field of microbiology and classification of living organisms to learners.
- To familiarize learners with salient features of microbes and internal structure of cells.
- To introduce learners about air and water microbes.
- To acquaint learners with microbial relationships and their role in agriculture.
- To make learners understand about food and milk microbiology.

UNIT 1 Introduction to Microbes and its Classification 12hours

Microorganisms: Definition and history. Contributions of Antony Van Leeuwenhoek, Louis Pasteur, Alexander Fleming and Robert Koch. Importance and application of Environmental Microbiology.
Outline classification of living organisms: Binomial nomenclature, two kingdom, three kingdom, four kingdom and five kingdoms. Differences between Prokaryotes and Eukaryotes.

UNIT 2 General Account of Microbes 10 hours

Microorganisms –General characteristics and economic importance of Bacteria, Algae and Fungi. Salient features of Viruses and Protozoa.
Ultrastructure of bacterial cell -size, shape and arrangement. Structure, lytic and lysogenic phages.

UNIT 3 **Microbes and Environment** **8 hour**

Air Microbiology: Air-borne microbes, impact of Air-borne microorganisms on living beings, sampling of air -borne microorganisms and control of air-borne microorganisms.
Aquatic microbiology: Water-microflora, sampling of water-microorganisms.
Soil microbiology: Soil components and microorganisms, sampling of soil-microorganisms. Humus and its significance.
Epidemiology of Tuberculosis, AIDS and Malaria

UNIT 4 **Microbial Links** **8 hour**

Microbial relationships: Mutualism (Rhizobium-legume association, Mycorrhizae and lichens), Commensalism, Amensalism, Parasitism and Predation
Microorganisms in Agriculture: Biological Nitrogen fixation, Biofertilizers (Bacteria and Algae) and microbial insecticides (BT). Microbes in sewage treatment.

UNIT 5 **Microbes Role in Food and Milk** **8 hour**

Food Microbiology: Role of Microorganisms in Food Spoilage (contamination of Plant Food Products, Animal Food Products and Processed Foods). Food Preservation processes.
Milk Microbiology: Sources of Microorganisms in milk, Microbiological examination of milk. Pasteurization.

Textbooks:

1. Willey J., Sandman K and Wood D. Prescott Microbiology, 11 edition, McGraw Hill, International edition. 2020.
2. Ananthanarayan R and Paniker C.J. Textbook of Microbiology, 11 edition, University Press (India) Pvt.Ltd. 2020.

References:

1. Madigan M.T., Martinko J.M., Bender K.S., Buckley D.H and Stahl D.A. Brock Biology of Microorganisms, 14 edition, Pearson, 2014.
2. Pelczar M.J., Chan E.C.S and Krieg N.R. Microbiology, 5th edition, McGraw Hill Education, 2001.
3. Raju P.V.R and Krishna M.K.V.S.G. Environmental Sanitation - Social and Preventive Medicine, Environmental Protection Agency.

Course Outcomes:

Upon Completion of the course student will be able to

1. List applications of environmental microbiology
2. Outline the salient features of viruses and protozoa.
3. Solve the problems associated with epidemiology of tuberculosis.
4. Examine microbe's role in biological nitrogen fixation.
5. Discuss the types of pasteurization techniques

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3								1		
CO2		3							2		
CO3				3						2	
CO4						2					
CO5							1				3

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:BOS

BOS :04-07-22 **ACADEMIC COUNCIL:14-07-22**

SDG No. 3 **& Statement:** Good health and Well being

SDG Justification: The learner will understand the microbes function in maintaining good health and ill health.

ENVS2051	ENVIRONMENTAL MICROBIOLOGY LAB	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

This course enables the students to acquire knowledge on various aspects of environmental microbiology. The course focuses on using different instruments, sterilization techniques. The knowledge gained in this course can be applied to enumerate different microbes by simple techniques.

Course Educational Objectives:

- To recall principles and working procedures of various instruments. To illustrate sterilization techniques and sterilizing materials.
- To demonstrate culture media.
- To introduce liquid media.
- To train staining procedures

List of Experiments:

Experiment	Topics
1	Environmental microbiology laboratory protocol.
2	Principle and working autoclave.
3	Principle and working of laminar air flow.
4	Working of inoculating loop and petri dishes.
5	To demonstrate Sterilization and wrapping of glassware
6	The function and the importance of cotton plugging, lab coats, gloves.
7	Estimation of microbes with nutrient agar.
8	Determination of specific microbes with eosin methylene blue agar.

9	Estimation of microbes with nutrient broth.
10	Determination of microbes with lactose broth.
11	Estimation of bacteria with simple staining.
12	Determination of Gram's staining.
13	Identification of spots

Textbooks:

1. Johnson T, Case C.L. Laboratory Experiments in Microbiology. Pearson Publishers. Edition 10. 2012**.**

Course Outcomes:

Upon completion of the course the student will be able to

1. Summarize the working procedures of various instruments.
2. Outline the sterilization techniques and materials.
3. Experiment with culture media
4. Examine the liquid media
5. Discuss the staining`

CO-PO Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	2							1			
CO2		2							2		
CO3				3							2
CO4					2				2		
CO5						2				1	

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:BOS

BOS :04-07-22	**ACADEMIC COUNCIL: 14-07-22**
SDG No. 3 & Statement:	Good health and Well being
SDG Justification:	The learner will understand the microbes function in maintaining good health and ill health

ENVS3001	SOLID WASTE MANAGEMENT AND SOIL POLLUTION	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

This course explains waste generation in society, types of solid wastes, segregation of materials, hazardous waste management and waste landfills and also soil pollution.

Course Educational Objectives:

- To impart knowledge of waste generation, its sources, and types of solid waste
- To familiarize learners with the concepts of integrated solid waste management and segregation of materials.
- To introduce learners on composting techniques and reuse methods.
- To acquaint learners about hazardous waste sources, classification and management
- To make learners understand about soil pollution - causes, effect and control measures

UNIT 1 Municipal Solid Waste Definition 12 hours

Sources and types of solid waste- composition and its determinants of Solid waste-factors influencing generation -quantity assessment of solid wastes-methods of sampling and characterization. Collection and transfer of municipal solid waste.

UNIT 2 Disposal of Solid Wastes 12 hours

Refuse disposal—various methods – incineration – principle features of an incinerator – site selection and plant layout of an incinerator - sanitary landfill- methods of operation – advantages and disadvantages of sanitary landfill - site selection – reactions accruing in completed landfills – gas and leachate movement and control – equipment's necessary

UNIT 3 Composting 12 hours

Principle – types- factors affecting compost process- mechanical composting methods. Reuse and recycling of paper, glass, and rubber. plastic waste status in India. The effect of plastic waste on the environment and management of plastic waste.

UNIT 4 **Hazardous waste Management** **12 hours**

Sources and classification of hazardous wastes – Storage and collection of hazardous wastes – Treatment and disposal techniques: Physical, chemical, and biological - Protection of public health and the environment. Biomedical wastes – Types – Management and handling and control. Radioactive wastes- sources and types - control and management

UNIT 5 **Soil Pollution** **12 hours**

Physical, Chemical, Mineralogical and Biological properties of soil, sources of soil pollution, Pollution and residual toxicity from the application of insecticides, pesticides, and fertilizers; soil erosion and land degradation. control of soil pollution.

Textbooks:

1. George Techobanoglous and Frank, K. Handbook of Solid Waste Management, Second Edition, Mc GRAW-HILL.
2. George Techobanoglous et al., "Integrated Solid Waste Management," Mc Graw - Hill.

References:

1. Tchobanoglous Theisen Ellasen; Solid Waste Engineering Principles and Management, McGraw – Hill.
2. Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Urban Development, Govt. of. India, New Delhi.
3. Blide A. D. & Sundaresan, B. B, "Solid Waste Management in Developing Countries, INSDOC.

