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

Accredited by NAAC with A^{++} Grade

CURRICULUM AND SYLLABUS

OF

UPHYS06 B.Sc. Electronics

w.e.f. 2021-22 admitted batch

(Updated up to May 2024)

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.

UPHYS06 B.Sc. Electronics

VISION AND MISSION OF THE SCHOOL

VISION

To nurture outstanding science education and to build a vibrant, world class research & innovation ecosystem.

MISSION

1. To provide a flexible and adaptive curriculum that emphasizes experiential learning to allow students to realize their full potential.

2. Develop high impact research knowledge and solutions to improve communities in which we live.

3. To promote a culture of healthy curiosity, enterprising mindset, and keen desire to contribute to society.

4. To inculcate empathy, integrity, trust with a strong commitment towards society and environment among the GITAM fraternity.

UPHYS06 B.Sc. Electronics

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

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO 1 Acquire knowledge with understanding of various devices

PEO 2 Implement of devices with circuit diagrams for its characteristics

PEO 3 Design of circuits for suitable application

PEO 4 Simulation by development of algorithm or program for output and Compare performance of devices

Mapping of the Mission of the School with the PEOs

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

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

At the end of the Programme the students would be able to:

PO1	To understand the basic circuits and explore the fundamental concepts of electronics
PO2	To identify, formulate, solve, and analyse the problems in various disciplines of electronics
PO3	To carry out experiments to understand the circuits and concepts of Electronics
PO4	To design and manage electronic systems or processes that conforms to a given specification circuits
PO5	To use techniques, skills, and modern technological/ scientific/ software/ tools for professional practices
PO6	Providing a hands-on learning experience such as in designing the circuit and analysing through simulation
PSO1	Students will understand in detail the concepts of electronics
PSO2	Students perform experiments independently and individually with different hardware and software compilers
PSO3	Gain expertise with experiments performed and verify with online resources available performing experiment with simulation
PSO4	To motivate the students to pursue higher education in reputed institutions and acquire a job efficiently in diverse fields

Curriculum Structure

(Flexible 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**
MATH1151	1	Differential Calculus	3	0	0	0	0	3
CHEM1011	1	Chemistry I	3	0	0	0	0	3
CHEM1041	1	Chemistry Lab I	0	0	2	0	0	1
MATH1161	1	Differential Calculus Lab	0	0	2	0	0	1
PHYS1111	1	Mechanics	3	0	0	0	0	3
PHYS1121	1	Mechanics Lab	0	0	2	0	0	1
PHYS1131	1	Basic Circuit Theory	3	0	0	0	0	3
PHYS1141	1	Basic Circuit Theory Lab	0	0	2	0	0	1
PHYS1231	1	Basic Instrumentation Skills	2	0	0	0	0	2

Program Core courses for B.Sc. Electronics								
Course code	**Level**	**Course Title**	**L**	**T**	**P**	**J**	**S**	**C**
PHYS1191	1	Electronic Devices & Circuits	3	0	0	0	0	3
PHYS1211	1	Digital Electronics	3	0	0	0	0	3
PHYS1201	1	Electronic Devices & Circuits Lab	0	0	2	0	0	1
PHYS1221	1	Digital Electronics Lab	0	0	2	0	0	1

PHYS2061	2	Analog & Digital IC Applications	3	0	0	0	0	3
PHYS2081	2	Basic Electronic Instrumentation	3	0	0	0	0	3
PHYS3081	2	Programming Language in C and C++	3	0	0	0	0	3
PHYS2071	2	Analog & Digital IC Applications Lab	0	0	2	0	0	1
PHYS2091	2	Basic Electronic Instrumentation Lab	0	0	2	0	0	1
PHYS3091	2	Programming Language in C and C++ Lab	0	0	2	0	0	1
PHYS2101	3	Microcontrollers& Applications	3	0	0	0	0	3
PHYS2111	3	Microcontrollers& Applications Lab	0	0	2	0	0	1
PHYS3061	3	Electronic communications	3	0	0	0	0	3
PHYS3101	3	Introduction to Embedded systems	3	0	0	0	0	3
PHYS3111	3	Embedded systems Lab	0	0	2	0	0	1
PHYS3071	3	Electronic Communications Lab	0	0	2	0	0	1

Program Elective courses for **B.Sc. Electronics**

Course code	**Level**	**Course Title**	**L**	**T**	**P**	**J**	**S**	**C**
PHYS2161	2	Microprocessors (Intel 8085)	3	0	0	0	0	3
PHYS2171	2	Microprocessors (Intel 8085) Lab	0	0	2	0	0	1
PHYS2221	2	Mathematical Method and analysis with Simulation	3	0	0	0	0	3
PHYS2231	2	Mathematical Method and analysis with Simulation Lab	0	0	2	0	0	1
PHYS2181	2	Fundamentals of Signals and Systems	3	0	0	0	0	3
PHYS2191	2	Modern Digital Design	3	0	0	0	0	3
PHYS3141	2	Environmental Physics	3	0	0	0	0	3
PHYS2251	2	Electronics and Instrumentation	3	0	0	0	0	3
PHYS3171	3	Bio sensors	3	0	0	0	0	3
PHYS3151	3	Principles of VLSI Design	3	0	0	0	0	3
PHYS3161	3	Introduction to Radar Systems	3	0	0	0	0	3
PHYS2201	3	Computational methods in Physics	3	0	0	0	0	3
PHYS3131	3	Essentials of Biophysics	3	0	0	0	0	3

**Students can choose any 5 courses from the program elective and should acquire a minimum of 16 credits.*

**If students opt from PHYS2161 or xxxxx must choose the corresponding lab course also*

Minor courses in Electronics

Course code	Level	Course Title	L	T	P	J	S	C
PHYS1191	1	Electronic Devices & Circuits	3	0	0	0	0	3
PHYS1201	1	Electronic Devices & Circuits Lab	0	0	2	0	0	1
PHYS1211	2	Digital Electronics	3	0	0	0	0	3
PHYS2061	2	Analog & Digital IC Applications	3	0	0	0	0	3
PHYS2081	2	Basic Electronic Instrumentation	3	0	0	0	0	3
PHYS2101	2	Microcontrollers& Applications	3	0	0	0	0	3
PHYS2111	2	Microcontrollers& Applications Lab	0	0	2	0	0	1
PHYS3061	3	Electronic communications	3	0	0	0	0	3
PHYS3071	3	Electronic Communications Lab	0	0	2	0	0	1
PHYS3101	3	Introduction to Embedded systems	3	0	0	0	0	3
* Eligibility: This minor course is offered to the students of B.Sc. Physics/Mathematics/Chemistry/Statistics/Data Science								

Eligible MINOR courses to be offered to the students of B.Sc. Electronics Program		
Stream	**Major course**	**Minor course (Select one)**
Physical Science	Electronics	Physics
		Mathematics
		Statistics
		Chemistry
		Data Science

Students pursuing 4th year of the B.Sc. Electronics programme need to choose either Honours or Honours with Research courses from the following tables respectively.

Honours Courses

Minimum number of credits to be earned is 40, out of which 8 credits must be earned through Minor Enhancement courses.

Minor Enhancement course to be chosen in the specialization the student has studied the Minor.

Course code	Level	Course Title	L	T	P	J	S	C
PHYS4091	400	Biomedical Instrumentation	4	0	0	0	0	4
PHYS4161	400	Advanced embedded systems	4	0	0	0	0	4
PHYS4101	400	Sensors and transducers	4	0	0	0	0	4
PHYS4121	400	Nanoelectronics	4	0	0	0	0	4
PHYS4131	400	Energy storage Devices	4	0	0	0	0	4
PHYS4041	400	Quantum Information and Computation	4	0	0	0	0	4
DIST4555	400	Research Project	0	0	0	16	0	8
		Total						**32**

Honours with Research Courses

Minimum number of credits to be earned is 40 out of which 20 credits must be earned through Research Project / Dissertation and 8 credit must be earned through Minor Enhancement course.

Minor Enhancement course to be chosen in the specialization the student has studied the Minor.

Course code	Level	Course Title	L	T	P	J	S	C
PHYS4091	400	Biomedical Instrumentation	4	0	0	0	0	4
PHYS4161	400	Advanced embedded systems	4	0	0	0	0	4
DIST4666	400	Dissertation – I	0	0	0	16	0	8
PHYS4131	400	Energy storage Devices	4	0	0	0	0	4
DIST4777	400	Dissertation – II	0	0	0	24	0	12
		Total						**32**

Minor Enhancement Courses

Mathematics								
Course code	**Level**	**Course Title**	**L**	**T**	**P**	**S**	**J**	**C**
MATH4521	400	General Operations Research	4	0	0	0	0	4
MATH4421	400	Optimization Techniques and Decision Modelling	4	0	0	0	0	4

Statistics								
Course code	**Level**	**Course Title**	**L**	**T**	**P**	**S**	**J**	**C**
MATH4431	400	Advanced AI Techniques	4	0	0	0	0	4
MATH4451	400	Visual Analytics and Dashboard Design	4	0	0	0	0	4

Chemistry (Opt Any Two Courses)								
Course code	**Level**	**Course Title**	**L**	**T**	**P**	**S**	**J**	**C**
CHEM4001	400	Advanced Inorganic Chemistry-1	3	0	2	0	0	4
CHEM4011	400	Advanced Organic Chemistry -1	3	0	2	0	0	4
CHEM4021	400	Advanced Physical Chemistry -1	3	0	2	0	0	4
CHEM4031	400	Advanced Analytical Chemistry -1	3	0	2	0	0	4
CHEM4041	400	Advanced Inorganic Chemistry-2	3	0	2	0	0	4
CHEM4051	400	Advanced Organic Chemistry-2	3	0	2	0	0	4
CHEM4061	400	Advanced Physical Chemistry-2	3	0	2	0	0	4
CHEM4071	400	Advanced Analytical Chemistry-2	3	0	2	0	0	4
CHEM4081	400	Medicinal Chemistry	3	0	2	0	0	4
CHEM4131	400	Regulatory affairs and Quality assurance	3	1	0	0	0	4

Data Science (Choose Any Set from following Courses)								
Course code	**Level**	**Course Title**	**L**	**T**	**P**	**S**	**J**	**C**
SET A								
CSCI4021	400	Fundamentals of Big Data Analytics	3	0	0	0	0	3
CSCI4031	400	Fundamentals of Big Data Analytics Laboratory	0	0	2	0	0	1
SET B								
CSCI4041	400	Cryptography	3	0	0	0	0	3
CSCI4051	400	Cryptographic Laboratory	0	0	2	0	0	1
		SET C						
CSCI4061	400	Web Analytics	3	0	0	0	0	3
CSCI4071	400	Web Analytics Laboratory	0	0	2	0	0	1
SET D								
CSCI4081	400	Advanced Python Programming	3	0	0	0	0	3
CSCI4091	400	Advanced Python Programming Laboratory	0	0	2	0	0	1

Allocation of credits for 3-year and 4-year B.Sc. Program						
	3-year B.Sc. Program		4-year B.Sc. Program (Honours)		4-year B.Sc. Program (Honours with Research)	
Type of Course	**Credits**	**% Of Program (in credits)**	**Credits**	**% Of Program (in credits)**	**Credits**	**% Of Program (in credits)**
University Core	12	10%	12	7.5%	12	7.5%
Faculty Core	18	15%	26	16.25%	38	23.75%
Major Core	32	26%	56	35%	44	27.50%
Major Electives	16	14%	16	10%	16	10%
Program Minor	24	20%	32	20%	32	20%
Open elective	18	15%	18	11.25%	18	11.25%
Total	120	100%	160	100%	160	100%

Course PO Mapping

Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
PHYS1111	Mechanics	M					L	L	M	M	L	M
PHYS1121	Mechanics lab	M				L	L	L	M	M	L	L
PHYS1131	Basic Circuit Theory	M			L	M	M	H	M	M	0	M
PHYS1141	Basic Circuit Theory Lab	L	M	L	M	L	M	L	M	H	L	M
PHYS1231	Basic Instrumentation Skills	L	M	M	H	M	L	L	M	M	L	H
PHYS1191	Electronic Devices and Circuits	M	0	0	L	M	M	M	L	M	0	M
PHYS1201	Electronic Devices & Circuits Lab	L	M	M	M	L	M	0	M	M	0	L
PHYS1211	Digital Electronics	M	0	0	L	M	M	M	L	M	0	M
PHYS1221	Digital Electronics Lab	M	M	M	M	M	M	M	M	M	M	H
PHYS2061	Analog & Digital IC Applications	M	L	0	M	L	L	M	M	M	M	M
PHYS2071	Analog & Digital IC Applications Lab	M	L	M	M	M	M	L	M	H	M	H
PHYS2081	Basic Electronic Instrumentation	M	L	0	M	L	L	M	M	M	M	L

PHYS2091	Basic Electronic Instrumentation Lab	M	M	H	M	H	M	H	M	M	H	M
PHYS3081	Programming Language in C Language and C++	L	0	0	M	M	M	M	L	M	M	L
PHYS3091	Programming Language in C Language and C++ Lab	L	H	M	M	H	M	M	M	M	H	M
PHYS2101	Microcontrollers & Applications	M	0	0	M	M	M	M	M	M	M	M
PHYS2111	Microcontrollers & Applications Lab	M	L	0	H	M	M	H	M	M	H	L
PHYS3061	Electronic Communications	M	L	M	L	M	H	M	M	H	M	M
PHYS3071	Electronic Communications lab	L	M	L	M	L	L	M	M	M	M	M
PHYS3111	Introduction to Embedded systems Lab	H	L	0	H	L	M	M	H	M	M	M
PHYS3101	Introduction to Embedded systems	M	L	M	H	M	M	H	M	H	M	H
PHYS2161	Microprocessors (Intel 8085)	M	L	M	M	H	M	H	L	M	M	H
PHYS2171	Microprocessors (Intel 8085) Lab	L	L	M	L	L	H	H	L	M	L	M
PHYS2221	Mathematical Method and analysis with Simulation	M	0	0	M	M	H	H	M	H	M	0
PHYS2231	Mathematical Method and analysis with Simulation Lab	M	M	H	H	M	H	M	0	M	M	L
PHYS2181	Signals and Systems	M	L	M	L	M	H	M	H	M	H	M
PHYS2191	Modern Digital Design	M	L	L	M	H	L	M	H	M	M	H
PHYS3171	Biosensors	M	L	L	M	H	M	M	L	H	M	M
PHYS3151	VLSI Design	H	L	M	M	L	M	M	H	L	L	M
PHYS3161	Radar Systems	M	L	L	H	M	M	H	M	L	M	H
PHYS2201	Computational Methods in Physics	L	0	0	L	M	L	H	L	0	0	0
PHYS3131	Essentials of Biophysics	M	L	L	0	L	L	M	L	L	0	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.

