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

Accredited by NAAC with A⁺ Grade



CURRICULUM AND SYLLABUS

of

B.Sc. Physics

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

Academic Regulations

Applicable for the Undergraduate programmes in the Faculties of **Engineering, Humanities, Management and the Sciences**

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

Program Educational Objectives

- Students pursuing program will be pioneered in their chosen area
- Inculcate profession with social responsibility and contribute to academic community with ethics
- Ability to develop interdisciplinary research work
- Work in the infrastructure development projects
- Pursue higher studies and secure academic excellence in competitive exams

Program Objectives

The student acquires competence in evolution of physics, understanding concepts, analyzing scientific theories and contribute to academic community, industry, consultancy and education with effective communication and ethical responsibilities

Gain substantial knowledge in various emerging areas of physics like Quantum

 mechanics, statistical mechanics, condensed matter physics, Nanoscience, Photonics and Electronics

Use of mathematical tools in solving physical problems and have the solid background and experience required to model, analyze, and solve advanced problems in physics

To apply advanced theoretical and/or experimental methods, including the use of numerical methods and simulations

Will be able to apply fundamental principles of physics together with analytic tools to
evaluate and describe complex physical situations

• Prepare students to evaluate the soundness of concepts proposed

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Will empower the student to acquire scientific and practical knowledge by performingexperiments in physics and electronics

to develop abilities and skills that encourage research and development activities and are
useful for society

to develop abilities and skills that encourage research and development activities and are
useful in everyday life

To get job opportunities in higher education of core research, interdisciplinary research and in research organizations as scientific assistant, project assistant and many others

- To compete in national level tests like UGC-CSIR NET, JEST, GATE, etc., successfully
- Enhance their skills for continuous professional development in response to technological and social challenges

Program Specific Objectives

- Ability to develop analytic and critical thinking with gained knowledge in major branches of physics
- Concern with intellectual curiosity and able to learn not only areas that are relevant to Physics and related programs
- To enable the students for pursuing higher studies and careers in Physics
- Apply the knowledge gained and perform basic research and collaborative research
- Improve scientific writing skills with latest methods
- Cultivate competency at national and international level
- Cultivate habit of lifelong learning and socially responsible citizens
- Maintain Ethics and values with pedagogy

CURRICULUM STRUCTURE OF B.Sc. PHYSICS

(2021-22 ADMITTED BATCH)

University Core (UC)

Course code	Level	Course title	L	Т	Р	S	J	С
CSEN1001	1	IT Productivity Tools^	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
CLAD1001	1	Emotional Intelligence & Reasoning Skills (Softskills 1)	0	0	2	0	0	1
CLAD1011	1	Leadership Skills & Quantitative Aptitude (Softskills 2)	0	0	2	0	0	1
CLAD1021	1	Verbal Ability & Quantitative Ability (Softskills 3)	0	0	2	0	0	1
CLAD1031	1	Practicing Verbal Ability & Quantitative Aptitude (Softskills 4)	0	0	2	0	0	1
VEDC1001	1	Venture Development	0	0	0	2	0	2
DOSP10XX	1	Sports 1#	0	0	0	2	0	2*
DOSL10XX	1	Club Activity#	0	0	0	2	0	2*
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*
DOSL10XX	1	Community Service#	0	0	0	0	2	2*
ENVS1001	1	Environmental Studies^	3	0	0	0	0	3*
MFST1001	1	Health and Welbeing#	0	0	2	0	0	1*
CLAD20XX	2	Softskills 5A/5B/5C	0	0	2	0	0	1
CLAD20XX	2	Softskills 6A/6B/6C	0	0	2	0	0	1
FINA3001	3	Personal Financial Planning#	0	0	2	0	0	1*

* Pass/Fail courses

Opt any three courses among the five ^ Online/Swayam/NPTEL Courses

Softskills courses 5 and 6

Course code	Level	Course title	L	Т	P	S	J	C
CLAD2001	2	Preparation for Campus Placement - 1 (Softskills 5A)	0	0	2	0	0	1
CLAD2011	2	Preparation For Higher Education (GRE/ GMAT) - 1 (Softskills 5B)	0	0	2	0	0	1
CLAD2021	2	Preparation for CAT/ MAT - 1 (Softskills 5C)	0	0	2	0	0	1
CLAD2031	2	Preparation For Campus Placement - 2 (Softskills 6A)	0	0	2	0	0	1
CLAD2041	2	Preparation For Higher Education (GRE/ GMAT) - 2 (Softskills 6B)	0	0	2	0	0	1
CLAD2051	2	Preparation for CAT/ MAT - 2 (Softskills 6C)	0	0	2	0	0	1

Sports courses

Course code	Level	Course title	L	Т	Р	S	J	С
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	Т	Р	S	J	С
DOSL1001	1	Club Activity (participant)	0	0	0	2	0	2
DOSL1011	1	Club Activity (Member of club)	0	0	0	2	0	2
DOSL1021	1	Club Activity (Leader of 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	Т	Р	S	J	С
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	Т	P	S	J	С
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

Course code	Level	Course title	L	Т	P	S	J	С
PHYS1151	1	Waves and Optics	3	0	0	0	0	3
PHYS1171	1	Thermal Physics and Statistical Mehanics	3	0	0	0	0	3
PHYS1161	1	Waves and Optics Lab	0	0	2	0	0	1
PHYS1181	1	Thermal Physics and Statistical Mehanics Lab	0	0	2	0	0	1
PHYS2001	2	Electricity and Magnetism	3	0	0	0	0	3
PHYS2041	2	Elementary Mathematical methods of Physics	3	0	0	0	0	3
PHYS3001	2	Mechanics of System of Particles	3	0	0	0	0	3
PHYS2011	2	Electricity and Magnetism Lab	0	0	2	0	0	1
PHYS2051	2	Elementary Mathematical methods of Physics Lab	0	0	2	0	0	1
PHYS3011	2	Mechanics of System of Particles Lab	0	0	2	0	0	1
PHYS2021	3	Elements of Modern Physics	3	0	0	0	0	3
PHYS3021	3	Introduction to Electromagnetic Theory	3	0	0	0	0	3
PHYS3041	3	Introduction to Quantum Mechanics	3	0	0	0	0	3
PHYS2031	3	Modern Physics Lab	0	0	2	0	0	1
PHYS3031	3	Electromagnetic Theory Lab/ Tutorial	0	0	2	0	0	1
PHYS3051	3	Quantum Mechanics Lab/ Tutorial	0	0	2	0	0	1

Programme Core/Major Core (PC/MaC)