Course Outcomes:

Upon completion of the course, the student will be able to

- Know the concept of sources, types and composition of solid waste.
- Outline of the disposal systems for various methods of solid waste.
- Build up the concept of the mechanical process of composting, the effects of plastic waste on the environment, and the management of plastic waste.
- List out the sources and classification of hazardous wastes; hazardous wastes, treatment and disposal techniques.
- Build a concept of the properties of soil, sources, types of soil pollution and its control methods.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3								3		
CO2		2							2		
CO3				3						1	
CO4						3					
CO5							2				3

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:

BOS :04-07-2022 **ACADEMIC COUNCIL: 14-07-2022**

SDG No.11 & Statement: Sustainable Cities and Communities

SDG Justification: The learners are able to understand solid waste management, hazardous waste management, and soil pollution control methods for the maintenance of urban areas .

ENVS3011	SOLID WASTE MANAGEMENT AND SOIL POLLUTION LAB	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

This course enables the students to gain knowledge of various object-oriented aspects of solid waste management. The course tours the students through classes, inheritance, and analysis of physical, chemical, and biological concepts of solid waste. The knowledge gained in this course can be applied to develop standalone applications for social and industrial assessment.

Course Educational Objectives:

1. To learn analysis of physico characteristics of solid waste.
2. To learn analysis of chemical characteristics of solid waste
3. To learn the estimation of organic fractions of solid waste.
4. To learn estimation of inorganic fractions of solid waste.
5. To determination of moisture in solid waste
6. To learn biological analysis of solid waste.
7. To learn how to analyze the characteristics of solid waste.
8. To understand how to use analyzing the Parmenter's by using standard methods

1. Determination of physical characteristics of solid waste:
    a. Particle size; Temperature; pH; Conductivity and bulk density
2. Determination of Chemical Characteristics of solid waste – Nitrogen, Phosphorus, Potassium, and Heavy Metals (selected).
3. Estimation of the organic and inorganic fractions of solid waste.
4. Determination of moisture in solid wastes.
5. Determination of biological analysis of solid waste.

Courser Outcomes

Upon completion of the course, the student will be able to

1. Analyze the physico-chemical characteristics of solid waste
2. Summarize the chemical characteristics of solid waste
3. Estimate of organic fractions of solid waste
4. Apply of the inorganic fractions of solid waste
5. Biological analysis of solid waste.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3							3			
CO2		3							1		
CO3				3							3
CO4					3				3		
CO5						3				2	

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:	**BOS**
BOS :04-07-2022	**ACADEMIC COUNCIL: 14-07-2022**
SDG No.11 & Statement:	Sustainable Cities and Communities
SDG Justification:	The learners are able to understand solid waste management, hazardous waste management, and soil pollution control methods for the maintenance of urban areas

ENVS3021	ENVIRONMENTAL IMPACT ASSESSMENT	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

This course aimed to focus on environmental impact assessment definitions, concepts, principles, and origin and development. Guidelines for preparing EIA. with different methodologies are detailed along with their merits and demerits. Concepts of Environmental management plan, disaster management plan, and environmental auditing are covered. Environmental management systems (EMS) are detailed in their standards, including the ISO 14000 series and ISO 14001. This course also focused on the pollution control norms at source, coastal zone regulation restrictions, zoning atlas, and medium-related standards.

Course Educational Objectives:

- To impart knowledge on the concepts, origin, and principles of EIA.
- To familiarize learners with salient features of types of impacts and preparation of Environmental impact statements.
- To introduce learners to EIA methodologies.
- To acquaint learners with disaster management plans onsite and offsite, Environmental Auditing, EMS standards.
- To make learners understand the pollution control norms at source and Coastal zone regulation and its management.

UNIT 1 Introduction to Environmental Impact Assessment 12 hours

EIA – Introduction -Definition – Basic concepts and principles of EIA – Origin and development of EIA - Short-term and Long-term objectives – EIA guidelines 2006 (Notification of Government of India) — Merits and Demerits of EIA.

UNIT 2 Basis for Environmental Impact Assessment 12 hours

The basis for Environment Impact Assessment—Types of impacts (Negative & Positive, Primary & Secondary, Reversible and Irreversible, Tangible and Intangible) Components ofof an EIA: Screening of Projects - Public Participation - Preparing environmental impact statements.

UNIT 3 **EIA Methodologies** **10 hours**

EIA Methodologies: Ad Hoc Method – Checklist Approach – Matrix Methods – Network Methods - Environmental Management Plan.

UNIT 4 **Disaster management plan and Environmental Auditing** **10 hours**

Disaster Management Plan: Disaster Management plan on site
Environmental Auditing: Scope, Objectives, and Procedures for Environmental Auditing
Environmental Management System (EMS): EMS standards, the ISO 14000 series, and the ISO 14001.

UNIT 5 **Coastal Zone Regulations** **8 hours**

Pollution control norms at source – Coastal Zone Regulation restrictions; Zoning atlas – Medium related standards (Ambient standards).

Textbooks:

1. Willey J., Sandman K and Wood D. Prescott Microbiology, 11th Edition, McGraw Hill, International edition. 2020.
2. Ananthanarayan R and Paniker C.J. Textbook of Microbiology, 11 edition, University Press (India) Pvt.Ltd. 2020.

References:

1. Fundamentals of Ecology, E.P. Odum, W.B. Saunders & Co.
2. Das, R.C. and Behera, D.K. Environmental Science – Principles and Practice, PHI, New Delhi.
3. Y. Anjaneyulu Environmental Impact Assessment Methodologies, B. S. Publications
4. Sherman, J. Rosen, Manual for Environmental Impact Evaluation. Prentice Hall, New Jersey.
5. Erickson, P.A. Environmental Impact Assessment Principles and Applications.
6. Canter LW. Environmental Impact Assessment. McGraw Hill, New York..

Course Outcomes:

Upon completion of the course, students will be able to

1. Gain knowledge of the concepts and principles of EIA and EIA notification.
2. Understands the types of impacts and components of EIA.
3. Gains knowledge of the procedures of EIA and Environmental Management Plan.
4. Understands the process of disaster management and the procedure of environmental auditing of an Environmental Management System.
5. Understands pollution control norms at source and coastal zone regulation and its management.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3								3		
CO2		2							2		
CO3				3						1	
CO4						3					
CO5							2				3

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:	**BOS**
BOS : 4/7/2022	**ACADEMIC COUNCIL: 14/7/2022**
SDG No. 11	**Statement: Sustainable cities and Communities**
SDG Justification:	The learner will be able to identify the potential impacts due to developmental activities by carrying out EIA studies and identifies the best possible alternatives for sustainable development.

ENVS3031	ENVIRONMENTAL IMPACT ASSESSMENT LAB	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

This course enables the students to acquire knowledge on various aspects of environmental impact assessment. The course uses different instruments, collects weather data, and develops wind roses. The knowledge gained in this course can be applied to enumerate other areas' measurements of noise in silent, industrial, residential and commercial areas.

Course Educational Objectives:

- To recall principles and working procedures of various instruments.
- To illustrate the comparative analysis of air sampling in clean and polluted areas.
- To demonstrate the collection and interpretation of weather data and development of wind roses.
- To demonstrate the effluent analysis.
- To train data collection and integration of data analysis.

List of Experiments:

Experiment	Topics
1	Demonstrations of PM_{10} & $PM_{2.5}$ air sampler instruments
2	National Ambient Air Quality Standards and Water Standards
3	Estimation of NO_2 in ambient air
4	Estimation of SO_2 in ambient air
5	To demonstrate the collection of weather data,
6	To the development of wind roses by using wind rose software
7	Measurement of noise in silent industrial, residential, and commercial areas.