10 hours

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, bibilography, 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 a 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 smartdraw
10. Create a website of his interest.

Text Books:

1. Katherin 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	PSO1	PSO2	PSO3	PSO4
CO1					2				1	1	
CO2					2				1	1	
CO3	2	1	1		2				1	1	
CO4					2				1	1	
CO5					2				3	3	

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

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 almost all competitive examinations and admission tests. Upon completion, students should be able (1) to deal with theirown emotions as well as the emotions of others and relate better with both. Using better knowledgeof 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 andUnhealthy 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 awebsite to showcase 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 inteams effectively
4. Students will be able to solve questions based on non-verbal and analytical reasoning, datasufficiency 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 messageto 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 tocommunicate 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 solvequestions that often appear in various competitive examinations and admission tests.
- Apply different concepts for tackling questions based on data interpretation, progression and series thatare 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	5

	Listening, Asking Questions, Empathizing, Being Non-Judgmental, Being 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 andVoice, Start Strongly, Organizing Ideas & Using Visual Aids: SPAM Model, EffectiveOpening 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 RationalApproach to Problem Solving: Defining the Problem, Identifying the Root Causes, Generating Alternative Solutions, Evaluating and Selecting Solutions, Implementingand 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 makingin 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 basesystem (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 & WordOrder, 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	None						

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 MeenakshiUpadhyay
2. Study material for CAT, SAT, GRE, GMAT by TIME, CareerLauncher and IMSetc.
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, TextCompletion, 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 MeenakshiUpadhyay
2. Study material for CAT, SAT, GRE, GMAT by TIME, CareerLauncher and IMSetc.
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 testsas 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 andIMS 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 IMSetc.
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 theirhigher 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 MeenakshiUpadhyay
2. Study material for CAT, SAT, GRE, GMAT by TIME, CareerLauncher and IMSetc.
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 MeenakshiUpadhyay
2. Study material for CAT, SAT, GRE, GMAT by TIME, CareerLauncher and IMSetc.
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 aslisted 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-curicular 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, 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. 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 organizationsthrough 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

- 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 organizationsthrough 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-curicular 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 behaviour 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 Rogat 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)

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 existfor providing service to communities. These activities allow students to develop leadership, management skills, empathy, citizenship behavior 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 60nstagram account)
4. Two learning papers (one per semester)

Textbooks:

1. Soul of a citizen: living with conviction in Challenging times (author: Paul Rogat 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 fellowstudents
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

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.

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, throwins, 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:

1. 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	PS01	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, defense
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	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 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 buildingconcept.
- To make learners understand about the present population scenario, its impacts and role ofinformational 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 InternationalPublishers 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 andSolutions. 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 ofour 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 : 01-02-2022 **ACADEMIC COUNCIL: 01-04-2022**

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 variationsin 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/english-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. **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 tothe content, context maintaining modalities	Group role-play in a con text (i.e. Identifying the situation and different roles and enacting theirroles)
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 (unfamiliarcontext); demonstration by teacher, learners' task (guided with scaffolding), learners' task (free), presentation and feedback	Pre-reading game/modelling, discussion in smallgroups, 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 aformal context
6	Introducing friends to family and vice versa -Informal context	Teacher modelling/AV support, noticing structure & note-taking, Introducing friends andfamily in an informal context
7	Vocabulary in context: Find clues in a text and usethem 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 andlistening to discussions/talks
8	A five-day journal (diary) writing based on learners reading from newspaper on a singlerelevant/ current social issue. Individual oral presentation and feedback from peers andinstructor.	Note-making (group work), Discussion, Feedback

9	Follow the essentials of lectures, talks, discussions, reports and other forms of academicpresentations and mak2 individual and group presentations aided with images, audio, video, tabular data, etc.	Making power point presentation aided with images, audio, video, etc. with a small group bylistening to academic lectures/talks/ discussions,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 textsby 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), generaldiscussion on structure, group work (collaboration), feedback
12	Independent reading of different text types using appropriate reference sources by adapting suitablereading styles and speed. Focus on active reading for vocabulary: low-frequency collocations andidiomatic 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 fellowspeakers/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 andgrammatical 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. FoundationBooks. 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 bySarah 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/english-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-specifictopics, 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 smallgroup discussions sharing experiences/views on familiar contemporary issues and give reasonsfor 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 subjectsof 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, responsesto 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. anaytical, evaluative and extra-polative 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 emhasizes free writing through meaningfully engaging tasks witha 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 theircomprehension 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 skillsand 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 longtext/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 reflectionand brief presentation of thoughts/ideas/opinions on the themeof 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 conventions of formal and polite speech, and managing bias	Listening to group discussions/ debates, reading news-paper articles on the current issues and expressing opinions in favour or against the topic (in GDs, debates or writing argumentativeessays).	3
6	Role-play (complex social and academic/professional situations): Focus on significant aspects of	Reading newspaper/ magazine articles/ blog posts on current social issues, listening to talks/	1

	delivery including clarity, tone, and use of contextually appropriate vocabulary and conventions, observation, reflective discussion, and self-reflective writing	discussions/ debates etc. and participating in role-plays using expressions appropriate to the context.	
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), presnetation, peer feedback, Open-class discussion	5
8	Formal Group Discussion on topics of currentinterest 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 scafolding though open-house discussion, Note-making (Group work), Group Discussion (free), post perfromance 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 disgreeing 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 fourjudges (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	Reading texts on abstract topics and	3

	topics beyond his/her own area of interest/field of study, using the language flexibly and effectively.	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.	
14	Self-relfection on own speech in context(recorded): tone, pitch, relevance, content; extending the reflections/ideas toothers	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 MartinHewings 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:

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/english-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/widelyaccepted 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

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

MATH1151	DIFFERENTIAL CALCULUS	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**None**						

Course Description:

Differential Calculus provides information about limits, continuity, differentiation, and partial differentiation. The focus of the course is to study the limits and continuity, applications of partial differentiation, tracing of curves in Cartesian coordinates and Polar coordinates and mean value theorem on differentiation.

Course Educational Objectives:

- To introduce Basic properties of continuity and differentiation
- Partial differentiation and application of theorem
- Tracing of curves and to find tangents and normal
- Rolle's theorem and mean value theorem
- Expansion of the function using series and series

UNIT 1 **8 hours**

Limit and Continuity (ε and δ definition), Types of discontinuities, Differentiability of functions, Successive differentiation, Leibnitz's theorem.

UNIT 2 **8 hours**

Partial differentiation, theorem on homogeneous functions.

UNIT 3 **8 hours**

Tangents and normals, Curvature, Asymptotes, Singular points, Tracing of curves, Parametric representation of curves and tracing of parametric curves, Polar coordinates, and tracing of curves in polar coordinates.

UNIT 4 **8 hours**

Rolle's theorem, Mean Value theorems, Taylor's theorem with Lagrange's and Cauchy's forms of remainder

UNIT 5 **8 hours**

Taylor's series, Maclaurin's series of sin x, cos x, e^x, log(l+x), $(l+x)^m$, Maxima and Minima, Indeterminate forms

Textbooks:

1. Elements of Real Analysis" by Shanthi Narayan and Dr. M.D. Raisinghania, published by S. Chand& Company Ltd., New Delhi
2. "A Textbook of B.Sc. Mathematics Volume-II" by P. Venkateswara Rao, N Krishna Murthy, B.V.S.S. Sarma and S. Anjaneya Sastry, published by S. Chand& Company Ltd., New Delhi.

References:

1. Calculus Single Variable" by Howard Anton, Irl Bivens and Stephen Davis, published by John Wiley and Sons, Inc., 2002.
2. Calculus and Analytic Geometry" by George B. Thomas, Jr. and Ross L. Finney, published by Pearson Education, 2007, 9th edition.

Course Outcomes:

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

1. Define the basic properties of limits and continuity
2. Explain different types of discontinuities
3. Trace the parametric curves
4. Evaluate Taylor's theorem with Lagrange's and Cauchy's forms of remainder
5. Evaluate Maxima and minima of a function

CO-PO Mapping:

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

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

APPROVED IN:

BOS : 13-09-2021 **ACADEMIC COUNCIL: 17-09-2021**

SDG No. & Statement: 4

Ensuing an inclusive and equitable quality education for all persons and promoting lifelong learning opportunities

SDG Justification:

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

MATH1161	DIFFERENTIAL CALCULUS LAB	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	**MATH1151: Differential Calculus**						
Co-requisite	**MATH1151: Differential Calculus**						
Preferable exposure	**None**						

Course Description:

Differential Calculus provides information about limits, continuity, differentiation, and partial differentiation. The focus of the course is to study the limits and continuity, applications of partial differentiation, tracing of curves in Cartesian coordinates and Polar coordinates and mean value theorem on differentiation.

Course Educational Objectives:

- To introduce Basic properties of continuity and differentiation
- Partial differentiation and application of theorem
- Tracing of curves and to find tangents and normal
- Rolle's theorem and mean value theorem
- Expansion of the function using series and series

1. Problems on Limits and Continuity
2. Problems on Partial differentiation
3. Problems on Euler's theorem
4. Problems on Tangents and normals
5. Tracing of curves
6. Problems on Rolle's theorem
7. Problems on Mean value theorems
8. Problems on Taylor's theorem
9. Problems on Taylor's and Maclaurin's series
10. Problems on Maxima and Minima

Course Outcomes:

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

1. Define the basic properties of limits and continuity
2. Explain different types of discontinuities
3. Trace the parametric curves
4. Evaluate Taylor's theorem with Lagrange's and Cauchy's forms of remainder
5. Evaluate Maxima and minima of a function

CO-PO Mapping:

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

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

APPROVED IN:

BOS : 13-09-2021 **ACADEMIC COUNCIL: 17-09-2021**

SDG No. & Statement: 4

Ensuing an inclusive and equitable quality education for all persons and promoting lifelong learning opportunities

SDG Justification:

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

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 **9 Hours**

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.

Learning Outcomes

The students will learn synthetic reactions, mechanism and properties of aromatic alcohol,

aromatic and aliphatic ether, aldehydes and ketones.

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.
3. Huheey, J.E., Keiter, E.A., Keiter, R.L. & Medhi, O.K. Inorganic 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	PSO 1	PSO 2	PSO 3	PSO 4
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

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

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, dichrometry 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 aminoacids 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.

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

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

Co-Po Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2	PSO 3	PSO 4
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

PHYS1111	MECHANICS	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	Laws of Motion						

Course Description:

To introduce operators, simple coordinate systems and its relevance to particles, rigid bodies and extending to strings and bars. Introductory aspects of relativity were realized for energy and mass relation

Course Educational Objectives:

The student will determine equation of motion for systems and rigid bodies with concepts of Scalar and vector fields. Understand new concepts like Fourier coefficients and special theory of relativity.

UNIT 1 **Vector Analysis** **9 hours**

Scalar and vector fields, gradient of a scalar field and its physical significance. Divergence and curl of a vector field with derivations and physical interpretation. Vector integration (line, surface, and volume), Statement and proof of Gauss and Stokes theorems., Cartesian, Curvilinear and Spherical coordinate systems.

UNIT 2 **Mechanics of Rigid bodies:** **9 hours**

Laws of motion, motion of variable mass system, motion of a rocket. Conservation of energy and momentum, Collisions in two and three dimensions, Concept of impact parameter, scattering cross-section, Rutherford scattering-derivation.

UNIT 3 **Mechanics of Rigid bodies and Complex vibrations** **9 hours**

Mechanics of Rigid bodies:

Definition of rigid body, rotational kinematic relations, equation of motion for a rotating body, angular momentum, Euler equation, precession of a top. Gyroscope, precession of the equinoxes**.**

Complex vibrations

Fourier theorem and evaluation of the Fourier coefficients, Fourier analysis of - square wave, triangular wave, saw tooth wave.

UNIT 4 Vibrating strings and Bars 9 hours

Transverse wave propagation and velocity along a stretched string, Energy transport and transverse impedance. Longitudinal vibrations in bars-wave equation and its general solution. Special cases

i) bar fixed at both ends ii) bar fixed at the midpoint iii) bar free at both ends iv) bar fixed at one end.

UNIT 5 Introduction to Relativity 9 hours

Frame of reference, Galilian transformations, Galilian invariance, Postulates of Special Theory of Relativity, Lorentz transformations of space and time(Qualitative), Length contraction. Time dilation. Relativistic addition of velocities. Variation of mass with velocity, Einstein's Mass energyrelation.