Programme Elective (PE)*

Course code	Level	Course title	L	Т	P	S	J	С
PHYS2131	2	Nuclear and Particle Physics	3	0	0	0	0	3
PHYS2151	2	Nuclear Physics and Solid State Physics Lab	0	0	2	0	0	1
	2	Computational methods in Physics	3	0	0	0	0	3
	2	Computational methods in Physics Lab	0	0	2	0	0	1
PHYS3121	2	Astronomy and Astro Physics	3	0	0	0	0	3
	2	Mathematical Method and analysis with Simulation	3	0	0	0	0	3
PHYS3141	2	Environmental Physics	3	0	0	0	0	3
	3	Bio sensors	3	0	0	0	0	3
PHYS2121	3	Solid State Physics	3	0	0	0	0	3
PHYS2141	3	Physics of Nano Materials	3	0	0	0	0	3
	3	Materials Science	3	0	0	0	0	3
PHYS3131	3	Essentials of Biophysics	3	0	0	0	0	3
Note 1: Students	should acq	uire a minimum of 16 credits from the program elective courses				•		
<i>Note 2:</i> Theory and corresponding lab course are co-requisites (For example if a student opts to study PHYS2131 then he/she has to study PHYS2151 in the same semester)								

Open Elective (OE)*

* Opt eligible Programme Elective (PE) courses from other programmes as an open elective courses and earn 18 credits

Stream	Major course	Minor course (Select one)
		Electronics
		Mathematics
Dhysical Ssion so	Dhysics	Statistics
Physical Science	Physics	Chemistry
		Data Science
		Environmental Science

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

		Minor courses in Electronics						
Course code	Level	Course title	L	Т	Р	S	J	С
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
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* Eligibility: This minor course is offered to the students of B.Sc Physics/ Mathematics/ Chemistry/ Statistics

		Minor courses in Mathematics						
Course code	Level	Course title	L	Т	Р	S	J	С
MATH1231	1	Differential Equations	3	0	0	0	0	3
MATH1241	1	Differential Equations Lab	0	0	2	0	0	1
MATH2001	2	Real Analysis	3	0	0	0	0	3
MATH2011	2	Algebra	3	0	0	0	0	3
MATH2041	2	Linear Algebra	3	0	0	0	0	3
MATH2051	2	Linear Algebra Lab	0	0	2	0	0	1
MATH3011	3	Vector Calculus	3	0	0	0	0	3
MATH3001	3	Numerical Methods	3	0	0	0	0	3
MATH3021	3	Numerical Methods using MATLAB	0	0	2	0	0	1
MATH3041	3	Discrete Mathematics	3	0	0	0	0	3

* Eligibility: This minor course is offered to the students of B.Sc Physics/Electronics/Chemistry											
		Minor courses in Statistics									
Course code	Level	Course title	L	Т	Р	S	J	С			
MATH1171	1	Descriptive Statistics and Probability Theory	3	0	0	0	0	3			
MATH1181	1	Descriptive Statistics Lab	0	0	2	0	0	1			
MATH1211	2	Mathematical Expectation and Probability Distributions	3	0	0	0	0	3			
MATH2061	2	Statistical Methods	3	0	0	0	0	3			
MATH2071	2	Statistical Inference	3	0	0	0	0	3			
MATH2101	2	Optimization Techniques	3	0	0	0	0	3			
MATH2111	2	Optimization Techniques Lab	0	0	2	0	0	1			
MATH3061	3	Sampling Techniques and Design of Experiments	3	0	0	0	0	3			
MATH3081	3	Sampling Techniques and Design of Experiments Lab	0	0	2	0	0	1			
MATH3071	3	Statistical Quality Control and Reliability	3	0	0	0	0	3			
* Eligibility: This n	ninor course	is offered to the students of B.Sc Physics/Electronics/Chemistry									
		Minor courses in Chemistry									
Course code	Level	Course title	L	Т	Р	s	J	с			
CHEM1061	1	Inorganic Chemistry I	3	0	0	0	0	3			
CHEM1071	1	Inorganic Chemistry 1 Lab	0	0	1	0	0	1			
CHEM1081	1	Physical Chemistry I	3	0	0	0	0	3			
CHEM2001	2	Organic Chemistry – I	3	0	0	0	0	3			
CHEM2021	2	Inorganic Chemistry-II	3	0	0	0	0	3			
CHEM2041	2	Physical Chemistry II	3	0	0	0	0	3			
CHEM1091	1	Physical Chemistry 1 Lab	0	0	1	0	0	1			
CHEM3001	3	Organic Chemistry – II	3	0	1	0	0	3			
CHEM2011	2	Organic Chemistry 1 Lab	0	0	1	0	0	1			
CHEM3021	3	Analytical Chemistry	3	0	1	0	0	3			
* Eligibility: This n	ninor course	is offered to the students of B.Sc Physics /Electronics/ Mathematics	s/ El	lectr	onic	S					
		Minor courses in Data Science									
Course code	Level	Course title	L	Т	Р	S	J	С			
CSCI1031	1	Introduction to Python Programming	3	0	0	0	0	2			
CSCI1271	1	Introduction to Python Programming Lab	0	0	2	0	0	2			
CSCI2311	2	Basics of Data Structures and Algorithms	3	0	0	0	0	3			
CSCI2321	2	Foundations of Artificial Intelligence	3	0	0	0	0	3			
CSCI2331	2	Fundamentals of Cloud Computing	3	0	0	0	0	3			
CSCI2341	2	Fundamentals of Database Management Systems	3	0	0	0	0	3			
CSCI2071	2	Database Management Systems Lab	0	0	2	0	0	1			

CSCI3301	3	Basics of Data Mining	3	0	0	0	0	3			
CSCI3021	3	R Programming Lab	0	0	2	0	0	1			
CSCI3311	3	Basics of Machine Learning	3	0	0	0	0	3			
* Eligibility: This n	ligibility: This minor course is offered to the students of B.Sc Mathematics/ Statistics/ Physics/ Electronics/ Chemistry										
	Minor Courses in Environmental Science										
Course code	Level	Course title	L	Т	Р	S	J	С			
ENVS1011	1	Understanding Environment & Ecology	3	0	0	0	0	3			
ENVS1021	1	Understanding Environment & Ecology Lab	0	0	2	0	0	1			
ENVS1031	1	Environmental Chemistry	3	0	0	0	0	3			
ENVS2021	2	Geological Sciences and its resources	3	0	0	0	0	3			
ENVS2001	2	Air Pollution and Control	3	0	0	0	0	3			
ENVS2041	2	Environmental Microbiology	3	0	0	0	0	3			
ENVS2011	2	r Pollution and Control Lab			2	0	0	1			
ENVS3001	3	olid Waste Management and Soil Pollution		0	0	0	0	3			
ENVS3011	3	lid Waste Management and Soil Pollution Lab			2	0	0	1			
ENVS3041	3	Industrial Safety	3	0	0	0	0	3			
* Eligibility: This n Tech/Biotechnolog	ninor course gy/Chemistr	is offered to the students of B.Sc Biochemistry/Microbiology/Food	Scie	nce	&						
Allocation of cree	lits for 3-ye	ar B.Sc Program	_								
Type of Course	Credits	% of Program (in credits)									
University Core	12	12 10%									
Faculty Core	18	15%									
Major Core	32	26%									
Major Electives	16	14%									
Program Minor	24	20%									
Open elective	18	15%									
Total	120	100%									

CSEN1001: IT Productivity Tools

L	Т	Р	S	J	С
0	0	2	0	0	1*

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 Objectives

- to enable the learner, the skill in preparing technical documents of professional quality using docs, sheets and forms.
- to involve the student in designing and creating of websites and acquaint the student with the skill of processing audio, images, documents etc.
- to create awareness in analysing data using pivot tables, query manager etc.
- to create awareness in composing emails, mail merge, e-mail merge etc.
- to provide the exposure to work with collaborative tools.