8	Determination of pH and temperature in a given effluent sample
9	Determination of total solids in a given effluent sample
10	Determination of BOD in a given effluent sample
11	Determination of COD in a given effluent sample
12	How to conduct questionnaires in public
13	How to collect data for collection and generation

Textbooks:

1. Guidelines for Ambient Air Quality Monitoring, Central Pollution Control Board, Ministry of Environment and Forest -Laboratory manual -2003
2. Topics 1,2,3,4,5,6,7

Reference Book(s):

1. Kotaiah and Kumara Swamy: Environmental Engineering Laboratory Manual, Charotar publishing house

Course Outcomes:

Upon completion of the course, the students will be able to

1. Gains theoretical knowledge on using PM_{10} & $PM_{2.5}$ air sampler instruments
2. Understand the National Ambient Air Quality Standards and Water standards
3. The development of wind roses by using wind rose software
4. Estimation of NO_2 and SO_2 in ambient air and determination of pH, temperature, total solids, BOD and COD for given effluent.
5. Conduct questionnaires in public and collect data for collection and generation

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3							3			
CO2		3							1		
CO3				3							3
CO4					3				3		
CO5						3				2	

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:	**BOS**
BOS : 4/7/2022	**ACADEMIC COUNCIL: 14/7/2022**
SDG No. 4	**Statement: Quality Education**
SDG Justification:	The learner gains the practical knowledge and attains the hands on experience to identify pollutants with respect to air and water samples.

ENVS3041	INDUSTRIAL SAFETY	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

Through the course content, you will learn more about safety, incident management, risk reduction, and crowd management, along with other principles that relate to law enforcement and public protection. In the event of any emergency conditions, the role of industrial safety cannot be overemphasized. When major accidents, state of emergency is declared, the public looks to trained individuals for guidance, comfort, and a course of action. The priority is always to save lives and ensure public stability at all times.

Course Educational Objectives:

- To know about basic definitions of safety, safety principles, and safety training education.
- To illustrate the history of occupational health and the essentials of occupational health service.
- To take part in the safety process and control of hazards.
- To analyze industrial threats and their risk assessment.
- Discuss the resistance of common causes of industrial fires, fire resistance building materials, and fire prevention.

UNIT 1 **Safety** **12 hours**

Introduction, importance of the safety, principles of industrial safety, definitions – Accident, Incident, Hazard, explosion, contamination, fire, protection, housekeeping, safe measures. Safety training and education.

UNIT 2 **Occupational Health** **12 hours**

Concept of health and occupational health, spectrum of health, Occupational and work-related diseases, Levels of prevention, History of occupational health, Characteristics of occupational diseases, Essentials of occupational health service, personal protective equipment (respiratory and non-respiratory).

UNIT 3 **Hazards in workplaces** **12 hours**

Safety in Process plants: Nature and types of workplaces, type of Hazards, hazards due to improper housekeeping, workers exposure to hazardous chemicals, Physical and chemical properties of chemical leading to accidents like fire, explosion, ingestion and inhalation – atmospheric pollution, dangers of dusts, fumes, vapors in work spots., Noise and Vibration hazards.

UNIT 4 **12 hours**

Control of Fire Hazards Factors contributing towards fire. The chemistry of fire. classification of fires. Common causes of industrial fires. Determination of fire load. Fire resistance of building materials. Design of building plants, exits, etc. for fire safety. prevention of fire. Portable extinguishers. Water systems, carbon-di-oxide systems. foam extinguisher system. Dry chemical extinguishing system. Industrial fire detection and alarms. Sprinkle systems.

UNIT 5 **Safety Management** **12 hours**

Management: Concept, definition, nature and importance, Role and functions of a manager, Elements and functions of Management. Management Principles: Authority, responsibility & power of Management, Span of Control. Delegation and decentralization of authority. general principles of management.

Textbooks:

1. R.K.Jain and Sunil S.Rao, Industrial Safety, Health and Environment Management Systems, Khanna publishers, New Delhi.
2. Slote.L.Handbook of Occupational Safety and Health, John Willey and Sons, New York.
3. Frank P. Lees, Loss of prevention in Process Industries, Vol. 1 and 2, Butterworth-Heinemann Ltd., London.
4. Industrial Safety -National Safety Council of India.
5. The Factories Act with amendments 1987, Govt. of India Publications DGFASLI, Mumbai

References:

1. Grimaldi and Simonds, Safety Management, AITBS Publishers, New Delhi.
2. Industrial Safety and Pollution Control Handbook: National Safety Council and Associate Publishers Pvt. Ltd, Hyderabad.
3. Handbook of Environmental Health and Safety: Herman Koren and Michel Bisesi, Jaico Publishing House, Delhi.

Course Outcomes:

Upon completion of the course, the student will be able to

1. To understand the concept and need for safety management.
2. Gain knowledge of workplace hazards and improper housekeeping hazards and their related case studies.
3. The gained knowledge will help to deal with major accidents and states of emergency.
4. Examine the factors contributing to fire hazards and equipment used to control fire hazards.
5. The public also looks to trained individuals for guidance, comfort, and a course of action.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3								3		
CO2		2							2		
CO3				3						1	
CO4						3					
CO5							2				3

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:	**BOS**
BOS :04-07-22	**ACADEMIC COUNCIL: 14-07-22**
SDG No. 3, 4 8 and 9 **& Statement:**	Good Health and Well Being Quality Education Decent work and Economic Growth Industry, Innovation and Infrastructure
SDG Justification:	The learner will learn about Safe work; good health and well being, Quality education; decent work and economic growth, industry innovation and infrastructure development.

ENVS3051	INDUSTRIAL SAFETY LABORATORY	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

This enhances a student's practical knowledge and working skills with respect to risk management techniques, standard health and wellbeing of workers, general safety measures, and preventive control measures to avoid accidents in near future.

Course Educational Objectives:

- To provide an opportunity to operate the equipment to acquire practical knowledge.
- To know the various PPEs.
- To carry out experiments to find out the environmental parameters.
- Case Studies of National and International Industrial Accidents
- Field Visits / Industrial Visits.

List of Experiments:

NOISE LEVEL MEASUREMENT AND ANALYSIS Measurement of sound pressure level in dB for Impact, continuous and intermittent sources.

ENVIRONMENTAL PARAMETER MEASUREMENT Dry Bulb Temperature, Wet Bulb Temperature, Determination of relative humidity, wind flow. Particle size Measurement Air sampling analysis.

TRAINING IN USAGE AND SKILL DEVELOPMENT
Personal protective equipment: respiratory and non-respiratory-demonstration-self-contained breathing apparatus. Safety helmet, belt, hand gloves, goggles, safety shoe, gum boots, ankle shoes, face shield, nose mask, ear plug, earmuff, anti-static and conducting plastics/rubber materials, apron and leg guard.

Field Visits / Industrial Visits
Fire extinguishers and its operations
Water, Co_2, Foam, Carbon dioxide (Co_2)
Dry chemical powder and currently amendment fire safety systems

Technical Seminar: (Case Studies of National and International Industrial Accidents)
OBJECTIVE: To enrich the communication skills of the student through presentation of topics in recent advances in Industrial safety engineering/technology

Course Outcomes:

Upon completion of the course the student will be able to

1. familiarize and run the various equipment to maintain a safe environment in the industry.
2. measure particulate matter and assess the impact of air pollution.
3. conduct experiments to find out various environmental parameters.
4. use personal protective equipment independently for lab work and field analysis.
5. gain knowledge of the industrial guidelines, instruction, and work area analysis of industries.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3							3			
CO2		3							1		
CO3				3							3
CO4					3				3		
CO5						3				2	

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:BOS

BOS :04-07-2022

ACADEMIC COUNCIL:14-07-2022

SDG No. 3, 4 8 and 9 & Statement:

Good Health and Well Being
Quality Education
Decent work and Economic Growth
Industry, Innovation and Infrastructure

SDG Justification:

The Learner will learn about Safe work place, Good health and well being, Quality education, Decent work and economic growth, industry innovation and infrastructure development.

ENVS2061	BIODIVERSITY CONSERVATION	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

This course, aimed to focus mainly on Biodiversity conservation, gives a scope to understand the importance of Biodiversity, focuses on levels of biodiversity, value of Biodiversity, Biogeographical Classification of India, major threat to biodiversity and important conservation strategies for sustainable development.

Course Educational Objectives:

- To impart knowledge on the concepts and components of biodiversity.
- To familiarize learners with bio-geographic classification of India.
- To introduce learners about threats of biodiversity.
- To acquaint learners with conservation of biodiversity.
- To make learners understand about special projects for endangered wildlife protection

UNIT 1 Biodiversity and values of biodiversity 11 hours

Biodiversity: Definition; Concepts and components of biodiversity, Levels of Biodiversity: Genetic, Species, Ecological. Types of Biodiversity: (Diversity Indices)-Alpha (α), Beta (β), Gamma (γ) Diversity;
Biodiversity as an important resource, value of biodiversity: Consumptive value, Productive Value, Social value, Ethical value, Aesthetic value, optional value.