Textbooks:

1. B.Sc. Physics Vol.I, Telugu Academy, Hyderabad
2. Mechanics & Properties of Matter, J.C. Upadhyaya, Himalaya Publishing House, Mumbai,2015.
3. Unified Physics Vol.I, Mechanics, Waves & Oscillations, S.L.Gupta and Sanjeev Gupta, JaiPrakash Nath& Co., Meerut

References:

1. Fundamentals of Physics Vol. I - Resnick-Halliday-Krane, Wiley India 2007
2. College Physics-I. T. Bhimasankaram and G. Prasad. Himalaya Publishing House.
3. University Physics-FW Sears, MW Zemansky& HD Young, Narosa Publications, Delhi
4. Mechanics, S.G.Venkatachalapathy, Margham Publication, 2003

Course Outcomes:

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

1. Applying different type of operators and understanding coordinate systems
2. Understand motion of particles and interpret its conservation laws
3. Realize rigid bodies for its equation of motion
4. Analyze equation of motion of strings and bars
5. Understand the concept of relativity

CO-PO Mapping:

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

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

APPROVED IN:

BOS : 01-02- 2022 **ACADEMIC COUNCIL: 01-04- 2022**

SDG No. & Statement: 04: Quality Education

SDG Justification: Quality Education in Higher Studies

PHYS1121	MECHANICS LAB	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	Understand motion when subjected to forces or displacements						

Course Description:

The course is intended to determine the various physical constants using simple experiments and understand the governing laws in these experiments.

Course Educational Objectives:

- Understand principle of acceleration due to gravity
- Determine physical constants
- Analyze and Interpret physical laws of motion

List of Experiments

1. Determination of' g' by compound/bar pendulum
2. Determination of the force constant of spring.
3. Time period of simple pendulum (L-T and L-T^2 graph)
4. Verification of laws of vibrations of stretched string -sonometer
5. Determination of velocity of transverse wave along a stretched string-sonometer
6. Determination of frequency of a electrically driven tuning fork -Melde's experiment.
7. Rigidity modulus of material of a wire-dynamic method (torsional pendulum)

   Flywheel
8. Determination o fY of bar (metal Scale) -cantilever.
9. Simple pendulum normal distribution of errors-estimation of time

   period and the error of the mean by statistical analysis

Course Outcomes

1. Understand the use of vernier caliper, screw gauge and travelling microscope.
2. Learn the concept of Moment of Inertia.
3. Understand use of Pendulums.
4. Understand the physical meaning of 'g'.
5. After acquiring knowledge of how to handle measuring instruments student shall embark on verifying various principles learnt in theory.

CO-PO Mapping:

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

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

APPROVED IN:

BOS :01-02-2022 **ACADEMIC COUNCIL:01-04-2022**

SDG No. & Statement: **4 & Quality Education**

SDG Justification: Student develop their attributes and skills towards enhancing personality contributing towards scientific community

PHYS1131	BASIC CIRCUIT THEORY	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	Analyze Electric circuits						

Course Description:

Understanding of Basics of Electronic Circuits and mathematical and graphical solutions to Electrical Circuits.

Course Educational Objectives:

1. To explain the basics of Circuit theory and circuit analysis
2. To develop an understanding of the fundamental laws and elements of electrical circuits.
3. To learn the energy properties of electric elements and the techniques to measure voltage and current.
4. To develop the ability to apply circuit analysis to DC and AC circuits.
5. To understand RLC circuits.

UNIT 1 A.C Circuit Fundamentals and Passive Networks 8 hours

A.C Circuit Fundamentals

The sinusoidal voltage and current-Average and R.M.S values- phasor representation- T operator, polar and rectangular forms of complex numbers, AC applied to RC, RL and RLCcircuits, concept of impedance- power factor in a.c circuits, numerical problems.

Passive Networks

Concept of ideal as well as practical voltage and current sources, Regulation Kirchhoffs current

law - Kirchhoff's voltage law - Method of solving A.C and D.C circuits by Kirchhoffs laws -Loop analysis Nodal analysis - numerical problems.

UNIT 2 Network Theorems 8 hours

Maximum power transfer theorem -Super position theorem - Thevenin's theorem - Norton's theorem - Milliman theorem-Reciprocity theorem- problem solving applications for all the theorems.

UNIT 3 **RC And RL Circuits** **8 hours**

Transient response of RL and RC circuits with step input, Time constants. Frequency response of RC and RL circuits, their action as low pass and high pass filters. Passive differentiating and integrating circuits numerical problems.

UNIT 4 **Resonance in Electric Circuits** **8 hours**

Resonance in series and parallel R- L- C circuits. Resonant frequency, Q-factor, Bandwidth, selectivity, Comparison of series and parallel resonance, Tank circuit-LC oscillations.Numerical problems.

UNIT 5 **Cathode Ray Oscilloscope** **8 hours**

CRT and its working, Electron gun, electrostatic and magnetostatic deflections. Deflection sensitivity, Fluoroscent screen, CRO block diagram, Measurement of voltage, frequency and phase, Function generator-Block diagram and its description.

Textbooks:

1. Electric circuits by David A. Bell 7thedition Oxford higher education
2. Robert L Boylestad, "Introductory circuit analysis", Universal Book Stall Fifth edition,2003.
3. Circuit analysis by P.Gnanasivam-Pearson education.

References:

1. Networks, lines&fields by Ryder-PHI
2. Circuits and Networks-A.Sudhakar and Shyammohan-TMH
3. Unified electronics (Circuit analysis and electronic devices) by Agarwal-Arora.

Course Outcomes:

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

1. Understanding of How to generate AC and List the parameters and recall the concept of impedance.
2. Apply the concept of Kirchhoff laws to solve the circuit currents and make use of network theorems.
3. Understand what the time response of RC networks is and apply to solve the transient analysis problems
4. Analysis of RLC series and parallel circuit, understand the frequency selection circuit and Compare series and parallel resonance
5. Understanding of How the CRO works and make use of CRO for measuring the frequency voltage and phase of AC

CO-PO Mapping:

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

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

APPROVED IN:

BOS : 01-02- 2022 **ACADEMIC COUNCIL: 01-04- 2022**

SDG No. & Statement: 04: Quality Education

SDG Justification: Quality Education in Higher Studies

PHYS1141	BASIC CIRCUIT THEORY LAB	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	**Understanding and analyze Electric circuits**						

Course Description:

To know the circuit analysis of electronic systems

Course Educational Objectives:

- To develop an understanding of measuring electrical parameters
- To provide hands on experience of electrical circuits
- To develop an understanding of LCR oscillators

List of Experiments

1. Measurement of D.C & A.C voltage, frequency using CRO.
2. Thevenin's theorem - Verification.
3. Norton's theorem - Verification.
4. Maximum power transfer theorem - Verification.
5. CR Circuit - Frequency response (Low pass and High pass)
6. LR Circuit- Frequency response (Low pass and High pass)
7. LCR Series resonance circuit - frequency response, Determination of Q and Band width
8. LCR parallel resonance circuit - frequency response, Determination of Q and Band width.
9. Verification of Kirchhof's laws**.**

Course Outcomes:

1. Understand what the time response of RC networks
2. apply to solve the transient analysis problems
3. Analysis of RLC series and parallel circuit
4. understand the frequency selection circuit and Compare series and parallel resonance
5. Understanding of How the CRO works and make use of CRO for measuring the frequency voltage and phase of AC

CO-PO Mapping:

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

APPROVED IN:

BOS : 01-02- 2022 **ACADEMIC COUNCIL: 01-04- 2022**

SDG No. & Statement: 04: Quality Education

SDG Justification: Quality Education in Higher Studies

PHYS1231	BASIC INSTRUMENTATION SKILLS	L	T	P	S	J	C
		2	0	0	0	0	2
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	Various aspects of Electronic Instruments and handling it						

Course Description:

To study and understand the basics of various electronic instruments

Course Educational Objectives:

- To know the basics of electronic and electrical components
- To get hands on experience with the electronic components
- To understand the basic operation and application of PN diode and BJT
- To learn construction and working of power supply
- To know the basics of electric motors and heaters.

UNIT 1 **Fundamental quantities and components** **8 hours**

Fundamental and derived units, accuracy, precision, sensitivity. Electric Current and Voltage, DC current and Battery, AC generation, Resistance, Inductance, Capacitance, Ohms Law. Series and Parallel resistance circuits, voltage and current calculations in a resistive circuit.

UNIT 2 **Measurement of electrical quantities** **8 hours**

Measurement of DC and AC Voltage and Frequency using CRO. Galvanometer basic principle, connection of Ammeter and Volt meter in a circuit. Difference between analog and Digital meters. Bridge circuits to measure R, L and C. Power calculation and maximum power transfer theorem.

UNIT 3 **Basic electronic components** **8 hours**

Types of Materials: Conductors, Semiconductors and Insulators, N-type and P-Type Materials. Fabrication process of PN junction device, PN Diode, Zener diode characteristics and applications. BJT construction and types (no configurations), BJT as a simple Switch, Basic logic gates AND, OR and NOT using diodes and BJT.

UNIT 4 **Rectifier and power supply** **8 hours**

Amperes Law, Faradays Law, Lenz's Law, Electromagnetic Induction, Transformer basic Principle and types. Half wave and Full Wave rectifiers (basic working only), Voltage regulator, Construction of Basic DC power supply.

UNIT 5 **Basic Electrical components and devices** **8 hours**

Different types of conductor-cables and Insulation, Switches and Relays. Fuses and disconnect switches, Circuit breakers, Preparation of extension board. Electrical geyser construction working principle. Basic Principle of a motor it's working. Construction working principles of electric mixer.

Textbooks:

1. Principles of Electric circuits, Thomas L Floyed, 9th Edition. Pearson,
2. Electronic devices and circuit theory, Robert L Boylsted, 11th Ed. Pearson.
3. Electrical and Electronic Measurements and Instrumentation by Sawhney, 3rd Edition, Dhanpat Rai Publications.,

References:

1. A text book in Electrical Technology -B L Theraja -S Chand and Co.
2. Performance and design of AC machines-MG Say ELBS Edition
3. Digital Circuits and systems, Venugopal, 2011, Tata McGr

Course Outcomes:

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

1. Recall the fundamental Units, measurements and semiconductor Physics
2. Understand the currents and voltages in circuits
3. Calculate the currents and power and unknown component values
4. Applications of PN diode and BJT as switches
5. Understand basic Electrical wiring, switches and appliances

CO-PO Mapping:

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

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

APPROVED IN:

BOS : 01-02- 2022 **ACADEMIC COUNCIL: 01-04- 2022**

SDG No. & Statement: 04: Quality Education

SDG Justification: Quality Education in Higher Studies

PHYS1191	ELECTRONIC DEVICES & CIRCUITS	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	PN Junction Diode and Transistors						

Course Description:

To study and analyse basic electronic devices and its circuits

Course Educational Objectives:

- Understanding of Basics of Electronic Circuits.
- Mathematical and Graphical solutions to Electrical Circuits.
- To gain the knowledge on the basics of Electronic devices and applications.
- To understand the classification of Rectifiers and other circuits.
- To identify the merits and demerits of different electronics liters.

UNIT 1 **9 hours**

Junction Diodes: PN junction diode - P-N junction theory-depletion region, barrier potential, working in forward& reverse bias condition, Junction capacitance, Diode current equation (no derivation),Effect of temperature on reverse saturation current, V-I Characteristics, Zener and Avalanche Break down, Zener diode - V-I characteristics, regulated power supply using Zener diode, Varactor Diode, Tunnel Diode - Principle,Working& Applications

UNIT 2 **9 hours**

Bipolar Junction Transistors (BJT),PNP and NPN transistors, current components in BJT, BJT static characteristics (Input and Output), Early effect, CB,CE,CC Configurations (Cut-off, Active and saturation regions) Determination of h-parameters from the characteristics, Concept of amplification-voltage and current amplifier. The C.E amplifier-analysis and parameters, Transistor as a switch.

UNIT 3 **Field Effect Transistors & UJT** **9 hours**

FET - Construction - Working – Drain &Transfer characteristics -Parameters of FET - FET as an amplifier-MOSFET-Enhancement MOSFET-Depletion MOSFET-Construction& Working-Drain characteristics of MOSFET -Comparison of FET&BJT and JFET &MOSFET.UJT Construction-working, V-I Characteristics.

UNIT 4 **9 hours**

Photo Electric Devices Structure and operation, characteristics, spectral response and applications of LDR, Photo Voltaic cell, Photo diode, Photo transistor, LED and LCD.

UNIT 5 **Power Supplies** **9 hours**

Rectifiers - Half wave, full wave and bridge rectifiers - Efficiency - Ripple factor – Regulation. Types of filter- Choke input (Inductor) filter –Shunt capacitor filter -L-Section and π section filters - Three terminal fixed voltage I.C regulators (78XX and 79XX) - Principle and working of switch mode power supplies (SMPS).

Textbooks:

1. Electronic Devices and Circuits David A.Bell, Fifth edition. Oxford university press

2. A.P Malvino, "Principles of Electronics", TMH, 7th edition

3. T.F. Bogart, Beasley, "Electronic Devices and circuits", Pearson Education, 6th Edition

4. N.N. Bhargava, D.C Kulshreshta, and S.C Gupta ,"Basic Electronics and Linear Circuits'' TMH

5. T.L.Floyd, "Electronic Devices and circuits", PHI, fifth edition

6. V.K. Metha, "Principle of Electronics", S CHAND Co. New edition

7. Godse A.P., Bakshi U.A (1st edition), Electronics Devices, Technical Publications rune.

References:

I. Sedha R.S., A TextBook of Applied Electronics, S. Chand & Company Ltd.

2. Jacob Millman and Christos C. Halkias (2008) Integrated Electronics, Tara Mcgraw-Hill

3. Robert L. Boylestad, Louis Nashelsky (10th edition). Electron Devices and Circuit Theory, Dorling

Kindersley (India Pvt. Ltd.)