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. Analyse the results of a examination studentwise, teacherwise, coursewise, 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/
- 4. Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics Fourth Edition ISBN-13: 978-1449319274

References/Online Resources

- 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. <u>https://edu.google.com/</u>

Course Outcomes

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

LANG1001: Communication Skills in English - Beginners

L	Т	Р	S	J	С
0	0	4	0	0	2*

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

Course 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

- 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)
- 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)
- 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)
- 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)
- 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)

LANG1011: Communication Skills in English

L	Т	Р	S	J	С
0	0	4	0	0	2

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 Objectives

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

S. No.	Tasks	Activities
1	Listening to subject related short discussions/ explanations/ speech for comprehension	Pre-reading group discussion, Silent reading (Note-making), Modelling (questioning), Post- reading reflection /Presentation
2	Asking for information: asking questions related to the content, context maintaining modalities	Group role-play in a context (i.e. Identifying the situation and different roles and enacting their roles)

List of Tasks and Activities

3	Information transfer: Verbal to visual (familiar context), demonstration by teacher, learners' task (guided with scaffolding), learners' task (free), presentation and feedback	Pair work for discussion & feedback, Presentations, question-answer
4	Information transfer: Visual to verbal (unfamiliar context); demonstration by teacher, learners' task (guided with scaffolding), learners' task (free), presentation and feedback	Pre-reading game/modelling, discussion in small groups, individual writing, and feedback
5	Introducing officials to peers and vice versa - Formal context	AV support, noticing, individual performance (3- 4), pair work (in context), teacher modelling, group work for Introducing self and others in a formal context
6	Introducing friends to family and vice versa - Informal context	Teacher modelling/AV support, noticing structure & note-taking, Introducing friends and family in an informal context
7	Vocabulary in context: Find clues in a text and use them to guess the meaning of words/phrases. Apply the newly learnt vocabulary in communication (speaking and writing).	Comprehending verbal communication: Identifying the contextual clues in oral and written texts; guessing the meaning of words/phrases in context while reading texts and listening to discussions/talks
8	A five-day journal (diary) writing based on learners reading from newspaper on a single relevant/current social issue. Individual oral presentation and feedback from peers and instructor.	Note-making (group work), Discussion, Feedback
9	Follow the essentials of lectures, talks, discussions, reports and other forms of academic presentations and mak2 individual and group presentations aided with images, audio, video, tabular data, etc.	Making power point presentation aided with images, audio, video, etc. with a small group by listening 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 texts by careful reading and identifying the errors, peer-exchange (Pair work), feedback/consolidation
11	Collaborative work (speaking and writing) in small groups of 3 or 4 learners: discussing a general/discipline-specific topic: creating outline, assigning specific roles to members of the group; and group presentation followed by peer and instructor feedback	Pre-task modelling (peer/teacher), general discussion on structure, group work (collaboration), feedback
12	Independent reading of different text types using appropriate reference sources by adapting suitable reading styles and speed. Focus on active reading for vocabulary: low-frequency collocations and idiomatic expressions.	Brain-storming, mapping of key terms (content specific), reading and note-making (individual), oral questioning, discussion
13	Role-play (specific social and academic situations): planning (making notes), understanding nuances of speaking in context, coordinating with situational clues and fellow speakers/participants	Peer discussion for outline, A-V support, observing (teacher modelling), role play (guided), role-play (free), feedback
14	Writing instructions: Guidelines - Flowcharts - Procedures to be followed	Pre-task reading, pair work, teacher/peer- discussion, feedback
15	Speaking spontaneously on topics of interest and writing short structured essays on the same topics adopting appropriate academic conventions and grammatical accuracy.	Reading for task preparation, note-making, speaking, reflection and corrective peer and teacher feedback

Reference Books

- 1. P. Kiranmayi Dutt, Geetha Rajeevan. (2007). Basic Communication Skills. Foundation Books. CUP
- 2. Harmer, J. (1998). How to teach English. Longman
- 3. Sanjay Kumar & Pushp Lata. (2018). Communication Skills: A Workbook. OUP.
- 4. Cambridge IGCSE: English as a Second Language Teacher's Book Fourth Edition. By Peter Lucantoni. CUP (2014).
- 5. Cambrdige Academic English: An Integrated Skills Course for EAP (Upper Intermediate) By Martin Hewings, CUP (2012)
- 6. Richards, J.C. and Bohlke, D. (2012). Four Corners-3. Cambridge: CUP.
- 7. Headway Academic Skills: Reading, Writing, and Study Skills Student's Book, Level-2 by Sarah Philpot. OUP
- 8. Latham-Koenig, C. & Oxenden, C. (2014). American English File. Oxfor: OUP.
- 9. McCarthy, M. & O' Dell. F. (2016). Academic Vocabulary in Use. Cambridge: CUP

Online Resources

- 1. <u>https://www.grammarly.com/blog/</u>
- 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

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

LANG1021: Advanced Communication Skills in English

\mathbf{L}	Т	Р	S	J	С
0	0	4	0	0	2

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 communicative skills besides building awareness on the finer nuances of language use for various purposes. This course emhasizes free writing through meaningfully engaging tasks with a pre and post context building. There is ample scope for application of critical thinking through simulated activities for effective communication in real life situations.