UNIT 2 Biodiversity hotspots 11 hours

Bio-geographical Classification of India: Geography and major biomes, climate, Wetlands, Forests: Biodiversity at National and Global Levels, India as a mega diversity nation, Hotspots of biodiversity in India and world.

UNIT 3 **Threats to Biodiversity** **10 hours**

Threat to Biodiversity – Habitat loss, Wildlife conservation and poaching of wildlife: Man – wildlife Conflicts, Threat to Indian Biodiversity Endangered Flora and Fauna of India – Reasons for Loss of Biodiversity, Endangered and Endemic species of India

UNIT 4 **Biodiversity conservation** **9 hours**

Conservation of biodiversity: Biodiversity Conservation Strategies, In-situ and Ex-situ conservation. Wildlife reserves in India, Protected Areas network of India, National Parks and Sanctuaries, Management of germplasm collection, Bio-piracy of Indian flora, Eco-planning Responsibilities

UNIT 5 **National and International regulations** **9 hours**

Endangered Wildlife–Special Projects for Endangered Wildlife, Biosphere Reserves, Mangrove conservation; Biological Diversity Act (2002); National Biodiversity Authority (NBA), Bio-piracy, Convention on Biological Diversity (CBD) and its milestones.

Textbooks:

1. Environmental Science: A Global Concern by William P.Cunningham and Baraba Woodworth Saigo.6th edition (2001), Publisher-McGraw Hill Higher Education. ISBN-978-0071180726. https://nsuworks.nova.edu/occ_facbooks/74/
2. Asthana D.K. and Asthana M. Environment Problems & Solutions S.Chand & Company Ltd., 2007.
3. Anjaneyulu Y, Introduction to Environmental Science, 3rd Edition reprint, BS Publications, 2004
4. A text book of Environmental Science by P.C.Joshi. A.P.H.Publishing corporation. ISBN-OK5L-D-26-ZN9B. 2009. https://books.google.com.ag/books?id=aFAwZ36VxhkC&printsec=frontcover#v=onepage&q&f=false
5. A text book of Environmental Science by Arvind Kumar. A.P.H.Publishing Corporation (2004). ISBN: 9788176485906, 817648590X.
6. A text book of Environmental Science by S.C.Santra. Publisher: New Central Book Agency (P) Limited. ISBN: 817381404X, 9788173814044 (2011). Ecology & Environment by P.D. Sharma. Rastogi Publications. ISBN: 9788171338146, 8171338143

References:

1. Perspectives In Environmental Studies by Anubha Kaushik and, C P Kaushik. New Age International Publishers; Sixth edition (2018). ISBN-10 : 9789386418630

Course Outcomes:

Upon completion of the course the student will be able to

- Increase knowledge about biodiversity and its types
- Gain the knowledge of bio geographical classification and conservation.
- Provide information about various ecosystems and energy flow in the ecosystem
- Get information related with biodiversity threats
- Know about biodiversity conservation and international regulations.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	1								1		
CO2		2									1
CO3			1	3						2	
CO4					2	2		1			
CO5		1			1		1		2		3

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:	**BOS**
BOS :04-07-2022	**ACADEMIC COUNCIL: 14-07-2022**
SDG No.2, 3, 24, 25 & Statement:	Zero hunger Good Health and Well-being Life Below Water Life on Land

SDG Justification:

1.The learner will understand the concept of food security and improved nutrition and promote sustainable agriculture (agro-biodiversity). SDG-2
2.The learners will provide healthy lives and promote well-being for all at all ages to save our biodiversity. SDG 3
3.The learner will understand the concept of Conservation and sustainably use of the oceans, seas and marine resources for sustainable development.SDG-14
4.The students will understand to restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.SDG-15

ENVS2071	BIODIVERSITY CONSERVATION LAB	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

This course enables the students to acquire knowledge on various aspects of Biodiversity and Conservation. The course focuses on using different methods for biodiversity assessment. The knowledge gained in this course can be applied to understand the biodiversity of the studied area.

Course Educational Objectives:

- To assess the biodiversity of the area.
- To illustrate Abundance of flora and fauna.
- To demonstrate the richness of flora and flora.
- To introduce floral diversity of the area
- To estimate alpha diversity of the area
- To estimate Beta diversity of the area.
- To survey birds diversity in an area

List of Experiments:

1 Understanding biodiversity survey

2 Determination of abundance of flora

3 Determination of abundance of fauna

4 Estimation of richness of biodiversity.

5 Determination of floral diversity

6 Determination of species diversity

7 Determination of aquatic alpha diversity

8 Estimation of alpha diversity

9 Determination of beta diversity

10 A study of pond ecosystem biodiversity

11 Determination of the biodiversity register

12 Survey of zoological park

Textbooks:

An Advanced Textbook on Biodiversity: Principles And Practice K.V. Krishnamurthy

References:

1. Biological Diversity: Exploiters And Exploited by Paul E. Hatcher, Nick Battey, John Wiley & Sons Inc

Course Outcomes

Upon completion of the course the student will be able to

1. To learn about surveys for biodiversity.
2. To learn about the abundance of flora and fauna.
3. To demonstrate the richness.
4. To learn floral diversity.
5. To understand species diversity in an area.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	1								1		
CO2		2									1
CO3			1	3						2	
CO4					2	2		1			
CO5		1			1		1		2		3

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:	**BOS**
BOS :04-07-2022	**ACADEMIC COUNCIL: 14.07.2022**
SDG No. 3, 14, 15 & Statement:	Good Health and Well-being Life Below Water Life on Land

SDG Justification:

1.The learners will provide healthy lives and promote well-being for all at all ages to save our biodiversity. SDG 3
2.The learner will understand the concept of Conservation.SDG-14
3.The students will understand to restore and promote sustainable use of terrestrial ecosystems.SDG-15

ENVS2081	ENVIRONMENTAL PROBLEM IN INDIAN CONTEXT	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

The course focuses on various contemporary environmental problems in India, means, methods and technologies to manage and combat these problems. It also emphasizes the environmental laws in India that help in dealing with various environmental issues. It also provides an insight to the previous environmental issues and how they were addressed through case studies so as to gain knowledge and apply some concepts for addressing the current issues.

Course Educational Objectives:

- To familiarize various contemporary environmental concerns, their causes and consequences.
- To learn lessons from previous environmental movements taken place in India
- To appreciate the environmental movements and the way they were addressed.
- To grasp legislative measures available in India towards addressing environmental issues
- To appreciate green benches and their efforts towards resolving environmental issues at earliest.

UNIT 1 **Land Degradation** **12hours**

Land use pattern in India, causes of land degradation, environmental consequences of land degradation: soil erosion, desertification, Salination and water logging. Control of land degradation.

UNIT 2 **Forests and Dams** **12hours**

Forest – Significance of forest. Deforestation: Causes and consequences of deforestation. Dimensions of deforestation in India. Forest Management: Social forestry and joint forest management.

UNIT 3 **Global Warming** **12hours**

Global Warming and Green House Effect: Greenhouse gasses and global climate changes, impact of Global warming. Control measures for Global Warming.
Ozone depletion: importance of Ozone, causes for Ozone depletion and ozone depleting substances, consequences of Ozone depletion, Ozone hole, alternate measures to mitigate Ozone depletion. Acid rain: causes of acid rain, impact of acid rain and mitigation of acid rain problems.

UNIT 4 **Environmental Movements** **12hours**

Environmental movements: Major environmental movements in India. Chipko movement, Silent Valley movement, Appiko movement, Narmada Bachavo Andolan and Tehri Dam conflict.
International agreements: Earth Summit, Convention of biodiversity and United convention on climate change.