4. Unified Electronics (Circuit analysis and electronic devices) by Agarwal-Arora.

Course Outcomes:

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

1. Understanding basics of basic semiconductor physics Recall previous knowledge, understand how the depletion layer forms and explanation capability on the working of different diodes characteristics
2. Understanding the basic construction of semi conductor devices like BJT and FET, classification of Devices and compare the VI characteristics of BJT and FET in different configurations.
3. Understand the basic optical devices operation and how they work, and how to make use of photo electronic devices as sensors and apply the knowledge in real time applications.
4. Understand the classification of Rectifiers; identify the merits and demerits of different filters.
5. Apply the basic rectifier, Analyze and compare the working of SMPS

CO-PO Mapping:

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

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

APPROVED IN:

BOS : 01-02- 2022 **ACADEMIC COUNCIL: 01-04- 2022**

SDG No. & Statement: 04: Quality Education

SDG Justification: Quality Education in Higher Studies

PHYS1201	ELECTRONIC DEVICES & CIRCUITS LAB	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	Programming knowledge on Microprocessor and controllers						

Course Description:

To perform the experiments to know the functionality and its characteristics of electronic devices

Course Educational Objectives:

- Understand and realize the working of Semiconductor Devices
- Graphical representation of V-I Characteristics and also results analysis**.**
- To design and obtain the V-I characteristics of Semiconductor devices

List of Experiments

1. V-I Characteristics of Junction Diode.
2. V-I Characteristics of Zener Diode.
3. Regulated Power Supply using Zener Diode.
4. IC Regulated Power Supply
5. BJT input and output Characteristics (CE Configuration) and determination of h-parameters.
6. Characteristics of UJT.
7. Characteristics of JFET
8. LDR characteristics
9. Characteristics of L and π section filters using full wave rectifier.

Course Outcomes:

1. Understand the characteristics of Basic semiconductor devices and Analyze the
2. results
3. Make use of IC regulators to construct the Regulated power supply
4. Able to identify the different kind of semiconductor devices, and can be able to
5. distinguish the input and out characteristics and analyze the data to get the h-parapets

CO-PO Mapping:

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

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

APPROVED IN:

BOS : 01-02- 2022 **ACADEMIC COUNCIL: 01-04- 2022**

SDG No. & Statement: 04: Quality Education

SDG Justification: Quality Education in Higher Studies

PHYS1211	DIGITAL ELECTRONICS	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	Microprocessor and controller working and programming						

Course Description: *To obtain the basic knowledge in digital number systems and circuits*

Course Educational Objectives:

- To introduce number systems, conversion used for representing numbers in computational structures
- To familiarize the implementation of simple logical operations using Combinational circuits
- To acquaint the student with the design of combinational and sequential logic circuits.
- To impart the design of synchronous and asynchronous digital systems.
- To expose different types of memories used in digital systems

UNIT 1 **8 hours**

Number Systems and Codes Decimal, Binary, Octal, Hexa Decimal numbers, conversion from one to another-codes,BCD, excess 3, gray codes conversion from one to another – Error detection codes.

UNIT 2 **Boolean Algebra and Theorems** **8 hours**

Basic & Universal logic gates – Boolean Identities – Boolean theorems De Morgan's Theorem – sum of products, products of sums expressions, simplification by Karnaugh Map method, simplification based on basic Boolean theorems – don't care conditions.

UNIT 3 **Combinational Digital Circuits** **8 hours**

Arithmetic Building blocks, Half & Full Adders and Half & Full Subtractions, BCD adders – multiplexers, De-multiplexers, encoders, decoders – Characteristics for Digital Ics -RTL, DTL, TTL, ECL CMOS (NAND & NOR Gates).

UNIT 4 **Sequential Digital Circuits** **8 hours**

Flip-flops, RS, Clocked SR, JK, D, T, Master-Slave Flip flop -Conversion of Flip flops – shift registers – ripple counters – synchronous counters and asynchronous counters (4-bit counter).

UNIT 5 **Memory Devices** **8 hours**

ROM Organization – PROM Organization – PLA (Programmable Logic Array) – PAL

(Programmable Array Logic) – Realization of functions using PROM

Textbooks:

1. R.P. Jain, "Modem digital Electronics", 3rd Edition, TMH, 2003.

2. Puri, V.K., Digital Electronics, Tata McGraw Hill,2nd Edition,2011

3. Marris mano M., Computer System Architecture, 2nd Edition, Prentice Hall, 1998

4. Malvino and Leach, Digital Principles and applications, McGraw Hill, 1996, 4th Edition

References:

1. Millman 1. Micro Electronics, McGraw Hill International Book Company, New Delhi.

2. Morris Mano M., "Digital Logic and Computer Design" PHI, 2005.

Course Outcomes:

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

1. Learn the number systems in digital systems
2. Acquire the knowledge on simplification gates
3. Learn about the designing of combinational circuits
4. Learn about the designing of sequential circuits
5. Learn the basics of organization of memory devices

CO-PO Mapping:

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

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

APPROVED IN:

BOS : 01-02- 2022 **ACADEMIC COUNCIL: 01-04- 2022**

SDG No. & Statement: 04: Quality Education

SDG Justification: Quality Education in Higher Studies

PHYS1221	DIGITAL ELECTRONICS LAB	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	Basic logic Gates and their truth tables						

Course Description: To design and develop various digital electronic circuits and to study their truth tables

Course Educational Objectives:

- This course was designed to construct and verify Digital circuits
- The student analyzes and designs the Digital circuits.
- Convert any number into different base representations.
- Simplify logic expressions using Boolean laws and realize using basic and universal logic gates.
- Design combinational circuits for the given specifications.

List of Experiments

1. Verification of I C (basic) logic Gates Universality of NAND & NOR Gates.
2. Verification of Boolean laws using NAND Gates (Associative, Commutative & Distributive Laws)
3. Study of RS, D, T and JK Flip-Flops with IC's
4. Half and Full Adders using Simple & NAND Gates.
5. 4-bit binary parallel adder and Subtractor IC 7483 using PSPICE simulation Study of7490
6. BCD Counter - MOD Counters using PSPICE simulation.
7. BCD to Seven segment decoder 7447/7448 using PSPICE simulation.

Course Outcomes:

1. The student will be able to design the electronic circuits.
2. Design synchronous sequential circuits for the given specifications.
3. Differentiate asynchronous and synchronous counters
4. Implement Multiplexers and D flip flops using CMOS technologies .

CO-PO Mapping:

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

APPROVED IN:

BOS : 01-02- 2022 **ACADEMIC COUNCIL: 01-04- 2022**

SDG No. & Statement: 04: Quality Education

SDG Justification: Quality Education in Higher Studies

PHYS2061	ANALOG & DIGITAL IC APPLICATION	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	Analog and digital signals and devices						

Course Description: *To understand the working principles of analog and digital circuits*

Course Educational Objectives:

- This course was introduced to understand the analog and digital applications
- To explain the configuration and use of operational amplifiers.
- To acquaint the students with the advantages of OPAmps
- To introduce the basic principles of integrators and Active filters
- To know the internal operations of and digital circuits.

UNIT 1 **8 hours**

Operational Amplifiers Basic differential amplifier-Op-Amp supply voltages - IC identification - Internal blocks of Op- Amp, Op-Amp parameters-offset voltages and currents-CMRR-Slew rate, Virtual ground, Op- Amp as a voltage amplifier - Inverting amplifier - non-inverting amplifier - Voltage follower

UNIT 2 **8 hours**

OP-AMP Circuits

Summing amplifier - Differential amplifier - Op-amp frequency response - Comparator Integrator-Differentiator - Triangular Wave generators - Square Wave generators - Active filter (Basics) – Low pass filter - High pass filter - Band pass filter, IC 555 applications - Astable, Mono stable and Schmitt trigger

UNIT 3 **8 hours**

Combinational &Sequential Circuits Design of code converter: BCD to 7 segments, Binary/ BCD to Gray, Gray to Binary / BCD, Design of counters using state machine: asynchronous and synchronous counters, Modulo-encounter, presentable binary up/down counter, Design of Universal shift register

UNIT 4 **8 hours**

Data Converters Key Features, Advantages and applications of Digital to Analog Converters: Weighted resistive network and R-2R ladder type. Key Features, Advantages and Applications Specific selection of Analog to Digital Converters: Staircase, Ramp Type, Single Slope and dual slope, Successive approximation and Flash type

UNIT 5 **8 hours**

Digital System Interfacing And Applications Digital system interfacing of LEDs and Multi digit Seven segments LED display Driver. Interface considerations for ADC / DAC with digital systems. Applications of counters: Digital clock, Auto-parking system, Applications of shift registers: Time delay generator, parallel to serial converter, serial to parallel converter, UART and serial Key board encoder.

Textbooks:

1. G.K.Kharate - Digital electronics-Oxford university press
2. Floyd Thomas L Digital Fundamentals Pearson Education
3. Microelectronic circuits by Sedra&Smith-6 edition-Oxford
4. Electronic Devices and Circuits David A.Bell, Fifth edition, Oxford University press

References:

1. Allen Mottershead, Electronic Devices and Circuits-an Introduction - Prentice Hall.
2. Mithal G.K., Electronic Devices and Circuits, Khanna Publishers.
3. Donald L.Schillling, Charles Belove, Discrete and Integrated Electronic Circuits, McGraw Hill

Course Outcomes:

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

1. Learn the basics of Op Amps
2. Understands the applications of Op Amps
3. Analyze the combinational and sequential circuits
4. Learn about the types and operation of data converters
5. Understand the interfacing concepts of digital systems

CO-PO Mapping:

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

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

APPROVED IN:

BOS : 01-02- 2022 **ACADEMIC COUNCIL: 01-04- 2022**

SDG No. & Statement: 04: Quality Education

SDG Justification: Quality Education in Higher Studies

PHYS2081	BASIC ELECTRONIC INSTRUMENTATION	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	Instrumentation basic principles and working						

Course Description*: To gain knowledge on working principles of general and medical instruments*

Course Educational Objectives:

- To provide an adequate knowledge in basic measurements.
- To study about the measurement of basic parameters
- To provide an adequate knowledge in basic measurements.
- To study about the measurement of basic parameters
- To emphasize on various AC& DC Bridges to calibrate instruments.

UNIT 1 **Basic Measurement Concepts** **8 hours**

Measurement systems – Static and dynamic characteristics- types of errors- statistical analysis – units and standards of measurements.

UNIT 2 **Electronic Instruments** **8 hours**

PMMC Mechanism-DC Ammeter-DC Voltmeter-AC Voltmeters- Using Rectifiers-True RMS responding Voltmeters -Digital voltmeter, – cathode ray oscilloscopes block Diagram-Cathode Ray Tube, Measurement of Voltage, Current, Frequency and Phase.

UNIT 3 **8 hours**

Data Acquisition Systems, D/A conversion- Linear weighted and ladder type. A/D conversion- Digital ramp ADC, Successive approximation method, Data loggers, Signal Conditioning of the inputs, Electronic Indicating instruments: Seven Segment Display, LCD and LED display devices.

UNIT 4 **Measurement of Temperature and Flow** **8 hours**

Temperature - RTD, Thermocouples and Thermistor. Flow -Orifice, Venturi, Rotameter and Electromagnetic Flow meter.

UNIT 5 **8 hours**

Medical Imaging Systems Radiography, X-Ray machine, CT scanner, Nuclear Medical Imaging systems: Physics of Radio Activity, Radiation Detectors, Gamma Camera, , Angiography and Fluoroscopy Understand the principles of Medical devices

Textbooks:

1. Electrical and Electronic Measurements and Instrumentation - Sawhney, Dhanapat Rai Publications., 3rd Edition, 2005
2. Handbook of Biomedical Instrumentation - Khandpur, Tata McGraw Hill, 2nd Edition

References:

1. Medical Instrumentation: Application & Design - John G. Webster, Houghton Miffin & Co., Boston
2. Biomedical Instrumentation - Marvin D. Wirs, Chilton Book Co., London,1973

Course Outcomes:

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

1. Know the basic principle and operation of various instruments
2. Identify the role of various instruments in the process of Measurement and instrumentation
3. Explain how instruments are used for process control
4. Understand the internal operation of medical devices
5. Applications of different of instruments

CO-PO Mapping:

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

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

APPROVED IN:

BOS : 01-02- 2022 **ACADEMIC COUNCIL: 01-04- 2022**

SDG No. & Statement: 04: Quality Education

SDG Justification: Quality Education in Higher Studies

PHYS3081	PROGRAMMING LANGUAGE IN C AND C++	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	Basic structure of programs and development of simple logics						

Course Description: *To obtain the program writing and to develop different algorithms*

Course Educational Objectives:

- To make it understand the basic programming languages C
- To understand various types of data structures, Arrays.
- To understand various types of Functions and Function calling methods.
- To make it understand the basic programming languages C++
- Learn different components like pointers structures and files in C.

UNIT 1 **Programming Fundamentals with C** **8 hours**

Sequencing the logical steps: Writing Algorithms and flowcharts. Structure of a C program: Syntax, components, expressions, operators, Input/output function. Data types: declaration, initiation and usage of integers, strings, floats.

UNIT 2 **Control statements:** **8 hours**

if statement, Scope of an if clause, if...else statement, if...else...if statement, switch statement, while loop, do...while loop, for loop, for loop with a comma operator, break statement, continue statement.

UNIT 3 **Strings and Arrays** **8 hours**

String functions: Standard library functions, sorting, sub setting, type conversion

Arrays: Lists/ 1-Dimensional arrays, 2- Dimensional arrays, 3- Dimensional arrays: Basic matrix operations

UNIT 4 **Functions and pointers** **8 hours**

Functions: structure, blocks, input and output arguments, Built-in functions, User-defined functions. Introduction to pointers: Basic arithmetic operations using pointers, Address Operator, Pointer Variables, Pointers, and Array.

UNIT 5 **Introduction to programming in C++** **8 hours**

Object-oriented programming and characteristics, Structure of a program in C++, Keywords, variables, data types and operators in C++. Converting C program to C++ program. Specifying a class and creating objects.