Course Objectives

- 1. 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)
- 2. Enable learners to become aware of tone and attitude in written texts, and demonstrate their comprehension of fairly complex lines of argument and points of view presented in a variety of texts by equipping them with upper intermediate to advanced level reading skills and strategies. (Bloom's Taxonomy Level/s:2 & 3)
- 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)
- 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	со
1	Evaluative and extrapolative reading of a long text/short texts on a current topic related to technology and society, identifying and questioning the author's intention, post- reading discussion in small groups, maintaining group dynamics, arriving at a consensus	Pre-reading group discussion, silent reading (Note-making), modelling (questioning), post-reading reflection and brief presentation of thoughts/ideas/opinions on the theme of the text	3
2	Debate in pairs based on listening to two recorded contemporary speeches by well- known leaders in different fields. Peer feedback and instructor feedback.	Pre-recorded audio/video for listening, student checklist for noticing key words/concepts, pre-task orientation (by teacher), pair work, feedback	1
3	Information transfer: Verbal to visual (unfamiliar context); demonstration by teacher, learners' task (guided with scaffolding), learners' task (free), presentation, question-answer(among students), modification and feedback before the final version is done	Pair work for discussion and feedback, presentations, question-answer	2
4	Information transfer: Visual to verbal (unfamiliar context); demonstration by teacher, learners' task (guided with scaffolding), learners' task (free), presentation, question-answer(among students), modification, editing, proofreading, and feedback before the final version is done	Pre-reading game/modelling, discussion in small groups, independent writing and feedback	4
5	Expressing opinion on a short argumentative text (e.g. a journal article or a newspaper editorial) and justifying one's opinion/stance; focus on the use of appropriate 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 argumentative essays).	3
6	Role-play (complex social and academic/professional situations): Focus on significant aspects of delivery including clarity, tone, and use of contextually appropriate vocabulary and conventions, observation, reflective discussion, and self- reflective writing	Reading newspaper/magazine articles/blog posts on current social issues, listening to talks/discussions/debates etc. and participating in role-plays using expressions appropriate to the context.	1
7	Collborative 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 current interest and relevance; focus on effective participation, reflection on control over argument/counter argument, and adherence to the conventions of formal GD	Noticing strategies from AV modelling, teacher 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 four judges (peers)	Pre-task activity for orientation/strategies (controlled/guided), Model interview (AV support), Group work (role play), interview in pair (one-to-one), Interview in group (many -to-one), oral corrective feedback (peer/teacher)	2
12	Writing a short reflective report of an event - incident/meeting/celebration	Writing a report on meetings/celebrataions/events etc. by actively involving in such events and giving a short oral presentation on the same.	4
13	Speaking on abstract and complex topics beyond his/her own area of interest/field of study, using the language flexibly and effectively.	Reading texts on abstract topics and comprehending the author's perspectives. Similarly, listening to talks and discussions on an abstract topic of other discipline and making short oral presentation by sharing views and opinions.	3
14	Self-relfection on own speech in context(recorded): tone, pitch, relevance, content; extending the reflections/ideas to others	Listening to selected general discussions (audios and videos) and observing the language production. Recording own speech on some general topic and providing a critical review (self-reflection) on it by focusing on the tone, expressions and relevance of the content, etc.	1
15	Collaborative and individual task: planning, preparing (preparing an outline, structure, setting objectives and presenting the plan of action) and executing a mini-project, and submitting a brief report on the same peer and instructor feedback after the planning stage and on completion of the mini project	Pre-task modelling (peer/teacher), general discussion on structure, group work (collaboration), oral corrective, task distribution, presentation, feedback	5

Reference Books

- 1. Latham-Koenig, C. & Oxenden, C. (2014). American English File-5. Oxford: OUPRichards,
- 2. J.C. and Bohlke, D. (2012). Four Corners-4. Cambridge: CUP.
- Cambrdige Academic English: An Integrated Skills Course for EAP (Advanced) By Martin Hewings and Craig Thaine, CUP (2012)

- 4. Berlin, A. (2016). 50 Conversation Classes: 50 Sets of Conversation Cards With an Accompanying Activity Sheet Containing Vocabulary, Idioms and Grammar. Poland: CreateSpace Independent Publishing Platform
- 5. Zemach, D. E., Islam, C. (2011). Writing Paragraphs: From Sentence toParagraph. Germany: Macmillan Education.
- 6. Stewart, J. P., Fulop, D. (2019). Mastering the Art of Oral Presentations: Winning Orals, Speeches, and Stand-Up Presentations. United Kingdom: Wiley.
- 7. Kroehnert, Gary. (2010). Basic Presentation Skills. Sidney: McGraw Hill.
- 8. Cunninghum, S. & Moor, P. (nd). Cutting Edge (Advanced) With Phrase Builder. Longman Publishers. CUP
- 9. McCarthy, M & O'Dell, F. (2017). English Idioms in Use (Advanced). Cambridge: CUP.

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- 1. https://www.grammarly.com/blog/
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- 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

- 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)
- Make presentations using suitable AV aids and engage in formal group discussions on a wide range of topics of contemporary interest, demonstrating awareness of standard/widely accepted conventions. (Bloom's Taxonomy Level/s: 3)
- 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)
- 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)
- 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)

CLAD1001: Emotional Intelligence & Reasoning Skills (Soft Skills 1)

\mathbf{L}	Т	Р	S	J	С
0	0	2	0	0	1

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 their own emotions as well as the emotions of others and relate better with both. Using better knowledge of EI, students will also be able to set more meaningful goals for themselves, choose suitable time management techniques that work best for them and work in teams more effectively. (2) to apply different concepts, ideas and methods to solve questions in reasoning and data sufficiency

Course Objectives:

- 1. 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.
- 2. Set meaningful goals based on their strengths and weaknesses and apply time management techniques, such as Q4 organizing to put first things first.
- 3. Manage conflicts and work in teams in an emotionally intelligent manner.
- 4. Solve questions on non-verbal and analytical reasoning, data sufficiency and puzzles

Unit	Topics	Hours
1	Self Awareness & Self Regulation: Introduction to Emotional Intelligence, Self Awareness: Self Motivation, Accurate Self Assessment (SWOT Analysis), Self Regulation: Self Control, Trustworthiness & Adaptability	3
2	Importance, Practising Social Awareness, Building Relationships, Healthy and Unhealthy Relationships, Relationship Management Competencies- Influence, Empathy, Communication, Types of Conflicts, Causes, Conflict Management	3
3	Social Media: Creating a blog, use of messaging applications, creating a website to 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 IneffectiveTeams, 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
	Total Hours	30

Course Outcomes

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

References:

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

CLAD1011: Leadership Skills & Quantitative Aptitude (Soft Skills 2)

\mathbf{L}	Т	Р	S	J	С
0	0	2	0	0	1

Course Description:

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

Course Objectives:

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

Unit	Topics	Hours
1	Communication Skills: <i>The Communication Process</i> , Elements of Interpersonal Communication, <i>Non-Verbal Communication:</i> Body Language, Posture, Eye Contact, Smile, Tone of Voice, <i>Barriers to Communication</i> . Effective Listening Skills: Active Listening, Passive Listening, Asking Questions, Empathizing, Being Non Judgemental, Being Open Minded, Mass Communication: Design of Posters, Advertisements, notices, writing formal and informal invitations	5
2	Focus on Audience Needs, Focus on the Core Message, Use Body Language and Voice, Start Strongly, Organizing Ideas & Using Visual Aids: SPAM Model, Effective Opening and Closing Techniques, Guy Kawasaki's Rule (10-20-30 Rule), Overcoming Stage Fear, Story Telling	3
3	Problem Solving & Decision Making: Difference Between the Two, Steps in Rational Approach to Problem Solving: Defining the Problem, Identifying the Root Causes, Generating Alternative Solutions, Evaluating and Selecting Solutions, Implementing and Following-Up, Case Studies	3

4	Group Discussion: Understanding GD, Evaluation Criteria, Nine Essential Qualities for Success, Positive and Negative Roles, Mind Mapping, Structuring a Response, Methods of Generating Fresh Ideas	4
5	Number Theory: Number System, Divisibility rules, Remainders and LCM & HCF	3
6	Numerical Computation and Estimation - I : Chain Rule, Ratio Proportions, Partnerships & Averages, Percentages, Profit-Loss & Discounts, Mixtures, Problems on Numbers & ages	6
7	Data Interpretation: Interpretation and analysis of data in Tables, Caselets, Line- graphs, Pie-graphs, Box-plots, Scatter-plots and Data Sufficiency	3
8	Mental Ability: Series(Number, Letter and Alphanumeric), Analogy(Number, Letter and Alphanumeric) and Classifications	3
	Total Hours	30

Course Outcomes

- 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.
- Students will be able to apply the the rational model of problem solving and decision making in their problem solving and decision making efforts.
- Students will be able to solve questions based on numbers and arithmetic given in various competitive examinations
- Students will be able to solve questions based on data interpretation, progressions and series.