UNIT 5 **Environmental Legislation** **12hours**

Environmental Laws in India. Objective of the Act, Definition of pollution under the Act and Power and functions of boards of the following Acts: The Wildlife (protection) Act, 1972, amended in 1983, 1986, 1991 and 2010. The Water (Prevention and Control of Pollution) Act, 1974, amended in 1988, The Forest (Conservation) Act, 1980, amended in 1988, The Air (Prevention and Control of Pollution) Act, 1981, amended in 1988, The Environment (Protection)Act, 1986, The Motor Vehicles Act, 1938, amended in 1988.
A Notification on Coastal Regulation Zone, 1991. Green benches: Structure and functions of green bench.

Textbooks:

1. Environmental Law in India by P. Leela Krishnan, 2016. 1st Edition. LexisNexis, India. ISBN 13: 978-9350357200
2. Exploring Environmental Issues: An Integrated Approach by David D. Kemp. 2004. 1st Edition. Routledge, London. 9780415268639

References:

1. Environmental Movements of India - Chipko, Narmada BachaoAndolan, Navdanya by Krishna Mallick. 2021. 1st Edition. Amsterdam University Press. Amsterdam. ISBN: 9789462984431

Course Outcomes:

Upon completion of the course the student will be able to

1. Gain acquaintance with contemporary environmental concerns, their causes and consequences.
2. Summarize key points from previous environmental movements taken place in India
3. Gain insights to the environmental movements and the way they were addressed.
4. Understand legislative measures available in India towards addressing environmental issues
5. Learn and understand the importance of green benches and their efforts towards resolving environmental issues at earliest.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	1								1		
CO2		2									1
CO3			1	3						2	
CO4					2	2		1			
CO5		1			1		1		2		3

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:	**BOS**
BOS: 04-07-2022	**ACADEMIC COUNCIL:14-07-2022**
SDG No.13 & Statement:	Climate Action
SDG Justification:	The learners will understand the need for taking measures to combat climate change.

ENVS2091	ENVIRONMENTAL PROBLEM INDIAN CONTEXT LAB	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

This course enables the students to acquire knowledge on various aspects of environmental problems in the Indian context. The course focuses on using different instruments, techniques. The knowledge gained in this course can be applied to enumerate different current issues related to environmental problems.

Course Educational Objectives:

- To recall principles and working procedures of various instruments.
- To illustrate different techniques and procedures.
- To demonstrate longitudinal studies.
- To introduce EC of different samples.
- To train analysis for soil and forest samples.

List of Experiments:

1 Estimation of bulk density of degraded land.

2 Estimation of soil pH and soil temperature of degraded land.

3 Determination of tree growth by visual observation.

4 Determination of longitudinal studies of a biodiversity region.

5 Case study on status of forest resources in India

6 Determination of different rays absorbs and emit at varying strengths.

7 Determination of Carbon dioxide content in collected sea water.

8 Determination of EC of collected sea water

9 Estimation of plant species in university campus

10 Case study on recent environmental movements

Textbooks:

1. Clesceri. L.S., Greenberg A.E., Eaton A.D. 2020. Standard methods for the estimation of water 20th Edn.

Course Outcomes

Upon completion of the course the student will be able to

1. understand the working procedures of various instruments
2. interpret different techniques of using various instruments
3. develop longitudinal studies biodiversity regions
4. distinguish electric conductivity of different samples
5. measure soil and forest samples

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	1								1		
CO2		2									1
CO3			1	3						2	
CO4					2	2		1			
CO5		1			1		1		2		3

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN: BOS

BOS: 04-07-2022 **ACADEMIC COUNCIL:14-07-2022**

SDG No. 13 & Statement: Climate Action

SDG Justification: The learners will understand the need for taking measures to combat climate change.

ENVS2101	INDUSTRIAL WASTE MANAGEMENT	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

This course aimed to focus on industrial waste to reduce the entry of toxic pollutants and hazardous substances into the air, water, and soil. Makes the student understand various sources of industrial waste and their effects on the environment. This paper highlights various characteristics of industrial waste discharges. This course also focuses on the management of industrial waste with the latest technology.

Course Educational Objectives:

- To impart knowledge on the introduction to industrial waste.
- To familiarize learners with the treatment of industrial waste.
- To introduce learners to cleaner technologies.
- To acquaint learners with the advanced technology of membrane technologies.
- To make learners understand major industries.

UNIT 1 Introduction to Industrial Waste 8 hours

Sources of industrial waste [manufacturing unit, processing unit, fabrication unit], types of industrial waste [solid, liquid, gaseous], principles of industrial waste management, effects of industrial waste on environment and human health.

UNIT 2 Treatment of Industrial Waste 8 hours

Characteristics industrial waste, collection and segregation of industrial waste [solid, liquid], primary treatment of industrial waste [screens, grit chamber, Coagulants, Flocculants], theories of neutralization, equalization and proportioning, Housekeeping.

UNIT 3 Cleaner Production 8 hours

Waste audit, removal of suspended colloidal [Primary clarifier, Secondary clarifier], dissolved organic solids [oxidation ponds, Activated Sludge Process, Contact stabilization, Trickling filtration], removal of inorganic dissolved solids [evaporation, ion exchange, reverse osmosis, electrocoagulation, dialysis], recovery and disposal of sludge.

UNIT 4 **Advanced Technology** **8 hours**

Membrane Techniques [Ultrafiltration, Nanofiltration], photocatalytic degradation, microbial degradation, ceramic membrane], Selective Catalytic Reduction system, air-Biofilter (mechanism and working), industrial waste incinerator.

UNIT 5 **Major industries** **8 hours**

Manufacturing processes, flow sheets, characteristics and composition of wastes including waste reduction, treatment and disposal methods of major Industries: Sugar, Steel mills, Textile, Dairy, Paper and Pulp and Oil refinery.

Textbooks:

1. Willey J., Sandman K and Wood D. Prescott Microbiology, 11 edition, McGraw Hill, International edition. 2020.

References:

1. Waste and wastewater technology, Mark, JH. John Wiley and Sons, New York.
2. Water and wastewater analysis, B.B. Sundaresan, NEERI, Nagpur.
3. Standard methods for examination of Water and wastewater, APHA, American Water work Association, Water pollution control federation, New York.
4. Industrial Waste Management, M.N. Rao and A.K. Datta.

Course Outcomes:

Upon completion of the course the student will be able to

1. Identify the sources of industrial waste.
2. Summarizes the characteristics of industrial waste.
3. Identify's different methods adopted for the treatment.
4. Examines advanced technology in the treatment of industrial waste.
5. Discusses major industries' manufacturing processes**.**

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	2							2			
CO2		1								1	
CO3					3				2		
CO4			2								1
CO5						1				3	

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:	**BOS**
BOS : 4/7/2022	**ACADEMIC COUNCIL: 14/7/2022**
SDG No. 9	**Statement: Industry, Innovation and Infrastructure**
SDG Justification:	The leaner gains theoretical idea on characterization of effluents and helps the learner to attain the knowledge on implementing safe disposal techniques for sustainable industrialization.

ENVS2121	ENVIRONMENTAL TOXICOLOGY	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

The Course describes the effects of natural and anthropogenic chemicals and pollutants on living organisms. The course will enable the learner to critically evaluate the effects of various chemicals through toxicological tests.

Course Educational Objectives:

- To create awareness among learners of the concepts of toxicology and its history.
- To gain knowledge on the toxicology tests, exposure to toxicants.
- To realize the principles of Environmental toxicology through dose response relationships.
- To appraise bioaccumulation and biomagnification of heavy metals in the environment
- To recognize various types of radiations and their health effects.

UNIT 1 **Basic concepts of Eco-toxicology** **8 hours**

Introduction to Ecotoxicology, Principles of toxicology, scope of toxicology. Types of toxic substances - degradable and non-degradable. Factors influencing toxicity, drug toxicity. Acute and chronic toxicity. influence of ecological factors on the effects of toxicity.

UNIT 2 **Toxicants in the Environment** **8 hours**

Toxic substances in the environment, their sources and entry routes. Transport of toxicants by air and water: Transport through the food chain - bioaccumulation and biomagnification of toxic materials in the food chain. Toxicology of major pesticides. Environmental impacts of pesticides, Physiological and metabolic effects on flora and fauna.