Textbooks:

1. Let Us C - YashawantKanetkar, BPB Publications, New Delhi, 3/e.
2. Programming in ANSI C - E. Balagurusamy, Tata McGraw Hill Publishing Co. Ltd., 2/e.
3. Object oriented programming with C++, E. Balagurusamy, The Mc Graw-Hill Companies, 4/e

References:

1. Programming with 'C' - K.R. Venugopal & R.P. Sudeep, Tata McGraw Hill Publishing Co. Ltd.
2. The C Programming Language - B.W. Kernighan & D.M. Ritchie, Prentice Hall of India Private Ltd., New Delhi, 2/e.
3. Theory and Problems of Programming with 'C' (Schaum'sSeries) -B.S. Gottfried, McGraw Hill International Book Company The Spirit of 'C' - H. Mulish& H.L. Cooper, Jaico Publishing House.

Course Outcomes:

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

1. Understand the Program Structure of C and C++.
2. Understand operators' data declaration in C and C++.
3. Implementation of programs using different conditional statements.
4. Writing different programs using Arrays, Functions and Pointers.
5. Understand difference between C and C++ and able to convert from C to C++.

CO-PO Mapping:

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

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

APPROVED IN:

BOS : 01-02- 2022 **ACADEMIC COUNCIL: 01-04- 2022**

SDG No. & Statement: 04: Quality Education

SDG Justification: Quality Education in Higher Studies

PHYS2071	ANALOG & DIGITAL IC APPLICATION LAB	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	**None**						
Co-requisite	**None**						
Preferable exposure	Analog and digital devices applications						

Course Description: *To perform the experiments in analog and digital systems*

Course Educational Objectives:

- This course was designed to perform analog and digital circuits experiments
- The student will be able to understand the designing of analog and digital circuits
- Able to build and analyse the working of Op-Amp for different applications
- To understand the timer and its applications
- Design and understand the digital Counters

List of Experiments

1. OP-AMP -Inverting and Non-inverting amplifiers.
2. OP-AMP - Sine Wave Generator (Wein bridge oscillator) Binary to
3. Grey and Grey to binary code converter Design of 4-bit priority encoder
4. OP-AMP - Square wave generator using PSPICE simulation Schmitt
5. Trigger using IC 555 timer using PSPICE simulation
6. Study of presentable binary up/down counter using PSPICE simulation. Design and
7. verification of 4-bit ripple counter. Using PSPICE simulation. OP-AMP integrator and differentiator.
8. Astable Multivibrator –determination of frequency (using IC-555)

Course Outcomes:

1. The student will be able to design the circuits in operational amplifiers
2. Able to design and perform analog and digital circuits experiments
3. Can build and analyse the working of Op-Amp for different applications
4. Design and analyse the timer and its applications
5. Design and understand the digital Counters

CO-PO Mapping:

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

APPROVED IN:

BOS : 01-02- 2022 **ACADEMIC COUNCIL: 01-04- 2022**

SDG No. & Statement: 04: Quality Education

SDG Justification: Quality Education in Higher Studies

PHYS2091	BASIC ELECTRONIC INSTRUMENTATION LAB	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	Operation and working of basic instruments						

Course Description:

This course covers the fundamentals of instrumentation and deals with the basics of Electrical and Electronic measuring instruments

Course Educational Objectives:

- This course was designed to perform Instrumentation experiments
- To understand the measurements using CRO
- To understand the behaviour of discrete components
- Measurement of Unknown inductance and capacitance
- To understand the working of power meter and milli Voltmeter

List of Experiments

1. Measurement of amplitude, frequency and phase difference using CRO.

2. Measurement of low resistance Kelvin's double bridge.

3. To measure unknown Inductance using Hay's bridge.

4. To measure unknown capacitance using Wein's frequency bridge.

5. Measurement of the unknown inductance by using Maxwell bridge method.

6. To measure unknown capacitance of small capacitors by using Schering's bridge.

7. Study of the AC Milli voltmeter.

8. Study of output power meter.

9. Study of distortion factor meter and determination of the % distortion of the given oscillator.

10. Study of the following transducer (i) PT-100 transducer (ii) K –type transducer

(iii) Pressure transducer

11. Study of L, C, R. and determination of the value of the given components.

Course Outcomes:

1. Able to do the measurements using CRO
2. Understand the behaviour of discrete components
3. Able to Measurement of Unknown inductance and capacitance
4. Student can work with of power and milli Voltmeters
5. Measure distortion produced in oscillators

CO-PO Mapping:

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

APPROVED IN:

BOS : 01-02- 2022 **ACADEMIC COUNCIL: 01-04- 2022**

SDG No. & Statement: 04: Quality Education

SDG Justification: Quality Education in Higher Studies

PHYS3091	PROGRAMMING LANGUAGE IN C AND C++ LAB	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	Numerical logic development and basic program structure						

Course Description: To know and develop the programming skills in C and C++

Course Educational Objectives:

- To understand execution of sorting the strings and numbers
- To understand application of different operations on Matrices
- To understand writing the programs using functions
- To understand writing the programs using arrays
- To understand writing the programs using binary search algorithms

List of Experiments

1. Arranging words in alphabetical order

2. Finding of largest and smallest from a set of numbers

3. Multiplication of two square matrices

4. Write functions for (i) reverse the string (ii) converting integer into string

5. Write functions for (i) string copy (ii) string compare (iii) Replace a sub-string with another string

6. Program to sort a series of elements.

7. Program to exchange elements of two arrays using pointers.

8. Write a C program to find the number of and mean of all integers greater than 100 and less than 200.

9. Given a number, write a C program using while loop to reverse the digits of the number. For e.g. the number 12345 should be printed as 54321.

Course Outcomes:

1. Knowledge in Writing and execution of sorting the strings and numbers
2. Knowledge in application of different operations on Matrices
3. Knowledge in writing the programs using arrays
4. Knowledge in writing the programs using binary search algorithms
5. Knowledge in writing the programs using queues and linked lists

CO-PO Mapping:

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

APPROVED IN:

BOS : 01-02- 2022 **ACADEMIC COUNCIL: 01-04- 2022**

SDG No. & Statement: 04: Quality Education

SDG Justification: Quality Education in Higher Studies

PHYS2101	MICROCONTROLLERS & APPLICATIONS	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	Programming knowledge on Microprocessor and controllers						

Course Description:

The purpose of this course is to teach students the fundamentals of microprocessor and microcontroller systems. To understand the basic architecture and functionality of microcontrollers.

Course Educational Objectives:

1. To understand the architecture of micro controller
2. To understand the basics of Microcontroller and its applications
3. To demonstrate instruction set and programming of 8051 microcontroller.
4. To impart the knowledge of assembly programming to interface various peripherals.
5. To demonstrate microcontroller based embedded system.

UNIT 1 **8051Architecture** **8 hours**

Introduction to Microcontroller - Comparison of Microcontroller& Microprocessor-8051 Microcontroller - Block diagram - I/O pins, ports and circuits - External memory - Counter and Timers -Serial data I/O - Interrupts

UNIT 2 **8051 Instruction Set** **8 hours**

Classification of instruction set-Addressing Modes – Logical operation: Byte level - Bit

level-Rotate and Swap operation. ARITHMETIC OPERATIONS- Instructions affecting flags - Incrementing and Decrementing - Addition -Subtraction - Multiplication and Division - Example Programs

UNIT 3 **Jump and Call Instruction** **8 hours**

Introduction - The Jump and Call program Range- Jumps: Bit - Byte Unconditional: Calls and Subroutine -Interrupts and Returns – Example programs. Time delay generation and calculation, Timer/Counter programming, accessing a specified port terminal and generating

a rectangular waveform.

UNIT 4 **Interfacing of Peripherals to 8051** **8 hours**

ADC 0808/0809 chip with 8 analog channels, DAC interfacing DAC 0808, programming, Displays - Stepper motor.

UNIT 5 **8 hours**

Introduction to Other Microcontrollers 6509 - PIC controllers -6575 series - Introduction to Embedded Systems

Textbooks:

1. Kenneth 1. Ayala, "The 8051 Microcontroller, Architecture, Program and Application" Pen ram International.
2. Muhammed Ali Mazidi, Janice GillispieMazidi "The 8051 Microcontroller and Embedded Systems" -Low Price Edition.
3. Microprocessors & Microcontrollers by N. SenthiIkumar, M. Saravanan & S. Jeevananthan,1edition. Oxford press (Helpful for interfacing applications)
4. Microcontrollers: Theo & App by Ajay V. Deshmukh Tata McGraw-Hill Education, 2005.

References:

1. Programming and customizing the 8051 Microcontroller- by MykePredko-TMH Design with Microcontrollers by-J.B.PeatmaTMH
2. Microcontroller Handbook, INTEL,2008.
3. Microprocessor, Microcontroller & Applications by D.A Godse A.P Godse Technical Publications 2008

Course Outcomes:

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

1. Learn the architecture of 8051, its pin diagram.
2. Learn about the microcontrollers and the organization of microcontroller based systems .
3. Acquire knowledge of microcontrollers and their role in I/O port programming and their interface with peripherals.
4. Learn about analog to digital and digital to analog convertors.
5. Learn basics of programming and other controllers

CO-PO Mapping:

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

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

APPROVED IN:

BOS : 01-02- 2022 **ACADEMIC COUNCIL: 01-04- 2022**

SDG No. & Statement: 04: Quality Education

SDG Justification: Quality Education in Higher Studies

PHYS2111	MICROCONTROLLERS & APPLICATION LAB	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	Microprocessor and controller working and programming						

Course Description: *To interface I/O devices with microcontroller*

Course Educational Objectives:

- To perform arithmetic, logical and interfacing programs.
- To understand branch and control programs.
- To understand and execute the programs using KEIL compiler.
- To interface and perform the electronic applications.
- To understand the functioning of data converters.

List of Experiments

1. Multiplication of two numbers using MUL Command (later using counter method for repeated addition)
2. Division of two numbers using DIV command (later using counter method for repeated subtraction)
3. Pick Largest & smallest number among a given set of numbers
4. Interface a DAC & Generate a stair case wave form with step duration and no. of steps as variables.
5. Interface a stepper motor and rotate Clockwise or anti clockwise through given angle step.
6. Using Keil software, write a program to pick the smallest among a given set of numbers.
7. Using Keil software, write a program to pick the largest among a given set of numbers.
8. Using Keil software, write a program to generate a rectangular wave form at a specified port terminal.

Course Outcomes:

1. Able to write the programs and also controls
2. Able to write arithmetic, logical and interfacing programs.
3. Able to understand branch and control programs.
4. Able to understand and execute the programs using KEIL compiler.
5. Able to interface and perform the electronic applications.

CO-PO Mapping:

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

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

APPROVED IN:

BOS : 01-02- 2022 **ACADEMIC COUNCIL: 01-04- 2022**

SDG No. & Statement: 04: Quality Education

SDG Justification: Quality Education in Higher Studies

PHYS3061	ELECTRONIC COMMUNICATIONS	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	Basic types of communication systems						

Course Description:

This course introduces the fundamentals of electronic communication systems. Topics include the frequency spectrum, electrical noise, modulation techniques, characteristics of transmitters and receivers, and digital communications.

Course Educational Objectives:

- To explain role of signal parameters in communication.
- To understand various techniques for propagation of information
- To demonstrate the nomenclature of signals
- To understand the generation and detection of modulation systems
- To understand the operation of digital communication systems

UNIT 1 Basics of Communication Systems 8 hours

Block diagram of communication system. Types of Electronic Communication systems: Simplex, Duplex. Analog /Digital Signals. Basis in Noise - Thermal, Shot noise Bit rate, Baud rate, Bandwidth, and signal to Noise Ratio. Frequency spectrum in communications

UNIT 2 Amplitude Modulation 8 hours

Need for modulation. Amplitude modulation, Modulation index, frequency spectrum, generation of AM (balanced modulator,), Amplitude Demodulation (diode detector), other forms of AM: Double side band suppressed carrier, DSBSC generation (Balanced modulator), Single side band suppressed carrier.

UNIT 3 Angle Modulation 8 hours

Frequency and phase modulation, modulation index and frequency spectrum, equivalence between FM and PM, Generation of FM (Direct and indirect methods), FM detector (Slope detector, balanced slope detector, PLL). Comparison between AM, FM and PM.

UNIT 4 Transmitters & Receivers 8 hours

Transmitters: Communication channels for AM and FM broadcast, AM transmitter: Low level and high-level modulation, FM transmitter. Receivers: Receiver parameters, sensitivity, selectivity and fidelity, Super Heterodyne receiver, AM receivers, FM receivers. Frequency division multiplexing.

UNIT 5 Electromagnetic Interference 8 hours

Sampling theorem, Pulse Amplitude Modulation (PAM), Time Division Multiplexing (TDM), Pulse Width Modulation (PWM) and Pulse Position Modulation (PPM), Pulse Code Modulation, Differential Pulse Code Modulation, Delta Modulation, Adaptive Delta Modulation.

Textbooks:

1. H. Taub and D. Schilling, Principles of Communication Systems, TMH (1999)
2. W.Tomasi, Electronic Communication Systems, Pearson Education (2004)
3. L.E.Frenzel, Communication Electronics, Principle and Applications, TMH (2002)
4. L. W. Couch II, Digital and Analog Communication Systems, Pearson Education (2005)

References:

1. S.Haykin, Communication Systems, Wiley India (2006)
2. G. Kennedy and B. Davis, Electronic communication systems, TMH(1999)
3. R. P. Singh and S. D. Sapre, Communication Systems: Analog and Digital, TMH
4. L. E. Frenzel, Communication electronics: Principles and applications. TMH
5. T.G. Thomas and S. Chandra Sekhar, Communication theory, TMH (2006)

Course Outcomes:

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

1. To introduce the nomenclature of signals and explain communication system
2. To illustrate generation and detection of AM systems
3. To outline generation and detection of Angle modulation systems
4. To explain various modulation levels of transmitters and receivers
5. To explain digital communication systems

CO-PO Mapping:

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

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

APPROVED IN:

BOS : 01-02- 2022 **ACADEMIC COUNCIL: 01-04- 2022**

SDG No. & Statement: 04: Quality Education

SDG Justification: Quality Education in Higher Studies

PHYS3101	INTRODUCTION TO EMBEDDED SYSTEMS	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	Knowledge on Micro Controller and processor						

Course Description:

To provide an understanding of the basic hardware, and interfacing concepts regarding an embedded microprocessor/microcontroller. This module provides an introduction to the fundamental principles underlying the specification, design and implementation of embedded systems

Course Educational Objectives:

- To provide a clear understanding of the embedded system
- To know the timers and peripherals of embedded system
- To familiarize the applications with advanced microcontrollers
- To understand the Principles of Protocols
- To familiarize the data converters

UNIT 1 **Introduction to Embedded Systems** **8 hours**

Overview of Embedded Systems, Features, Requirements, and Applications, Recent Trends in the Embedded System Design, Common architectures for the Embedded System Design, Embedded Software design issues. Introduction to microcontrollers, Overview of Harvard architecture and Von Neumann architecture, RISC and CISC microcontrollers

UNIT 2 **Interrupts and Timer** **8 hours**

Introduction to System Clock, reset sources, Introduction to interrupts, External interrupts, IO Ports, 8-bit and 16-bit Timers, introduction to different modes, Input Capture and Compare Match.