References:

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

CLAD1021: Verbal Ability & Quantitative Ability (Soft Skills 3)

L T P S J C 0 0 2 0 0 1

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 Objectives:

- 1. List and discuss the different word formation methods, word denotation, connotation, collocation, etc. and introduce selected high frequency words, their antonyms, synonyms, etc
- 2. Apply different advanced reading skills to solve questions based on author's tone, main ideas and sub-ideas, inferences, parajumbles, etc. that are frequently asked in various competitive exams and admission tests.
- 3. 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.
- 4. 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.
 - 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
- 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)

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

References:

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

CLAD1031: Practicing Verbal Ability & Quantitative Aptitude (Soft Skills 4)

\mathbf{L}	Т	Р	S	J	С
0	0	2	0	0	1

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 Objectives:

- 1. Apply the rules of grammar to solve questions in Error Detection, Sentence Correction and Sentence Improvement.
- 2. Apply the rules of structure to solve questions in Error Detection, Sentence Correction and Sentence Improvement, Fill-in-blanks and Cloze Passages.
- 3. Explain methods of solving problems in Combinatorics (Permutations & Combinations, Probability], Cryptarithmetic & Modular Arithmetic (Cryptarithmetic, Application of base system (7, 24), Clocks (Base 24), Calendars (Base 7)]
- 4. 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)
- 1. Error Detection: Pronouns, Conjunctions, Prepositions and Articles
- 2. Error Detection: Tenses and their Uses
- 3. Sentence Correction: Subject-Verb Agreement, Antecedent-Pronoun Agreement, Conditional Clauses
- 4. Sentence Correction: Modifiers (Misplaced and Dangling) & Determiners, Parallelism & Word Order, and Degrees of Comparison
- 5. Combinatorics: Permutations & Combinations, Probability

- 6. Crypt arithmetic & Modular Arithmetic: Crypt arithmetic, Application of Base System (7, 24), Clocks (Base 24), Calendars (Base 7)
- 7. Algebra: Exponents, Logarithms, Word-problems related to equations, Special Equations, Progressions, Statistics

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

References:

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

VEDC1001: Venture Development

\mathbf{L}	Т	Р	S	J	С
0	0	0	2	0	2

Course Description

In this course, you will discover your deeper self in terms of how you might contribute to society by creating exciting new products and services that can become the basis of a real business. Your efforts, creativity, passion, and dedication to solving challenging problems are the future of our society, both in your country and worldwide.

The course is divided into four sections:

- 1. Personal discovery of your core values and natural skills
- 2. Ideation and improving the impact
- 3. Business model design for the innovation
- 4. Presenting your idea in a professional manner suitable for a new venture pitch

Each section has key frameworks and templates for you to complete, improving your idea step by step until the final presentation.

First, you will discover your personal values and emerging areas of knowledge that are the foundations of any successful company. Next, you will learn how to develop insight into the problems and desires of different types of target customers and identify the design drivers for a specific innovation. Then, you will learn specific design methods for new products and services. And as important as the product or service itself, it is a strategy for monetizing the innovation – generating revenue, structuring the operating costs, and creating the operating profit needed to support the business, hire new employees, and expand forward.

This project is intended to be for teams of students. Innovation and entrepreneurship are inherently team-based. This course will give you that entrepreneurial experience.

This is the beginning of what might be the most important journey of personal and career discovery so far in your life, one with lasting impact. This is not just a course but potentially an important milestone in your life that you remember warmly in the years to come.

Course Objectives

Students will have the opportunity to:

- Discovery who you 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 actually going through the innovation process.
- Conduct field research to test or validate innovation concepts with target customers.
- Understand innovation outcomes: issues around business models, financing for start-ups, intellectual property, technology licensing, corporate ventures, and product line or service extensions.

Course Materials

- Meyer and Lee (2020), Personal Discovery through Entrepreneurship, The Institute for Enterprise Growth, LLC. Boston, MA., USA
- Additional readings

• Additional videos, including case studies and customer interviewing methods.

Expectations of you in the classroom: Each student is <u>expected</u> to be prepared to discuss the readings/exercises assigned for each class. It's not optional! Students will be randomly asked to discuss and summarize the material. Your learning – and your success—in this course are heavilydependent upon your willingness to participate actively in class discussion. Your class participation will be assessed on the quality and consistency of your effort in each and every class.

Late assignments: Late assignments are subject to grade penalty. Lateness will only be considered for grading if prior notice was given to the instructor before the due date.

Presentation: Achieving success with an innovative idea requires you to package and present the idea in a crisp, creative, and powerful manner. The activity of presenting helps you to internalize your idea -- as you talk about it and obtain feedback – and improve upon it. There would be two major presentations during the course, plus a series of other smaller unscheduled presentations of work in progress or course material. Prepare, practice, and succeed!

Time spent outside of class: The course is hands-on and requires students to conduct field research through direct interactions with people (interviews/surveys) and online/in the library. Specifically, the course requires that students conduct studies with potential target users and stakeholders. You must be prepared to go out of your comfort zone to dig for information. You will need to search for information online and arrange to meet or talk to relevant people who may have the information you need.

Group Project Overview

This is a semester length project and the cornerstone component of the course. The group project will give you the opportunity to apply the course concepts to a real situation. You will learn about the entrepreneurship for your own business or your work in organizations. Even if you are not going to be an entrepreneur, you need to know how to identify the opportunities, who to persuade people, and how to create economic and social values in many different contexts.

<u>Talking to customers</u> is one of the most important steps in investigating your business because your entrepreneurial vision must correspond to a true market opportunity. With your group, select 5-6 potential customers willing to be interviewed. They should represent a cross-section of our target market and should provide information that helps you refine your opportunity. This is not a simple survey: you are seeking in-depth understanding of the lifestyle and behaviors of your customer that can help you shape your opportunity. Please remember, you are not simply looking to confirm you have a great idea, but to shape your idea into a great opportunity. You will maximize your chances for success and your ability to execute your business cost-effectively by making early (rather than later) changes to your concept.

<u>"Design"</u> is fun, particularly when you merge customer insight with your own creativity. Enjoy! In this book, we provide structured methods to be an active listener and learner from customers as well as a product or service designer.