UNIT 3 **Environmental Toxicology** **8 hours**

Principles in toxicology dose response relationship; Statistical concept concerning toxicology, principles in toxicology dose response relationship statistical concept of LC50 and EC50 values. Potency vs. toxicology short and long term effect at organisms' synergetic effects eco toxicology of heavy metals to algae and higher plants.

UNIT 4 **Biomagnification and Bio monitoring** **8 hours**

Heavy metals pesticides and fertilizers pollution in air water soil – extent accumulation of pollution in organization- biomagnification – Bioindicators – Bioremediation with special reference to microbes and plants.

UNIT 5 **Evaluation of toxicity** **8 hours**

Methods used to assess toxicity, classification of toxic materials. Concepts of Bioassay-types, characteristics. Importance and significance of bioassay, Microbial bioassay for toxicity testing, Bioassay test models and classification.

Textbooks:

1. Principles of Environmental Toxicology: I. C. Shaw and J. Chadwick; Taylor & Francis, ltd
2. Environmental biology and Toxicology, by Sharma P.D. Rastogi and Lamporary.
3. Environmental Toxicology by M.Satake, H.Yasuhisa, M.S. Sethi, Y.Mido, S. Taguchi, S.A. Iqbal; Discovery Publishing House.

References:

1. Introduction to Environmental Science by Y.Anjaneyulu; B.S. Publications
2. Science and Engineering – Meenakshi, Prentice Hall India.

Course Outcomes:

Upon completion of the course the student will be able to

- Appraise the concepts of ecotoxicology and toxic substances, their entry and environmental impacts.
- Appreciate the toxicological tests for assessing toxicity.
- Acknowledge dose response relationship of toxicity.
- Realize the heavy metals and pesticide accumulation through biomagnification.
- Cognize the biological effects of radiation.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1		3						3			
CO2			3						2		
CO3	2									2	
CO4					2			2			
CO5						2					1
				1				1			

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:	**BOS**
BOS : 04-07-22	**ACADEMIC COUNCIL:14-07-22**
SDG No. 3, 4 & Statement:	Good Health and Well-being Quality Education

SDG Justification:

- The Course enables students to understand the aspects dealing with healthy lives and how to promote well-being for all.
- The Course prepares students to be inclusive and have equitable quality education, promoting lifelong learning opportunities.

ENVS2111	WATER AND WASTEWATER TREATMENT	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

This course is developed to provide precise understanding of providing safe water and also treating wastewater. Providing a safe, reliable source of potable water is an ever-growing challenge for governmental and professional agencies, where daily demand is growing and yet more complex issues are evolving with the daily use of more chemicals and materials. In order to ensure that the public at large are receiving healthy water for daily use a fundamental understanding of processes and technology used in water and wastewater treatment becomes very important.

Course Educational Objectives:

- Will characterize water from various sources and also understand the quantitative aspects.
- Will gain understanding on the purpose and operational steps of drinking water treatment processes.
- Will be able to quantify and characterize domestic sewage.
- Get acquainted to the purpose and operational steps for treatment of wastewater.
- Will learn and appreciate the efficacy of low-cost waste treatment methods
- Grasp the advantages and disadvantages of low-cost waste treatment methods.

UNIT 1 **Sources of Water** **12 hours**

Hydrological cycle - Sources of Water – Surface sources & Ground Water Sources - suitability of surface and ground water with regard to quantity & quality.
Quantity of Water – Types of demands - Fluctuation in demand of water – Factors affecting the water demand

UNIT 2 **Quality of Water** **12 hours**

Quality of Water – Classification of impurities – Examination of water – Collection of water samples – Water analysis – Physical tests- Chemical tests- Living organisms in water- Biological tests- Standard of water quality.
Intakes - Classification of intakes. Objectives of treatment of water – Plain sedimentation – types of sedimentation tanks - Sedimentation with coagulation

UNIT 3 **Treatment of Drinking Water and Analysis of Sewage** **12 hours**

Filtration – Classification of filters- Slow Sand Filter- Rapid Sand Filter - Disinfection of water - Methods of disinfection – Chlorination.
Sewage- Physical, Chemical & biological characteristics, analysis of sewage. Need for treatment, criteria for selection of site for sewage treatment plant

UNIT 4 **Sewage Treatment** **12 hours**

Sewage Treatment - Objectives of treatment- Classification of treatment- Flow diagram of conventional treatment plant.
Preliminary Treatment- Screenings, Grit chamber, Skimming tanks - Only description (design not required). Primary Treatment- Primary sedimentation – Description & working (Design not required).

UNIT 5 **Secondary and Low-cost waste treatment** **12 hours**

Secondary Treatment – Trickling filters, Contact beds, intermittent sand filters, Activated Sludge process (Only description, design not required). Sludge Treatment & disposal-Sludge digestion, Sludge drying, Sludge Disposal.
Low-cost waste treatment: Oxidation ponds, Oxidation ditches, Activated Lagoon, Anaerobic lagoons. Miscellaneous: Septic tank, Imhoff tank

Textbooks:

1. Water Supply & Sanitary Engineering - Including Environmental Engineering & Pollution Control Act's by J. S. Birdie, G. S. Birdie. 2014, 9th Edition, Dhanpath Rai Publishing Company, New Delhi. ISBN: 9789384378387, 9384378380 – Units 1 to 5
2. Wastewater Engineering: Treatment and Reuse by Metcalf & Eddy, Inc, George Tchobanoglous, Franklin Burton, H. David Stensel, 2017, 4th Edition, McGraw Hill Education India, Uttar Pradesh, ISBN: 9780070495395, 978007049539 – Units 1 to 5
3. Water and Wastewater Engineering by Sudha Goel, 2019, 1st Edition, Cambridge University Press India Private Limited, New Delhi, ISBN – 1108155324, 9781108155328 – Units 1 to 5

References:

1. Water & Wastewater Engineering by Davis, 2020, 2nd Edition, McGraw Hill, New York, ISBN: 9781260132274. Units 2 to 5

Course Outcomes:

Upon completion of the course the student will be able to

- Characterize water from various sources and also understand the quantitative aspects.
- Understand the purpose and operational steps of drinking water treatment processes.
- Quantify and characterize domestic sewage.
- Describe the purpose and operational steps for treatment of wastewater.
- Appreciate the efficacy of low-cost waste treatment methods.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1		2						3	2		
CO2		3						2			
CO3				2						2	
CO4						2		1			1
CO5					1						

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN: **BOS**

BOS : 04-07-22 **ACADEMIC COUNCIL:14-07-22**

SDG No.6 & Statement: Clean Water and Sanitation

SDG Justification:

The Course provides understanding of availability, sustainable and management of water and sanitation for all.

ENVS2131	SUSTAINABLE ENVIRONMENTAL TECHNOLOGIES	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

The course is designed to teach students the scientific and engineering principles of microbiological treatment technologies to clean up contaminated environments and to generate valuable resources for the human society.

Course Educational Objectives:

- To impart knowledge on the current status of biotechnology on environmental protection.
- To familiarize learners about biological filters.
- To introduce learners about the use of biofertilizers.
- To acquaint learners with the bioremediation technologies.
- To make learners understand biomass based energy.

UNIT 1 Environmental Biotechnology 8hours

Definition, Scope and role of Biotechnology in Environment Protection, Current Status of Biotechnology in Environment Protection, Future.
Biotechnology for air pollution abatement and odor control: Deodorization process - bio scrubbers, bio beds, Bio trickling filters.

UNIT 2 Bioreactors for Waste –Water Treatment 8hours

Biological processes for Industrial treatment - Aerobic biological Treatments (Activated sludge process, biological filters, Rotating Biological Contactors (RBC), Anaerobic Biological treatment: Contact Digesters, Packed column reactors, Up flow Anaerobic Sludge Reactor (UASB).

UNIT 3 **Biofertilizers** **8hours**

Use of microbes as biofertilizers and bioinsecticides to improve productivity and crop protection. Bio pesticides: Bacterial (Bt pesticides), fungal (Trichoderma). Role of symbiotic and a symbiotic nitrogen fixing bacteria in the enrichment of soil, Algal and fungal biofertilizers (VAM). Eutrophication.