UNIT 3 **Data converters and displays** **8 hours**

D/A conversion-types, A/D conversion-types, Data loggers, Signal Condition, Buffers, and latches. Displays-LED, LCD, OLED

UNIT 4 **Communication Protocols** **8 hours**

Parallel Communication, Serial Communication, Wireless Communication Serial Protocols: RS-232, Serial Peripheral Interface (SPI), I2C, CAN, and USB. Parallel Protocols: PCI BUS and ARM BUS

UNIT 5 **Applications of embedded systems** **8 hours**

Digital camera, automotive embedded system, home security system, automatic washing machine, personal digital assistant, Industrial robots, Automated teller machine, calculator.

Textbooks:

1. Embedded Systems: Architecture, Programming and Design by Raj Kamal, Second edition, TataMcgrawhill
2. Embedded / Real-Time Systems: Concepts, Design and Programming Black Book, New ed (MISL-DT) by Dr. K.V.K Prasad
3. Embedded system Design - Frank Vahid and Tony Givargis, John Wiley, 2002

References:

1. An Embedded Software Premier-Davide-Siman, PEARSON Education
2. The art of programming Embedded systems, Jack G. Ganssle, academic press
3. Intelligent Embedded systems, LouisL. Odette, AdisonWesly,1991

Course Outcomes:

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

1. Understanding the firmware of embedded systems .
2. Analysis of the clock pulse.
3. Design of data converters
4. Implementation of Protocols
5. Applications of embedded

CO-PO Mapping:

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

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

APPROVED IN:

BOS : 01-02- 2022 **ACADEMIC COUNCIL: 01-04- 2022**

SDG No. & Statement: 04: Quality Education

SDG Justification: Quality Education in Higher Studies

PHYS3111	EMBEDDED SYSTEMS LAB	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	Applications of Micro Controllers						

Course Description: *To perform different experiments using KEIL compiler*

Course Educational Objectives:

- To introduce concept of embedded systems and practical knowledge
- To introduce the LEDs, Display and moving LEDs controlling system
- To familiarize the Practical knowledge on embedded applications
- Practical knowledge on port controlling and waveform generation
- Practical experience on serial communication

List of Experiments:

1. AC load controlling system by using Relay
2. Object obstacle identification system using IR transmitter and receiver
3. LEDs Display and moving LEDs controlling system
4. Discrete Switches interface to read inputs
5. Buzzer indication system when an interrupt triggers from Switches
6. Realization of Boolean expression using ports
7. Generation of different waveforms
8. Serial communication programs

Course Outcomes

1. Able to control the devices and systems
2. Able to program the LEDs Display and moving LEDs controlling system
3. Practical knowledge on embedded applications
4. Practical knowledge on port controlling and waveform generation
5. Practical experience on serial communication

CO-PO Mapping:

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

APPROVED IN:

BOS : 01-02- 2022 **ACADEMIC COUNCIL: 01-04- 2022**

SDG No. & Statement: 04: Quality Education

SDG Justification: Quality Education in Higher Studies

PHYS3071	ELECTROMAGNETIC COMMUNICATIONS LAB	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	Different Types of modulation methods						

Course Description:

To understand the working operations of different modulation techniques

Course Educational Objectives:

- The student will realize various communication systems
- To understand various modulation techniques
- To demonstrate the nomenclature of modulation methods
- To understand the generation and detection of Pulse modulations methods
- To understand the operation of digital communication systems

List of Experiments

1. Amplitude Modulation and Demodulation.
2. Frequency Modulation and Demodulation
3. Pulse Amplitude Modulation
4. Pulse Width Modulation
5. Pulse Position Modulation
6. Pulse Code Modulation
7. PCM modulation and Demodulation
8. Delta modulation and Demodulation

Course Outcomes

1. The student will be able to realize various communication systems
2. Able to perform various modulation techniques
3. Able to demonstrate the nomenclature of modulation methods
4. Able to understand the Pulse modulations methods
5. To able to understand the operation of digital communication systems

CO-PO Mapping:

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

APPROVED IN:

BOS : 01-02- 2022 **ACADEMIC COUNCIL: 01-04- 2022**

SDG No. & Statement: 04: Quality Education

SDG Justification: Quality Education in Higher Studies

PHYS2161	MICROPROCESSORS (INTEL 8085)	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	Building the logic and digital electronics						

Course Description: To understand the internal architecture and the registers of 8085 microprocessor. Microprocessors course is intended to introduce the architecture, programming of microprocessors

Course Educational Objectives:

- Understand the basics of Microprocessors OF INTEL-8085
- To understand the architecture and then programme 8085.
- To understand the basics of microprocessor its applications
- To demonstrate instruction set and programming of 8085.
- To impart the knowledge of assembly programming to interface various peripherals.

UNIT 1 **Architecture of 8085 Microprocessor** **8 hours**

Functional block diagram of Intel 8085-Register structure-multiplexing & De-multiplexing of address / data bus - Control Signal Generation and status signals - 8085 pin-out diagram & functions - Interrupts - Priority Concept Instruction Set of 8085 -Instruction set classification - addressing modes

UNIT 2 **Memory** **8 hours**

Instruction cycle - machine cycle - T-state -Timing diagrams for Opcode Fetch Cycle Memory Read, Memory Write, I/O Read, I/O Write, - Functional explanation for RAM,

ROM, EPROM, EEPROM

UNIT 3 **Programming 8085** **8 hours**

Addition & subtraction(16-bit), multiplication, division, largest, smallest, block data transfer (all 8-bit data), Binary to BCD, BCD to Binary, Binary to ASCII, ASCII to Binary, BCD to ASCII, ASCII to BCD (all 8-bit data) - Stack & Subroutines Concept - time delay using single and double register & calculations – Debugging program

UNIT 4 **INTERFACING MEMORY** **8 hours**

2K X 8, 4K X 8 ROM, RAM to 8085, interfacing an I/O portion Memory Mapped I/O

and I/O Mapped I/O - Difference between I/O mapped and Memory Mapped I/O.

UNIT 5 **Microprocessor Applications** **8 hours**

Programmable peripheral devices (8255, 8253)- Pin functions, Different Modes & Block Diagram - Keyboard and Display Interface 8279 (Architecture) - Simple temperature controller- Simple traffic light controller-stepper motor control interface.

Textbooks:

1. Ramesh S. Gaonakar, Microprocessor Architecture, Programming and Application with the 8085-PenramLnternational Publishing, Mumbai.
2. Ram, Fundamentals of microprocessors and microcomputers - Dhanapat Rai Publications, New Delhi
3. Microprocessors & Microcontrollers by N. Senthilkumar, M. Saravanan& S. Jagannathan's edition, Oxford press (Helpful for interfacing applications)
4. Microprocessors & Microcontrollers by B.P.Singh, Galgotia publicationsPvt.Ltd.

References:

1. Mathur A.P., Introduction to Microprocessors. (3rd edn., Tata McGraw, New Delhi,
2. Leventhal L.A., Microprocessor Organisation and Architecture, Prentice Hall India.
3. Microprocessor lab premier by K.A. Krishnamurth

Course Outcomes:

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

1. Learn the architecture of 8085, its pin diagram.
2. Learn about the microprocessors and microprocessor-based systems.
3. Acquire knowledge of microprocessor and their role in I/O port programming.
4. Learn about analog to digital and digital to analog convertors.
5. Learn basics of programming and other microprocessors.

CO-PO Mapping:

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

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

APPROVED IN:

BOS : 01-02- 2022 **ACADEMIC COUNCIL: 01-04- 2022**

SDG No. & Statement: 04: Quality Education

SDG Justification: Quality Education in Higher Studies

PHYS2171	MICROPROCESSORS (INTEL 8085) LAB	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	Structure of programming instructions						

Course Description: To perform arithmetic, logical programs and interfacing of I/O devices

Course Educational Objectives:

- To perform arithmetic, logical and interfacing programs
- Able to understand then apply the logic in written programs.
- To perform the athematic programs.
- To perform the sorting programs
- To perform the interfacing programs

List of Experiments

1. Addition & Subtraction (8 &16-bits)
2. Multiplication & Division (8 -bit)
3. Largest & Smallest number in the given array.
4. Ascending & Descending order.
5. Binary to ASCII & ASCII to Binary, BCD to ASCII & ASCII toBCD.
6. Block Transfer of Data.
7. Waveform generation using DAC interface.
8. Stepper motor interface.

Course Outcomes:

1. Able to write the programs to control basic devices (L2 and L3)
2. Able to perform arithmetic, logical programs (L3)
3. Able to execute the ascending and descending programs (L4).
4. Able to execute and perform the sorting programs (L4)
5. Able to perform the interfacing programs (L4)

CO-PO Mapping:

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

APPROVED IN:

BOS : 01-02- 2022 **ACADEMIC COUNCIL: 01-04- 2022**

SDG No. & Statement: 04: Quality Education

SDG Justification: Quality Education in Higher Studies

PHYS2221	MATHEMATICAL METHOD AND ANALYSIS WITH SIMULATION	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	Programming in MATLAB and Data processing						

Course Description: *To learn about various simulation software's applicable to mathematical analysis*

Course Educational Objectives:

- To introduce the syntax, features and MATLAB programming fundamentals with basic mathematical operations.
- To provide an insight into the essential plotting features and handling different file formats of MATLAB.
- To familiarize MATLAB functions for Laplace and Fourier Transforms.
- To appraise the circuit analysis applications with MATLAB.
- To acquaint mathematical and regression methods using MATLAB.

UNIT 1 **Introduction to MATLAB** **8 hours**

Scope of the course, introduction to MATLAB workspace, variables, simple arithmetic problems, symbolic calculations: writing expressions and equations. Matrix operations: addition, multiplication, inverse operation, adjoint matrix; Differentiation, integration

UNIT 2 **Graphics and handling files with MATLAB** **8 hours**

Introduction to graphics: Plotting in MATLAB: types & features. 2-D plots: line plot, scatter plot, bar plot. 3-D plots: scatter plot, surface plot, contour plot. fplot function: y= sin(x), y=x2. Overlays, scripts, and functions. M-files. Conditions: if and if-else; special function variable loops: for, while. File handling (input and output): text, csv, excel

UNIT 3 **Laplace and Fourier Transforms using MATLAB.** **8 hours**

CT and DT plotting. Laplace transforms, and inverse Laplace transforms of a given function in MATLAB. Evaluation of Fourier Co-efficient, Fourier series for Sine, Square, and Triangular waves. Fourier Transforms, and inverse Fourier transforms of a given function in MATLAB. DFT and FFT using MATLAB.

UNIT 4 **DC Circuit Analysis using MATLAB** **8 hours**

Circuit analysis: Parallel and series combination of Resisters and capacitors. Nodal analysis (KCL), Loop analysis (KVL). Transient Response: Charging of capacitor. Series RC circuit, RL circuit, RLC circuit. Problems on KCL, KVL, and transient response

UNIT 5 **Mathematical Application** **8 hours**

MATLAB ode function. Real root of algebraic equation-matrix method. Solution of differential equation using separation of variable method. Curve fitting: introduction, least-square method, fitting Straight line for discrete data set, polynomial fit, and Exponential fit.

Textbooks:

1. Electronics and Circuit Analysis using MATLAB by John O. Attia
2. Getting Started with MA TLAB by RudraPratap,7th Edition Oxford University Press N Delhi

References:

1. MATLAB and Simulink for engineers, Agam kumar tyagi-Oxford University press.
2. MATLAB: An introduction with applications by Amos Gilat, Wiley India

Course Outcomes:

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

1. Demonstrate arithmetic operations and matrix operations in MATLAB.
2. Visualize basic 2D and 3D plots, and handle csv, excel files in MATLAB .
3. Compute the Laplace, Fourier transforms and their inverse transforms
4. Perform basic circuit analysis using MATLAB .
5. Write MATLAB codes to perform curve fitting, and solve algebraic and differential equations

CO-PO Mapping:

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

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

APPROVED IN:

BOS : 01-02- 2022 **ACADEMIC COUNCIL: 01-04- 2022**

SDG No. & Statement: 04: Quality Education

SDG Justification: Quality Education in Higher Studies

PHYS2231	MATHEMATICAL METHOD AND ANALYSIS WITH SIMULATION LAB	L	T	P	S	J	C
		0	0	2	0	0	1
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	Development of logic and programming in MATLAB						

Course Description: *To analyse the mathematical methods using simulation techniques*

Course Educational Objectives:

To perform MATLAB programs for different equations

List of Experiments

1. Performing arithmetic operations: Addition, Multiplication, division-remainder
2. Matrix operations: addition, multiplication
3. Calculus: Integration, differentiation of the given function
4. 2D plotting: Line plot, scatter plot, bar plot
5. 3D plotting: Scatter plot, surface plot, contour plot
6. Symbolic math: plot y as a function of x (ex: $y=4x^2+3x+4$) and fplot function
7. File handling: importing and exporting csv file and excel file
8. Laplace transforms and inverse Laplace transforms of a given function
9. Fourier transforms and inverse transforms of a given function.
10. Applying KCL to the given node
11. Applying KVL to the given loop
12. RLC circuit analysis
13. Finding roots of an algebraic equation in matrix method
14. Straight line and exponential fitting to the given dataset.
15. Solving differential equations.