<u>Business modeling</u> is not as hard as it might sound. This is the design of your business – how it charges customers, what is spent producing and selling products or services, and the money that can be made for each unit sold. We keep it simple – so should you.

For <u>the final outcome</u>, you will be required to come up with Pitch that can used as the basis for actually starting a company based on an impactful innovation. Once again, we provide a specific format and tools for creating a compelling Pitch. We also want you to think about an exciting proposition that is more than just making money, but rather, one that helps society. This will give

you innovation and venture concept greater lift with customers – and it will also make you feel better, deep inside.



Project Components and Grading



[20 Steps and activities in this course]

<u>Deliverables</u>

There are a number or different deliverables for the course that follow the templates presented in the book, as applied to your own venture idea. Do your best to keep up with the timeline of the

class; do not fall behind! Later templates build on the learnings from prior templates. Make the most of your team! Everyone needs to pitch in. In no case, should one person be taking the lead on all templates.Rather,different team members should take the lead on specific deliverables. Coordinate well. Let your teacher know if a team member is not carrying his or her load.

Specific Deliverables

Ideation and ImpactHand-in Package: 5% of total grade

clearly written, with a one-page explanation for the team's decision

- Problem to Solve Templates, Step 4, Page 62 and 63 (with a page of additional explanation if needed)
- Idea Impact Template, Step 6, Page 69 (with a page of explanation)

Customer Interviews and InsightHand-in Package: 15%

(1st Round of Customer Interviews)

- Customer Interviews Template, Step 7, Pages 75-78, plus add additional template forms for each additional customer interview. The more, the better.
- Idea Reshaping Template, Step 7, Pages 84 and 85. Integration into overall conclusions. How have you improved your original idea through customer research?
- Latent Needs Template, Step 7, Page 93 what are the frustrations of users that are not solved by current products or services?
- Full Use Case Template, Step 7, Page 99 how do you customers' needs change over the full use case, and what innovative ideas can you propose at each step of the way?

Concept Design (and Test)Hand-in Package: 15%

- Customer Value Proposition Template: Step 8, Page 107. This becomes the landing point for what you learned in your customer interviews.
- Competitive Analysis Template: Step 8, Page 109. (Use the Web or actual stores/dealers)
- Product Vision and Subsystem Design Templates:Step 10, Pages 121 and 126 (You can add additional pages with design illustration and explanations of your bubble chart)
- Reality Check Survey Template and Results: Step 11, Page 141, 143-144 (You can use more than 2 pages for reporting the results.)

Business Model Design Hand-in Package: 15%

- Industry Analysis Templates: Step 12, Pages 153 and 154
- Illustrate the Business Model Template: Step 13, Page 170 (Use different colours or line patterns to show the flows of product, money, and information)
- Revenue Model Template: Step 14, Page 177
- Operating Model Template: Step 15, Page 187
- Customer Journey Template: Step 16, Page 195
- Validating the Business Model Template: Step 17, Pages 199 and 200

Discovery IntegrationHand-in Package: 20%

- Business and Social Vision Impact Statement Template: Step 18, Page 210.
- Per Unit Profitability Template: Step 19, Page 229
- Your Venture Story Pitch: Step 20(PowerPoint)
- Overall Pitch Design Template:Page 264



Assemble the templates from all your work above, plus any others that you found particularly meaningful, and from these, create your Team's Innovation Pitch.The book has lists specific templates that fit for each part of the final presentation.

Do not just regurgitate the templates in your pitch; rather, take the key points from them to create your own, unique presentation. The templates help you think – but most are toocomplex to present to outside people who have not taken the course. Therefore, design this pitch as if you presenting to a new set of investors.

And don't forget to add an attractive title page with your team members names and email addresses!You can also add an Appendix at the very back with particularly interesting information, such as industry data or the results of your customer interviews and Reality Check.

Individual Innovation Assignments

You will be required to submit two Reflection Journalsas well as a maximum two pages double spaced Synthesis, Integration and Application paper by email at the Week 4 and Week 14 respectively. Please note, this exercise is not about regurgitating the course concepts.

(1) Personal Discovery Reflection Journal (10%)

At the beginning of this semester, you will have a time to think about your self (who you are, what you are good at, what areas you want to contribute on) using a couple of templates. After that sessions, you will have a quiet moment to think about yourself, yourcareer, and your happiness in your life. Please write 2-page reflectional journal what you feel and learning through the personal discovery sessions.

(2) Insight Learning Reflection Journal (10%)

At the end of this semester, you are to prepare a short reflection of impressive sessions aswell as related activities outside the classroom. Specially, (1) reflect on the key points from lectures, reading, discussion, guest speakers, and interviews, (2) apply this to your own situation, and (3) outline ways that you intend to use this knowledge in the future.

Course Schedule

We ek	Sessi on	Topics and Steps	Key CONCEPTS Introduced in Class	Class Focus Activity	
1	1	Course Overview	 Why is entrepreneurship important? What is Personal Discovery through Entrepreneurship? Four Stages; Personal Discovery, Solution Discovery, Business Model Discovery, Discovery Integration Preparation (finding interesting areas) 	Lecture and Discussion	
	2	Personal Discovery (Step 01, Step 02)	 Personal Values Strength and Weakness 	 Individual: Work with the templates provided on pages: Core values: 22, 23 Skills: 27, 28, 29, 30, 31 Societal Contribution: 33, 34 	
2	3	Find Teammates (Step 03)	 Review Problem Area Template at the beginning of the book to find classmates who want to work on the same problem area. Findteammates Shared values Levels of commitment Skills and experiences (Same or Different?) 	 Problem template: Page 9 Talk to your classmates and find teammates. See who wants to work on in the same problem space, with a shared vision of solutions, and complementary skill sets. Sit back and assess: Team templates on Pages 44, 45, and 46. Prepare to present your team, the problem it is going to tackle, and its collective skills. 	
	4	Define Purpose (Step 04) Create Mission (Step 05)	 Methods for defining and refining a venture's purpose Defining a Venture's Purpose Creating a Vision Statement 	 Team: Purpose and Mission Templates: Pages 49 and 52 Be prepare to present to the class. Personal Discovery Reflection Journal Due 	