UNIT 4 **Bioremediation** **8hours**

Definition need and scope of bioremediation: types of bioremediation. Environmental applications of bioremediation, Bioremediation of soil and water contaminated with oil spills, heavy metals and pesticides by soil microorganisms.
Phytoremediation.-Biotechnology in cleaning up the environment by plants. Phytoremediation of heavy metal contaminated soils.

UNIT 5 **Biomass based energy** **8hours**

Role of microbes in energy production, biogas production (Methanogenic bacteria), microbial hydrogen production, ethyl alcohol production from sugarcane and single cell protein (SCP).

Textbooks:

1. Introduction to Environmental Biotechnology by A.K.Chattarji, 2nd Edition, Prentice Hall Publishers.
2. Environmental Biotechnology – Principles and Applications by Bruce E Rittman, Perry. L. Mc.Carty, McGraw Hill Publishers.

References:

1. Microbial Ecology by Ronald. A.Atlas
2. Environmental Biotechnology, SVS Rama, Rastogi Publications**.**

Course Outcomes:

Upon completion of the course the student will be able to

1. Gain knowledge on the scope, role and current status of biotechnology.
2. Know the types of biological processes for industrial treatment and the role of microbes as biofertilizers and biopesticides.
3. Know about the processes and types of bioremediation, phytoremediation and role of biotechnology in production of energy.
4. describe the application of remediation on pollutants
5. appreciate the use of biomass-based energy sources.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	1								1		
CO2		2									1
CO3			1	3						2	
CO4					2	2		1			
CO5		1			1		1		2		3

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN: **BOS**

BOS :04-07-2022 **ACADEMIC COUNCIL: 14-07-2022**

SDG No. 2, 4, 14, 15 & Statement:

Zero Hunger Quality Education Life Below Water Life on Land

SDG Justification:

The student learns End hunger, achieve food security and improved nutrition and promote sustainable agriculture.
Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.
Conserve and sustainably use the oceans, seas and marine resources for sustainable development.
Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

ENVS3061	GLOBAL WARMING AND CLIMATE CHANGE	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

This course illustrates the science of global warming and its impact on Earth's climate. It brings together intuitions and perceptions from physics, chemistry, biology, Earth and atmospheric sciences, and even some economics. It also focuses on various mitigation strategies applicable from the perspectives of developing countries. It mainly focuses on International, National, and regional perspectives on climate change and human rights. It begins by examining the most up-to-date climate research and understanding and advancements in the climate change agenda and its relationship to environmental and human rights law.

Course Educational Objectives:

- To realize the causes and consequences of global climate change.
- To comprehend the past and present scenario of climate.
- To grasp the concept of climate modeling, Carbon sequestration, Functions of Kyoto Protocol.
- To apprehend concepts of clean development mechanism, IPCC, UNFCC and Mitigation measures.
- To promote climate change and mitigation measures

UNIT 1 **Global climate Change** **8 hours**

Evidence, causes and consequences, climate of past, present and future scenarios, concept of climate modeling. Impact on climate change on tropical and temperate regions. Impact of climate change on natural resources and health, causes for climate change, climate change mitigation measures, Adaptation to climate change.

UNIT 2 **Causes for climate change** **8 hours**

Greenhouse effect, sources and trends of greenhouse gases, warming potential of gases. Impacts of global warming, Photosynthetic mechanism and global climate change – case studies. Impact of climate change on India.

UNIT 3 Carbon Sequestration 8 hours

concept, global carbon cycle, carbon sequestration potential in terrestrial and marine ecosystems, anthropogenic impact on carbon sequestration. Forest-Sink of Carbon, Measuring of Carbon Dioxide. Role of forests in climate mitigation potential and its evaluation, land use, land use change and forestry, Policy Perspective: UNFCC, Role and Function of IPCC, Kyoto Protocol and its implication on Developed and developing countries.

UNIT 4 CDM (Clean Development Mechanism) 8 hours

Definition and origin of CDM, CDM potential, and CDM Market today, Carbon credits under Kyoto, Emission markets. IPCC (Intergovernmental Panel on Climate Change) UNFCC (United Nations Framework Convention on Climate Change). National Action plan on climate change.

UNIT 5 Tools to study climate change 8 hours

Mitigation and adaptation strategies for global warming, carbon capture and storage technologies. National action plan on climate change in India. Indian approach towards climate change in agriculture and food, energy consumption, water availability, environmental pollution and protection of biodiversity.

Textbooks:

1. Global Warming and Climate Change by John P. Tiefenbacher, Texas State University
2. Climate Change and Global Warming by Ata Amini, Kurdistan Agricultural and Natural Resources Research and Education Center.

References:

1. Aguado, E. and James, E.B. Understanding weather and climate, Prentice Hall, New Delhi.
2. Gupta, K.R. Encyclopedia of environment global warming: problems and policies, Atlantic Publication, New Delhi.
3. Lovejoy, T.E. and Hannah L. Climate change and biodiversity, TERI press

Course Outcomes:

Upon completion of the course the student will be able to

1. Understands the concept of greenhouse effect.
2. Appraises the case studies at the local level.
3. Characterizes carbon sequestration potential in terrestrial and marine ecosystems.
4. Apprehends the role of policies and protocols to combat pollution.
5. Comprehends the concept of Clean Development Mechanism.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3								1		
CO2		3							2		
CO3				3						2	
CO4						2					
CO5							1				3

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:	**BOS**
BOS :04-07-2022	**ACADEMIC COUNCIL: 14-07-2022**
SDG No. 13 & Statement:	Take urgent action to combat climate change and its impacts.
SDG Justification:	This course illustrates various causes of climate change and helps identify various problems associated with climate change.

ENVS3071	REMOTE SENSING AND GIS	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

Remote Sensing is the science of acquiring information about an object or a phenomenon kept at a distance. This course provides basic understanding about Remote Sensing and GIS. Remote sensing is a powerful tool to study landscapes, which involves extracting information from spectral images and then analyzing them to interpret earth surface processes. On the other hand, Geographic Information system (GIS) is a software tool used for creating, managing, analyzing and mapping various types of data.

Course Educational Objectives:

- To describe the fundamental principles of remote sensing.
- To familiarize students with different types of aerial photographs
- To describe basics and components of Geographical Information Systems.
- To provide exposure on applications of remote sensing for the environment.
- To comprehend applications of remote sensing and GIS for pollution monitoring.

UNIT – I Fundamental principles of Remote Sensing 12 hours

Definition and Overview of Remote Sensing; History and Evolution of Remote Sensing and Remote Sensing Systems.

Electromagnetic energy and its atmospheric interactions; Remote Sensing Data Acquisition

UNIT – II Elements of Image interpretation 12 hours

Elements of Image interpretation. Aerial photo-classification, distortions caused due to flight irregularities, overlaps, scale, relief displacement and its effects.

Different types of photographs – their advantages and disadvantages.

UNIT – III **Fundamentals of GIS** **12 hours**

Fundamentals of GIS - Role of information technology in human health.

Weather forecasting, Agro meteorology

UNIT – IV **Applications of Remote Sensing and GIS** **12 hours**

Applications of Remote Sensing and GIS in Water Resources management.