Course outcomes

1. Compute the Laplace, Fourier transforms and their inverse transforms
2. Perform basic operations using MATLAB .
3. MATLAB codes to perform curve fitting, and solve algebraic and differential equations
4. Solve mathematical models
5. Understand solving electrical circuit models

CO-PO Mapping:

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

APPROVED IN:

BOS : 01-02- 2022 **ACADEMIC COUNCIL: 01-04- 2022**

SDG No. & Statement: 04: Quality Education

SDG Justification: Quality Education in Higher Studies

PHYS2181	FUNDAMENTALS OF SIGNALS AND SYSTEMS	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	Different types of Signals and principles of systems						

Course Description: *To study about different types of signals and systems*

Course Educational Objectives:

- To provide an understanding of characterization of linear-time invariant systems
- To understand the impulse response and convolution function.
- To familiarize the application of Fourier series,
- To understand the applications of Fourier, transform and their properties.
- To understand the process and continually growing role in areas of science**.**

UNIT 1 **Signals and Systems:** **8hours**

Continuous and discrete time signals, Transformation of the independent variable, Exponential and sinusoidal signals, Impulse and unit step functions, Continuous-Time and Discrete-Time Systems, Basic System Properties.

UNIT 2 **Linear Time -Invariant Systems (LTI)** **8hours**

Discrete time LTI systems, the Convolution Sum, Continuous time LTI systems, the Convolution integral. Properties of LTI systems: Commutative, Distributive, and Associative. LTI systems with and without memory, Invariability, Causality, Stability, Unit Step response, Differential and Difference equation formulation, Block diagram representation of first order systems

UNIT 3 **Fourier Series Representation of Periodic Signals:** **8hours**

Continuous-Time periodic signals, Convergence of the Fourier series, Properties of continuous-Time Fourier series, Discrete-Time periodic signals, Properties of Discrete-Time Fourier series. Frequency-Selective filters, SimpleRC high-pass and low-pass filters

UNIT 4 **Fourier Transform** **8hours**

Aperiodic signals, Periodic signals, Properties of Continuous-time Fourier transform, Convolution and Multiplication Properties, Properties of Fourier transform, and basic Fourier transform Pairs.

UNIT 5 **Laplace Transform** **8hours**

Laplace Transform, Inverse Laplace Transform, Properties of the Laplace Transform, Laplace Transform Pairs, Laplace Transform for signals, LaPlace Transform Methods in Circuit Analysis, Impulse and Step response of RL, RC and RLCcircuits.

Textbooks:

1. V. Oppenheim, A. S. Wilsky and S. H. Nawab, Signals and Systems, Pearson Education (2007)
2. S. Haykin and B. V. Veen, Signal and Systems, John Wiley & Sons (2004)
3. C. Alexander and M. Sadiku, Fundamentals of Electric Circuits, McGraw Hill (2008)
4. H. P. Hsu, Signals and Systems, Tata McGraw Hill (2007)

References:

1. S. T. Karris, Signal and Systems: with MATLAB Computing and Simulink Modelling, Orchard Publications (2008)
2. W. Y. Young, Signals and Systems with MATLAB, Springer (2009)
3. M. Roberts, Fundamentals of Signals and Systems, Tata McGraw Hill (2007)

Course Outcomes:

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

1. describe the mathematical model of continuous - time/discrete - time signals and systems and perform mathematical operations on signals .
2. determine the output response of continuous time/ discrete time LTI system using convolution integral and convolution sum.
3. analyze the characteristics of linear – time invariant systems.
4. derive the frequency domain representation of signals and systems using transform techniques.
5. determine the output response of LTI systems using CTFT and DTFT.

CO-PO Mapping:

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

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

APPROVED IN:

BOS : 01-02- 2022 **ACADEMIC COUNCIL: 01-04- 2022**

SDG No. & Statement: 04: Quality Education

SDG Justification: Quality Education in Higher Studies

PHYS2191	MODERN DIGITAL DESIGN	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	Designing of Logic circuits						

Course Description: *To understand and analyze the different digital circuits*

Course Educational Objectives:

- To introduce number systems, conversion used for representing numbers.
- To familiarize the implementation of simple logical operations using Combinational circuits.
- To acquaint the student with the design of combinational and sequential logic circuits.
- To impart the design of synchronous and asynchronous digital systems.
- To expose different types of memories used in digital systems

UNIT 1 Digital Systems and Binary Numbers

Analog and Digital signals, characteristics of Digital Systems, switching mode operation of PN-Diode, BJT, Introduction to Binary number system, conversion of Binary to Decimal, Octal, Hexadecimal. Binary arithmetic, 2's complement arithmetic, hamming Error code.

UNIT 2 Logic Gates and Boolean algebra

Implement AND, OR, and NOT Gates using Diodes and Transistors, NAND gate and NOR gate using Diodes and Transistors. Basic laws and theorems in Boolean algebra, SOP, and POS forms of Boolean functions. Convert SOP and POS to Standard forms, Simplification of expressions using Boolean laws.

UNIT 3 Gate level minimization and Combinational logic Design

Karnaugh Map method up to four Variables, SOP and POS simplification Don't Care conditions, implementation of logic functions using basic gates, NAND implementation (2-level), Combinational circuit- analysis procedure, Design procedure, designing of Full-adder and 2-bit magnitude comparator, implement simple Boolean functions using Multiplexer.

UNIT 4 Analysis of Sequential Digital Circuits

Introduction to sequential circuits, Latches, Flip-flips (RS, JK, D, and T), and excitation tables. State diagram representation, state diagrams of basic flip-flops, Convert SR flip flop to D, JK. Convert JK flip-flop to T, D. Design 3-bit binary counter using T-flip-flop. Design of synchronous mod-6 counter using JK flip-flop.

UNIT 5 Memory, Programmable logic and Algorithmic state machine (ASM)

ROM Organization, PROM Organization, implement Boolean functions using PROM, Introduction to PLA. AND, OR and NOT matrix, input-output buffers, implement Boolean functions using PLA. Introduction to ASM, Components of ASM, features of ASM, plotting ASM chart for a simple 2-bit counter.

Textbooks:

1. Digital Logic Design, A.P. Godse, D.A.Godse, 1st Ed., Technical publications pune, 2008.
2. Digital Design- Morris Mano, M.D. Ciletti, Pearson, 4th Edition,2008.
3. Modern Digital Electronics – R. P. Jain, 4th Edition, Tata McGraw-Hill,2010.

References:

1. Switching Theory and Logic Design, C V S Rao, 1st Edition, Pearson, 2005.
2. Introduction to Switching Theory and Logic Design – Fredriac J. Hill, Gerald R. Peterson, 3rd Ed, John Wiley & Sons Inc.
3. Fundamentals of Logic Design- Charles H. Roth, Cengage Learning, 5th, Edition, 2004.
4. Switching Theory and Logic Design – A Anand Kumar, PHI, 2013

Course Outcomes:

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

1. Recall the number systems in digital systems
2. Acquire the knowledge on Logic gates and Boolean functions
3. Able to Design of simple combinational circuits
4. Able to Design of sequential circuits
5. Learn the basics of organization of memory devices

CO-PO Mapping:

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

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

APPROVED IN:

BOS : 01-02- 2022 **ACADEMIC COUNCIL: 01-04- 2022**

SDG No. & Statement: 04: Quality Education

SDG Justification: Quality Education in Higher Studies

PHYS3141	ENVIRONMENTAL PHYSICS	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	Industrial pollution control and pollution measurement						

Course Description:

This course deals with the Physics of the interaction of living organism with the earth system. The underlying physics of atmosphere, ground, water, radiation in connection with the biology, chemistry, and geology. This helps the effective management of human interaction with an environmental system

Course Educational Objectives:

1. To understand the basic concepts of thermodynamics of the atmosphere, and human thermal environments
2. To comprehend the radiation corning from sun, radioactivity in relation with the biosphere.
3. To appreciate the basic physics of the elements of water cycle, soil types and relevant adverse side of development.
4. To understand the laws of weather, climate to extreme weather events.
5. To appreciate the basic Physics of different renewable power plants and their environmental concerns.

UNIT 1 **Physics of the Atmosphere:** **8 hours**

Scope of the course, structure of atmosphere, composition. Conduction, Convection, Evaporation, Newton's law of cooling, Laws of thermodynamics, Hydrostatic equation- lapse rate, stability of the atmosphere. Human thermal environments: temperature, relative humidity, and the heat balance equation of human body. Survival in cold and hot climates**.**

UNIT 2 **Environment and Radiation** **8 hours**

Solar spectrum, Radiative balance and temperature of Earth's atmosphere, Global warming and radiative forcing, Solar UV radiation and life. Radioactivity: cosmic radiation and cosrnogenic radionuclides- naturally occurring long-lived, Biological effects of radiation, manmade radiation sources in the environment - radioactive waste.

UNIT 3 Elements of Hydrologic cycle and underlying Physics 8 hours

Hydrosphere, Hydrologic cycle, Water in the atmosphere, Clouds, Physics of cloud formation, growing droplets in cloud. Thunderstorms. Elementary concepts of monsoons.

Soils: types of soils and hydrologic cycle, Surface tension and soils, Water flow, Water evaporation, Soil temperature. Water pollution, and Soil pollution: Land fill (Plastic and electronic waste).

UNIT 4 Elements of Weather, climate and underlying Physics 8 hours

Weather conditions for different living organism, Measuring the wind, Physics of wind creation, Principal forces acting on air masses, Gravitational force, Pressure gradient, Cyclones and anticyclones, Global convection, Global wind patterns. Urbanization and challenges: air pollution, Greenhouse effect, Ozone layer depletion and extreme weather events.

UNIT 5 Energy for living 8 hours

Urbanization: Energy demand and Crisis. Energy from Fossil fuels, Nuclear power generation (Fission), Renewable resources - Photovoltaic effect and Solar power, Hydroelectric power, Tidal power, Wind power, biomass. Recent advances: Hydrogen fuel cells, Nuclear fusion. Energy equilibrium between biotic and abiotic environmental components.

Textbooks:

1. Physics of Environment by A. W. Brinkmen
2. Principles of Environmental Physics, fourth Edition by John L. Monteith and Mike H. Unsworth
3. Environmental Physics by M. Dzelalija
4. Introduction to Environmental Soil Physics by Daniel Hillel

References:

1. Human Thermal Environments: The Effects of Hot, Moderate, and Cold Environments on Human Health, Comfort and Performance, Second Edition, By Ken Parsons.
2. Environmental Pollution and Control, 4th ed. by J. Jeffrey Peirce, P. Aarne Vesilind, Ruth F. Weiner
3. Environmental Studies: The earth as a living planet by Botkin, D.B and Kodler E.A., John Wiley and Sons Inc.,2000
4. The nature and properties of Soils by Brady, N.C. Tenth Edition. Mac Millan Publishing Co., New York,1990

Course Outcomes:

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

1. Interpret the role of the concepts of heat and thermodynamics m connection with the atmosphere, and human being.
2. Understand the earth's radiation budget, its elements and interconnection.
3. familiarize with water cycle of Earth's environment, and pollution of water and soil
4. Articulate the physics of elements of hydrological cycle; water pollution, soil pollution, and their concerns).
5. to identify the future concerns of energy crisis and understand underlying science

CO-PO Mapping:

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

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

APPROVED IN:

BOS :01-02-2022 **ACADEMIC COUNCIL:01-04-2022**

SDG No. & Statement: **4 & Quality Education**

SDG Justification: Student develop their attributes and skills towards enhancing personality contributing towards scientific community

PHYS3171	BIO SENSORS	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	Measurement of Biological signals						

Course Description: To know the functionality of different sensors

Course Educational Objectives:

- Learn about the standard structure of Biosensor
- Use mathematical methods of biosensors.
- Use circuit analysis models for the Biosensors.
- The conceptual study on Bio-sensing elements.
- Familiarize with the advancements in the designing of biosensor for various applications

UNIT 1 Introduction

Definitions, Biological inspiration (Advantages and limitations), various components of biosensors, types of sensors, structure of biosensor, components and design, ideal requirements.

UNIT 2 Basic Design and Characterization

Considerations calibration, dynamic Range, signal to noise, sensitivity, selectivity, stability, Interference, Recognition/Transduction membrane protein sensors: ion channels. Characterization techniques for surface and interface analysis.

UNIT 3 Transducers In Biosensors

Various types of transducers; principles and applications - Calorimetric, Optical, Electrochemical, carbon nanotube, Piezoelectric, Semiconductor, Impedimetric, cantilever.

UNIT 4 Applications of Biosensors

Electrochemical and optical sensors, Biosensors in clinical chemistry, Microfabricated biosensors and point-of-care diagnostics systems, Surface plasmon resonance and evanescent wave biosensors, Biosensor in cancer and HIV early diagnosis.

UNIT 5 Applications of Nanomaterials in Biosensors

Production of nanomaterials, Nano Materials in biosensors; Carbon based Nano Material, Metal oxide and nano particle, Quantum dots, Role of nano material in Signal Amplifications.

Textbooks:

1. Introduction to Biosensors by Jeong-Yeol Yoon; Publisher: Springer-Verlag New York Ed.1
2. Novel Approaches in Biosensors and Rapid Diagnostic Assays by Zvi Liron; Publisher: Springer US Ed.1

References:

1. Electrochemical Sensors, Biosensors and their Biomedical Applications, X. Zhang, H. Ju J. Wang, Publisher: Elsevier, 2008.
2. Recognition Receptors in Biosens.by Mohammed Zourob; Publisher: Springer-Verlag New York Ed.1
3. Any other Study Material: Review articles, Research articles, Web site information's, Notes.