We ek	Sess ion	Topics and Steps	Key CONCEPTS Introduced in Class	Class Focus Activity
3	5	Ideation & Impact	Ideation Methods • An in-class ideation exercise	Team: • Problem to Solve Templates, Step 4, Page 62, and 63
		6	(Step 06)	Increasing the Impact of an Idea. (The Eat-Your-Coffee Video – a good example of ideation)
4	7	User Insights	 Identifyand find the right target users. Interview style and methods The Customer Interview template. 	 Team: Customer Interviews Template, Step 7, Pages 75 Edit interview template for your project.
	8	8 (Step 07)	Laddering methods for interviews	Team:Latent Needs Template, Step 7, Page 93
5 -	9	User Insights Customor	 Finding latent needs Field work check-in 	 Team: Latent Needs Template, Step 7, Page 93 Field work – customer interviewing
	10	Interviews (Step 07)	 Think about innovation across the entire use case Field work check-in 	 Team: Full Use Case Template, Step 7, Page 99 Field work – customer interviewing
6	11	User Insights Interpreting	 Interpreting customer interview results Field work check-in 	 Team: Field work – customer interviewing Also talk to retailers/dealers if appropriate
	12	Results (Step 07)	 Idea Reshaping based on Customer Interviews Field work check-in 	Teams prepare results of results from customer interviews and how the original ideas have been reshaped& improved.
7	13 14	User Insights Interpreting Results (Step 07)	 Customer Research Reports Implications for product and service design 	 Teams prepare PPTs for class presentation Customer Insight Template Hand-in Package
We ek	Sess ion	Topics and Steps	Key CONCEPTS Introduced in Class	Class Focus Activity
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8	15	Concept Design	 Defining Customer Value Understanding Customer Value Proposition 	 Team: Customer Value Proposition Template: Step 8, Page 107 Draft the CVP
	16	(360)	• Presentation and review of CVPs	Team: • Complete CVP
0	17	Competitive Analysis and	 Understanding of Competitive Matrix Competitive positioning: creating your separate space 	 Team: Identify major competitors, and dimensions for analysis Template: Step 8, Page 109
9	Positioning (Step 08)		 Presentations of Competitive Analyses and Positionings 	 Team: Perform the competitive analysis and present results, including positioning
	19	Product Line Strategy (Step 09)	 Product line framework: good, better, best on underlying platforms, plus application to Services. 	 Team: Identify good, better, best variations based on the underlying concept. Product line template: Page 115
10	20	Product Visioning Subsystem Design, and Prototype Sketch (Step 10)	 The structured bubble chart, showing implementation options and the team's choices Prototype sketching (The Bluereo Video is a good example of iterative prototyping driven by customer discovery.) 	 Team: Prototype sketch, and for Web apps, a wireframe. For physical products, an initial bill of materials. Underlying bubble chart showing your decision process. Product Vision and Subsystem Design Templates: Step 10, Pages 121 and 126
We ek	Sess ion	Topics and Steps	 Key CONCEPTS Introduced in Class 	Team or Individual Activity
11	21	Reality Check (Step 11)	• The purpose of the Reality Check, testing the product concept, channel preferences, and much other.	 Team: Reality Check Survey Template and Results: Step 11, Page 141, 143-144

	22		 Guidance on the number or additional customers for the reality check survey How to analyze and interpret the results 	 Customize the Reality Check template for your venture. Do a quick round of customer surveying. Aim for 12 more interviews.
12	23	Industry Analysis (Step 12)	 Team reports on Reality Check Results Examine major components of an Industry Analysis Review Templates 	 Team: Prepare and present the results of your reality check, plus any pivots you wish to make. Concept Design (and Test) Hand-in Package Industry Analysis Templates: Step 12, Pages 153 and 154s
	24	Business Model (Step 13)	 Defining the Business Model: Lecture on basic structure and different types. Illustrating it as the flow of product, money, and information. 	 Team: Business Model Illustration Template, Step 13, Page 170

We ek	Sess ion	Topics and Steps	 Key CONCEPTS Introduced in Class 	Team or Individual Activity
	25	D :	 Revenue and Expenses The key decision points in the Revenue Model 	Team Step 14, Page 177 Step 15, Page 187 Step 16, Page 195 Step 17, Pages 199 and
13	26	Business Model (Steps 14, 15, 16, 17)	 The key decision points in the Operating Model Designing the Customer Journey Validating the Business Model (The Polka Dog Bakery Video: an example of creating a new retail experience, plus new products.) 	 200 Validate the Revenue and Operating Model by trying to have phone calls with a few Sellers and Manufacturers to validating pricing, channels, and costs.
14	27	Impact Visioning (Step 18)	 Develop clear statements for business and societal impact. Look at good existing examples of companies that do both. 	 Team: Start integrating your research and templates towards the final presentation, provided in Step 20, Page 264 Business Model Design Hand-in Package
	28	Creating Value (Step 19)	 Develop a project of the profitability in make low volumes for a product, a service, and a Web app. Discuss applications of the framework to your venture. 	 Team: Develop and present Unit of 1 Economics Template, Step 19, Page 229 Keep working on the Final presentation

We ek	Sess ion	Topics and Steps	Key CONCEPTS Introduced in Class	Team or Individual Activity
	29		 Presentation Format and Style Format: (1) Title Slide with names and contact information (2) The Target Customer and the Problem to be Solved (3) The Market Opportunity (4) The Innovation Story 	Team: • The PPT Presentation 1. The target customer & 2. The market opportunity represented 7. Action steps 6. The team 5. The customer journey () The target customer () The target customer & 2. The market opportunity () The target customer & 2. The
15	30	Tell Your Story	 (5) The Business Model Story (6) The Customer Journey (7) The Team (8) The Proposed Action Steps. (9) Appendices (if needed or desired) If you have built a prototype during the class, please bring it and show it to us! (The Fortify Video is a good example of how a good technical idea can translate into a business model, and next, into a well-funded venture.) 	 & Business Model Story & The venture as the revenue as the reve
Final Course Deliverables		l Course verables	Due on the Monday after the weekend of the final class meeting.	Team: Your Venture PPTs Individual: Insight Learning Reflection Journal

Course Outcomes

- 5. Identify one's values, passions, skills and their will to contribute to society
- 6. Formulate an idea and validate it with customers
- 7. Demonstrate prototyping and analyze the competition for the product
- 8. Create business models for revenue generation and sustainability of their business
- 9. Come up with a pitch that can used as the basis for actually starting a company based on an impactful innovation and societal impact

DOSP1001: Badminton

L T P S J C 0 0 0 2 0 2*

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 Objectives:

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

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

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

Reference:

1. Handbook of the Badminton World Federation (BWF)

DOSP1011: Chess

L T P S J C 0 0 0 2 0 2*

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 Objectives:

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

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

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

Reference:

1. International Chess Federation (FIDE) Handbook

DOSP1031: Football

L T P S J C 0 0 0 2 0 2*

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 Objectives:

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

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

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

Reference:

1. FIFA Laws of the Game

DOSP1041: Volleyball

L T P S J C 0 0 0 2 0 2*

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 Objectives:

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

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

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

Reference:

1. FIVB - Official Volleyball Rules

DOSP1051: Kabaddi

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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 Objectives:

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

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

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

Reference:

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

DOSP1091: Basketball

L T P S J C 0 0 0 2 0 2*

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 Objectives:

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

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

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

Reference:

1. FIBA Basketball Official Rules

DOSP1111: Throwball

L T P S J C 0 0 0 2 0 2*

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 Objectives:

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

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

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

Reference:

1. World Throwball Federation - Rules of the Game

DOSL1001: Club Activity – Participant

L T P S J C 0 0 0 2 0 2*

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 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)