Mining – Urbanization

UNIT – V **Environmental Applications of GIS** **12 hours**

Environmental Applications of GIS – Pollution Monitoring – Water – Air

Oil Pollution – Desertification

Text Book(s)

1. Remote Sensing and Image Interpretation by Thomas Lillesand, Ralph W. Kiefer, Jonathan Chipman. 2015, 7th Edition, John Wiley & Sons, USA, Inc. ISBN: 978-1-118-34328-9 (Units 1 to 5)
2. Basic Concept of Remote Sensing, GPS and GIS by Shivam Pandey. 2020, 1st Edition, Sankalp Publication, India, ISBN: 9788194778011 (Units 1 to 5)

Reference Book(s):

1. Concepts of Cartography, Remote Sensing and GIS Paperback by K.K. Maltiar & S.R. Maltiar, 2019, 1st Edition, Rajesh Publications, India. ISBN: 9789383684847 (Unit 1)
2. Application of GIS and Remote Sensing in Environmental Management by Shahid A. Abbasi, K. B. Chari. 2005, 1st Edition. Discovery Publishing House, India. ISBN 9788171419630 (Units 3 to 5)
3. Remote Sensing and GIS by Basudeb Bhatta, 2021. 3rd Revised edition, Oxford University Press India, India, ISBN 13: 978-0199496648 (Units 1 to 3)

Course Outcomes:

Upon completion of the course the student will be able to

1. Learn fundamental principles of remote sensing.
2. Grasp various types of aerial photographs
3. Understand basics and components of Geographical Information Systems.
4. Gain knowledge on applications of remote sensing for the environment.
5. Will realize applications of remote sensing and GIS for pollution monitoring.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	2							2			
CO2	1							1			
CO3		1								1	
CO4				2					1		
CO5				2							1
					2				2		

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN: **BOS**
BOS : 04-07-22 **ACADEMIC COUNCIL:14-07-22**

SDG No.4, 11 & Statement: Quality Education
Sustainable Cities and Communities

SDG Justification:

- The Course prepares students to be inclusive and have equitable quality education, promoting lifelong learning opportunities.
- The Course disseminates knowledge on making cities and human settlements inclusive, safe, resilient and sustainable through remote sensing techniques.

ENVS3071	GREEN TECHNOLOGIES	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

The course content includes concepts of green technologies, green chemistry, applications of green technology which help student in understanding the modern and green technologies available

Course Objectives:

- To understand the concept of green technologies and their need in the contemporary scenario.
- Appreciate techniques for waste minimization leading to Zero emissions.
- Evaluate biological remediation of various pollutants.
- Comprehend nano materials for removing pollutants.
- Appraise applications of green technology for a sustainable environment.

UNIT - I Overview, Principle, concepts and tools of Green technology 8 hours

Overview of green chemistry, chemistry of the atmosphere, principles of sustainable and green chemistry. Basic principles of green technology, concepts of atom economy and carbon trading, tools of green technology.

UNIT - II 8 hours

Waste minimization techniques, waste minimization and climate change, zero emission technology, industrial ecology, greenhouse effect, climate change, photochemical smog.

UNIT - III Biological remediation 8 hours

In situ and Ex situ bioremediation; evaluating Bioremediation; Bioremediation of VOCs. Phytoremediation – concept, types and mechanism involved in phytoremediation.

UNIT- IV **Green Nanotechnology** **8 hours**

Introduction to Nanomaterials and green nanotechnology, fullerene, carbon nanotubes, nanoparticles; green nanoparticle production and characterization, use of nanotechnologies and materials impact on biodiversity, resource conservation, ecosystems and humans.

UNIT - V **Green technology applications** **8 hours**

energy from alternate sources, solar energy and solar photovoltaic technology, Biofuel production (bio-ethanol and biodiesel), prevention/minimization of hazardous/toxic products. Concept of green building.

Textbooks:

1. M. H. Fulekar. Nanotechnology Importance and applications, I K international publishing house Pvt.Ltd.
2. Lynn Goldman, Christine Coussens, Implications of nanotechnology for environmental health research, National Academic Press, Washington.
3. Matlack, A. S. Introduction to Green Chemistry. Marcel Dekker: New York.
4. Anastas, P. T.; Warner, J. C. Green Chemistry: Theory and Practice. Oxford Univ. Press: Oxford.

References:

1. Lynn E. Foster: Nanotechnology: Science, Innovation, and Opportunity. Prentice Hall
2. Fei Wang & Akhlesh Lakhtakia (eds). Selected Papers on Nanotechnology—Theory &Modeling (Milestone Volume 182). SPIE Press
3. Caye Drapcho, Nhuan PhúNghiêm, Terry Walker. Biofuels Engineering Process Technology. [McGraw-Hill].
4. AkhleshLakhtakia (ed). The Handbook of Nanotechnology. Nanometer Structures: Theory, Modeling, and Simulation. SPIE Press, Bellingham, WA, USA

Course Outcomes:

Upon completion of the course the student will be able to

1. Gain knowledge on principles, tools and applications of green technology.
2. Acknowledge methods and techniques available for waste minimization.
3. Appreciate techniques of bioremediation and its types.
4. Cognize pollutant removal through nano materials.
5. Recognize the applications of green technology.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	1								1		
CO2		2									1
CO3			1	3						2	
CO4					2	2		1			
CO5		1			1		1		2		3

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN: **BOS**

BOS : 04-07-22 **ACADEMIC COUNCIL:14-07-22**

SDG No.4 & Statement: Quality Education

SDG Justification:

The Course prepares students to be inclusive and have equitable quality education, promoting lifelong learning opportunities.

ENVS3081	ENVIRONMENT AND SANITATION	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	None						

Course Description:

This course aimed to concentrate on the importance of environmental conditions and personal sanitation in an individual's health. This course gives information about categorizing different sanitation systems and technologies and identifies and also selects criteria for the selection of sanitation technology appropriate for a community.

Course Educational Objectives:

- To impart importance of health and role of environmental sanitation.
- To familiarize learners about the types of diseases, water borne diseases and low-cost sanitation methods.
- To introduce learners about indoor sanitation.
- To make learners aware about illumination
- To acquaint learns about institutional sanitation

UNIT - I **Public Health** **8 hours**

Definition, Health and disease. Components of Epidemiology and health, types of diseases. Determinants of health. Concept of disease: Causative agent, host factor and modes of transmission of disease. Disease Prevention and Control. Environmental Sanitation: History of sanitation. Definition, Concept and importance of Environmental Sanitation. Rural and urban sanitation. Rural sanitation in India. Urban sanitation in India.

UNIT - II **Water sanitation** **8 hours**

Sources of water. Impurities of water and water quality. Water-borne diseases (intestinal diseases). Protection of water storage in reservoirs, wells and overhead tanks. Purification of water on a small scale (household level and small communities).

UNIT- III **Low Cost Sanitation** **8 hours**

Existing scenario of waste disposal systems. Health and socio-economic criteria for low cost sanitary Privies. Night soil and excreta disposal. Insect vector and rodent control: Mosquitoes, rodent and house fly: habits, life cycle, diseases and their control measures.

UNIT- IV **Indoor sanitation** **8 hours**

Principles of indoor sanitation. Ventilation: type of ventilation and standards for ventilation. Lighting and illumination: Requirement of good lighting, measurement of light, sources of lighting, types of illumination, standards for illumination. Air disinfection, thermal comfort and Noise control in indoor environments.

UNIT - V **Institutional Sanitation** **8 hours**

Sanitation in Schools. Sanitation of hospitals and nursing homes. Sanitation in restaurants and fairs. Sanitation at public bathing places and swimming pool sanitation.

Textbooks:

1. Environmental Sanitation (Social and Preventive Medicine) I edition by K.V.S.G. Murali Krishna and P.V. Rama Raju, Environmental Protection Society, Kakinada
2. Municipal and Rural Sanitation Sixth Edition by Victor M. Ehler and Ernest W. Steel. Tata Mc Graw-Hill Publishing Company.

References:

1. Environmental Sanitation by Baljeet S. Kapoor, S. Chand & Company Limited, 1st Edition
2. Text Book of Environmental Engineering by P. Venugopala Rao, PHI Learning Private Ltd., 7th Edition.

Course Outcomes:

Upon completion of the course the student will be able to

1. Gain knowledge on the types of diseases, importance of sanitation.
2. Know the importance of water sanitation
3. Outline low-cost sanitation methods.
4. Know about the importance of indoor sanitation
5. Conclude institutional sanitation.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	1								1		
CO2		2									1
CO3			1	3						2	
CO4					2	2		1			
CO5		1			1		1		2		3

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

APPROVED IN:	**BOS**
BOS :04-07-22	**ACADEMIC COUNCIL: 14-07-22**
SDG No. & Statement: SDG-6	Clean water and Sanitation
SDG Justification:	The learner will understand the importance of clean water and sanitation through this course and apply in their daily activities