Course Outcomes:

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

1. Understand the importance of biosensors
2. Know about various types of biosensors
3. Realize the applications of biosensors
4. Analyze the gap between the conventional technologies
5. Understand the advanced bio-sensing technology

CO-PO Mapping:

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

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

APPROVED IN:

BOS : 01-02- 2022 **ACADEMIC COUNCIL: 01-04- 2022**

SDG No. & Statement: 04: Quality Education

SDG Justification: Quality Education in Higher Studies

PHYS3151	VLSI DESIGN	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	IC fabrication and basic principles						

Course Description: *To know the fabrication and electrical characteristics in digital circuits*

Course Educational Objectives:

- Learn the various fabrication steps of CMOS devices and their electrical properties.
- Apply CMOS technology-specific layout rules in the placement and routing of transistors
- and interconnect and to verify the functionality, timing and power effects.
- The concepts and techniques of modern integrated circuit design and testing (CMOS VLSI).
- Familiarize with Simulation and Synthesis Tools, Test Benches used in Digital system Design.
- Write programs in VHDL/Verilog

UNIT 1 Introduction and CMOS Technology

Introduction to IC Technology, MOS and related VLSI Technology, MOS and CMOS Fabrication processes, Comparison between CMOS, and Bipolar technologies.

Basic Electrical Properties of MOS and CMOS Circuits:

I_{ds} versus V_{ds} Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Transconductance, Output Conductance and Figure of Merit. The Pass transistor, NMOS Inverter, Pull-up to Pull-down Ratio for NMOS inverter driven by another NMOS inverter, CMOS inverter, Latch up.

UNIT 2 Circuit Design process

MOS Layers, Stick Diagrams, Design Rules and Layout, General observations on the Design rules, Delay estimation, Logical effect and Transistor sizing, Power dissipation, Interconnect,

Design margin, Reliability, Layout Diagrams of NAND and NOR gates and CMOS inverter.

UNIT 3 Combinational and Sequential Circuit Design

Circuit families -Low power logic design - comparison of circuit families – Design of combinational circuits-Adders, Subtractors, decoder, encoder, multiplexer, Design of sequential circuits- latches, flip flops and Registers

UNIT 4 **CMOS Testing**

Need for testing- Testers, Text fixtures and test programs- Logic verification- Silicon debug principles- Manufacturing test - Design for testability - Boundary scan.

UNIT 5 **Specification Using VHDL**

Basic concepts- structural gate level switch level modeling, Design hierarchies, Behavioural and RTL modeling, Test Benches, Structural gate level description of half adder, full adder, Ripple carry adder, decoder, comparator, D flip flop.

Textbooks:

1. D.A Pucknell& K. Eshraghian Basic VLSI Design, Third edition, PHI
2. Weste and Harris: CMOS VLSI DESIGN (Third edition) Pearson Education.

References:

1. Wayne Wolf, Modern VLSI design, Pearson Education
2. M.J.S. Smith: Application specific integrated circuits, Pearson Education
3. J.Bhasker: Verilog HDL primer, BS publication
4. Ciletti Advanced Digital Design with the Verilog HDL, Prentice Hall of India

Course Outcomes:

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

1. Understand the MOS technology .
2. Analyze the layout design
3. Design of logic circuits.
4. Testing of CMOS logic circuits
5. Design of logic circuits using VHDL

CO-PO Mapping:

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

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

APPROVED IN:

BOS : 01-02- 2022 **ACADEMIC COUNCIL: 01-04- 2022**

SDG No. & Statement: 04: Quality Education

SDG Justification: Quality Education in Higher Studies

PHYS3161	RADAR SYSTEMS	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	Different Radar systems and their working principles						

Course Description: *To understand the basic operation of different RADAR systems*

Course Educational Objectives:

- To understand the basics of radar and study the effect of various parameters.
- To analyze how the Doppler frequency shift is used for measuring the velocity of a moving target.
- To estimate the position of the target using CW and MTI radars.
- To interpret various radar tracking systems.
- To determine the signal-to-noise ratio, probability of detection and false alarms.

UNIT 1 **Introduction to Radar**

Radar block diagram, Radar frequencies, Applications of radar, Radar range equation, Minimum detectable signal, Receiver noise, Integration of radar pulses Radar cross section of targets, Pulse repetition frequencies and range ambiguities.

UNIT 2 **Radar Components**

Radar antennas, Review of antenna parameters, Parabolic reflector antennas, scanning feed reflector antennas, Lens antenna, Cosecant squared antenna pattern, Radomes. Radar receivers: Noise figure in receivers, Mixers, Displays, Duplexers.

UNIT 3 **Radar Types**

CW and FM modulated radar: Doppler Effect, CW radar, FM CW radar, multiple frequency CW radar. MTI and pulse Doppler radar: Delay line cancellers, Staggered PRF, Pulse Doppler radar, MTI from a moving platform.

UNIT 4 **Tracking radar**

Tracking using a radar, Sequential lobing conical scan, Monopulse tracking radar, Target reflection and angular accuracy, Tracking in range, Acquisition.

UNIT 5

Propagation Radar Waves, Line of sight propagation, Atmospheric Refraction –Standard propagation – Nonstandard Propagation, Radar used to navigation

Textbooks:

1. Meril I Skolink,"Introduction to Radar Systems", Tata–McGraw Hill (Third Edition), 2003
2. C.A Balanis, "Antenna Theory: Analysis and design", John Willey & Sons,2000.

References:

1. Mark A Richards, James A Scheer, William A Holm, "Principles of modern radar", Sci. Tech Publishing incorporated, 2010.
2. Jerzy M Kawecki, "Radar Essentials", IEEE Press 2000.

Course Outcomes:

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

1. Understand different frequency bands, RADAR equation for minimum detectable target.
2. Gain the knowledge on RADAR Antennas and their functions.
3. Knowledge on RADAR types and their applications.
4. Understand what is tracking RADAR and scanning methods in RADARs.
5. RADAR wave propagation in earth atmosphere.

CO-PO Mapping:

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

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

APPROVED IN:

BOS : 01-02- 2022

ACADEMIC COUNCIL: 01-04- 2022

SDG No. & Statement: 04: Quality Education 4: Quality Education

4: Quality Education

SDG Justification: Quality Education in Higher Studies

PHYS2201	COMPUTATIONAL METHODS IN PHYSICS	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	Methods of understanding and analysing physical principles of complex systems						

Course Description:

Enables to understand and the use of various computational tools for its applicability

Course Educational Objectives:

1. To introduce salient tools of computational methods in problem solving in contemporary Physics.
2. To calculate differentiation and definite integrals of various functions with desired accuracy
3. To write programs for solving ordinary differential equations with desired order of accuracy
4. To introduce the theory and application of Density Functional Theory (DFT) of solids
5. Analyze its solutions

UNIT 1 **Introduction to Computational Physics**

Definition, Scope of computational methods in sciences, Contemporary interest and applications, the role of programming. Visualization of the data, Curve fitting: Least square method, Linear method, polynomial, exponential. Errors and Uncertainties: Types of errors: Blunders and bad theory, random error, approximation errors, round off errors; error assessment.

UNIT 2 **Numerical Calculus**

Numerical differentiation: first order and second-order differentiation using two-point formula, three-point formula and five-point formula. Numerical integration: Definite integrals using trapezoid rule, Simpson rule, Gaussian quadrature rule. Application of these methods: centroid calculation.

UNIT 3 **Solution of Ordinary Differential Equations**

Solution methodologies of Initial value problems: Euler and Picard methods, Predictor-Corrector method, Runge-Kutta method. Applications to the harmonic oscillator, Newton's law of motion, Projectile motion, driven pendulum under damping. Solution of methodology for boundary value problem: relaxation method. Application to the one-dimensional diffusion equation, two-dimensional Poisson equation.

UNIT 4 **Molecular Mechanics**

History and Fundamental Assumptions; Potential Energy Functional Forms-Bond Stretching; Valence Angle Bending; Torsions; van der Waals Interactions; Electrostatic Interactions; Cross Terms and Additional Non-bonded Terms. Parameterization Strategies; Force-field Energies and Geometry Optimization. Quantum Mechanics and the Wave Function; Hamiltonian operator; variational principle and born–Oppenheimer Approximation; LCAO approach. Approach to various molecules for optimization.

UNIT 5 **FT and Plane Waves**

Introduction to Electronic Structure, Independent Particle Approximation (Hartree; Hartree-Fock), Crystal Symmetry and Bloch States, Basic Understanding of Bands in Solids, Density Functional Theory: Kohn-Sham Theory; LDA, Beyond the LDA: GGAs; nonlocal functionals, Pseudopotentials, Plane Wave Calculations in Crystals, self-consistent DFT.

Textbooks:

1. Computational Physics, Problem Solving with Computers, Enlarged e-textbook Python 3rd Edition by Rubin H. Landau, Manuel J. Páez, Cristian C. Bordeianu, WILEY-VCH Verlag GmbH & Co. KGaA
2. An Introduction to Computational Physics (Second Edition), 2006, Tao Pang, Cambridge University Press,
   Link: https://www.physics.unlv.edu/~pang/cp2.html

Online material

http://cmt.dur.ac.uk/sjc/thesis_ppr/node14.html;
https://courses.engr.illinois.edu/mse404ela/sp2019/5.DFT-practice.pdf

Coursera Course:

Density Functional Theory: https://www.coursera.org/learn/density-functional-theory?

References:

1. Essentials of Computational Chemistry-Theories and Models 2nd ed., 2004, Christopher J Cramer, Wiley
2. Solid State Physics, 2003, Ashcroft and Mermin, Cengage Learning India Private Limited
3. Electronic Structure: Basic Theory and Practical Methods (2nd ed.), 2020, Richard M. Martin, Cambridge University Press;

Course Outcomes:

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

1. understand the importance of programming, visualization tools, errors assessment in Physics.
2. perform numerical differentiation and definite integrals for a given function with their programs
3. perform numerical solution of ordinary differential equations associated with initial value and boundary value problems
4. Understand and apply the principles of DFT in determining the electronic structure of solids
5. Analyze solutions for interpretation

CO-PO Mapping:

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

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

APPROVED IN:

BOS : 01-02- 2022 **ACADEMIC COUNCIL: 01-04- 2022**

SDG No. & Statement: 04: Quality Education

SDG Justification: Quality Education in Higher Studies

PHYS3131	ESSENTIALS OF BIOPHYSICS	L	T	P	S	J	C
		3	0	0	0	0	3
Pre-requisite	None						
Co-requisite	None						
Preferable exposure	Basic understanding of biological signals and measurement						

Course Description: *To understand and analyze biological phenomena with principles of physics*

Course Educational Objectives:

- To understand and interpret radiation and its effects on biological materials.
- To identify diffusion related phenomena and biophysical properties in biological systems.
- To understand different types of light and electron microscopes.
- To understand different spectroscopic techniques and laser theory.
- To understand and interpret XRD and XAFS spectra.

UNIT 1 **Radiation Biology** **8 hours**

Radioactivity-Natural, Artificial, and induced Radioactivity and applications, radioactive disintegration, Units of radioactivity, physical and biological half-life and relative biological effectiveness. Measurement of Radioactivity-Geiger Muller counter, proportional counter, scintillation counter, biological effects of radiation and radiation energy.

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

Diffusion –factors effecting diffusion, Ficks law, diffusion of electrolytes, accelerated diffusion and biological significance. Biophysical phenomena in biochemical studies-pH meter - principle, electrode system and factors effecting in its measurement and centrifugation. Hemodynamic: Rheology biophysical properties of plasma, viscosity of blood, comparison of Newtonian and Non-Newtonian fluids and dielectric constant.

UNIT 3 **Microscopy in biology and Medicine** **8 hours**

Light characteristics, microscopes- compound, phase contrast, interference, polarization, ultraviolet, fluorescent and electron microscopes – Transmission Electron Microscope, Scanning Electron Microscope, and its probe analysis, centrifuge microscope with biological applications. Bioacoustics-ultrasound-physical and biological effects.

UNIT 4 **Spectroscopic studies in biology** **8 hours**

Interaction of EM radiation with matter Ultraviolet & Visible spectroscopy, fluorescence and phosphorescence methods, Infrared spectroscopy- bending, near, mid & far infrared region. Raman spectra- principle and instrumentation. NMR, ESR Instrumentation and Laser-characteristics, population inversion, stimulated and spontaneous and relation

UNIT 5 **Advanced Spectroscopic Techniques** **8 hours**

Atomic spectroscopy-atomic absorption spectroscopy and double beam atomic absorption spectroscopy-ray spectroscopy Absorption spectroscopy, diffraction spectroscopy, transmission photographic method, X- ray ionization spectrometer, rotating crystal spectrometer and powder crystal diffraction spectrometer.

Textbooks:

1. Introductory Bio Physics F.R. Hallet, P.A.Speight, R.H.Stinson, Chapman & Hall.
2. Bio Physics Principles and Aplications. M.A. Subrahmaniam-MJP Publishers
3. A Text book of Biophysics R.N.Roy, New central Book Agency

References:

1. Basic Bio Physics- M.Daniel Student Edition
2. Bio Physics- Rodney Cotterill John Wiley & Sons, Ltd.

Course Outcomes:

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

1. Understanding of nuclear radiation, its measurement and effects of samples
2. To analyze diffusion related processes in biological fluids and blood.
3. To attribute different light and electron microscopes.
4. Analyze spectroscopic techniques and their usage
5. Understand the different absorption spectroscopy and diffraction techniques.

CO-PO Mapping:

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

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

APPROVED IN: BOS & Academic Council

BOS : 01-02- 2022 **ACADEMIC COUNCIL: 01-04- 2022**

SDG No. & Statement: 04: Quality Education

SDG Justification: Quality Education in Higher Studies