Text Books

- 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

- Identify personal interest areas
- Learn from diverse perspectives and experiences
- Gain exposure to various activities and opportunities for extra-curicular activities
- Learn to manage time effectively
- gain confidence

DOSL1011: Club Activity – Member of the Club

L	Т	Р	S	J	С
0	0	0	2	0	2*

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

Course 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-curicular activities
- 4. Develop management skills through hands on experience
- 5. Explore different managerial roles and develop competencies

Text Books

- 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-curicular activities
- Develop management skills through hands on experience
- Explore different managerial roles and develop competencies

DOSL1021: Club Activity – Leader of the Club

L	Т	Р	S	J	С
0	0	0	2	0	2*

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

Course 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

Text Books

- 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

DOSL1031: Club Activity – Competitor

L	Т	Р	S	J	С
0	0	0	2	0	2*

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

Course 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

Text Books

- 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

POLS1001: Indian Constitution and History

L	Т	Р	S	J	С
2	0	0	0	0	2*

Course Description:

This course analyzes 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 Objectives:

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

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

Unit I: India as a Nation

6 hrs

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.

Module Learning Outcomes

- 1. Understand ideas of India
- 2. Explain the story behind making constitution and its future.
- 3. Articulate the differences between pre and post-colonial governments.

Unit 2: Understanding the Constitution

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.

Module Learning Outcomes

Understand the concept of constitutionalism. Demonstrate strength or weakness of constitutional morality in India

Evaluate constituent assembly debates in framing Indian Constitution.

Unit 3: The Preamble, Fundamental Rights and Directive Principles of State Policy 6 hrs

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

Module Learning Outcomes

- 1. Explain the relationship between 'Preamble' and 'The constitution'.
- 2. Interpret the key concepts of preamble
- 3. Analyzes the dynamic nature of Indian constitution
- 4. Understanding Fundamental Rights
- 5. Evaluate Directive Principles of State Policy
- 6. Interpret case studies on Fundamental Rights.

Unit 4: Citizenship

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 Rodrigues

6 hrs

Module Learning Outcomes

- 1. Explain different dimensions of citizenship in Indian context
- 2. Evaluate the basis of citizenship
- 3. Compare 'claim' and 'status' of citizenship

Unit 5: Separation and Distribution of Powers

6 hrs

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

Module Learning Outcomes

- 1. Explain the importance of separation of powers in a democracy
- 2. Understand the relation between three organs of the government
- 3. Evaluate the system of 'checks and balances'
- 4. Understand the difference between unitary and federal political systems
- 5. Critically analyze the Indian model of Federalism
- 6. Evaluate the distribution of responsibilities between union and state governments.

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.

PHPY1001: Gandhi for the 21st Century

L	Т	Р	S	J	С
2	0	0	0	0	2*

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 Objectives

The objectives of the course are;

- 1. To provide the students with the basic knowledge on Gandhi's life and his philosophies
- 2. To understand the early influences and transformations in Gandhi
- 3. To analyse the role of Gandhi in India's national movement
- 4. To apply Gandhian Ethics while analysing the contemporary social/political issues

5. To appreciate the conflict resolution techniques put forward by Gandhi and its significance in the current scenario.

Module I : MK Gandhi: Childhood and Education

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

Module II: 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.

Module III: Gandhi and Indian National Movement

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

Module IV: Gandhi and Sustainable Development

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

Module V: Gandhi and Contemporary Issues

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

Learning Outcomes

- 1. To understand the life of Gandhi
- 2. To understand the role of Gandhi in Indian national movement
- 3. To analyse the origin and significance of Satyagraha
- 4. To understand the eleven vows of Gandhi which he followed through-out his life.

5. To examine the significance of constructive programs today

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.

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

DOSL1041: Community Services - Volunteer

L	Т	Р	S	J	С
0	0	0	0	2	2*

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

Course 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 Sheryl WuDunn)
- 2. The story of My Experiments with Truth (author: M. K. Gandhi)

Course Outcomes

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

DOSL1051: Community Services - Mobilizer

L	Т	Р	S	J	С
0	0	0	0	2	2*

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

Course Objectives

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

List of Community Service Activities

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

List of Activities

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

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)
- 3. List of student run and and other Government and nongovernment community serviceorganizations organizations

Course Outcomes

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

ENVS1001: Environmental Studies

L T P S J C 3 0 0 0 0 3*

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 Objectives

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

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

UNIT – I Multidisciplinary nature of environmental studies & Natural Resources:

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 – II Ecosystem and biodiversity

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

No of Hours: 10

No of Hours:

10

No of Hours: 10

UNIT – Environmental Pollution III

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

Learning Outcomes:

After completion of this unit, the student will be able to

UNIT – IV Social Issues and the Environment

No of Hours: 10

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 – V Human Population and the Environment and Environment Protection No of Hours: Act and Field work 10

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

Activity:

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

Text Book(s)

- 1. Erach Bharucha. Textbook of environmental studies for undergraduates courses-Universities Press, India Private Limited. 2019.
- 2. Kaushik A and Kaushik C.P. Perspectives in Environmental Studies. New Age International Publishers Edition-VI. 2018.
- 3. Dave D Katewa S.S. Textbook of Environmental Studies, 2nd Edition. Cengage Learning India. 2012. Additional Reading
 - 1. Benny Joseph. Textbook of Environmental Studies 3rd edition, McGraw Hill Publishing company limited. 2017.

Reference Book(s):

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

Journal(s):

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

Website(s):

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

	Programme Objectives (POs)									PSO's					
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2												2		
CO2		2				1							2		
CO3			1						1					1	
CO4				2							2				1
CO5	1													1	
CO6					2							1			1

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

MFST1001: Health & Wellbeing

L	Т	Р	S	J	С
0	0	2	0	0	1*

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 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-I

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-II

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-III

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

UNIT-IV

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

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

CLAD2001: Preparation for Campus Placement-1 (Soft Skills 5A)

L T P S J C 0 0 2 0 0 1

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 Objectives:

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

- 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: Practising 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

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

References:

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

CLAD2011: Preparation for Higher Education (GRE/ GMAT)-1 (Soft Skills 5B)

L	Т	Р	S	J	С
0	0	2	0	0	1

Course Description:

1. 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 Objectives:

- 1. Prepare the students to solve questions from all four broad areas of GRE/ GMAT
- 2. Orient the students for GRE/ GMAT through mock tests
- 1. Verbal Reasoning: Reading Comprehension, Sentence Equivalence, Text Completion, Sentence Correction, Critical Reasoning
- 2. Quantitative Reasoning: Arithmetic, Algebra, Geometry, Data Analysis
- 3. Analytical Writing Assessment: Issue/ Argument
- 4. Integrated Reasoning

Course Outcomes:

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

References:

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

CLAD2021: Preparation for CAT/ MAT - 1 (Soft Skills 5C)

L	Т	Р	S	J	С
0	0	2	0	0	1

Course Description:

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

Course Objectives:

- Prepare the students to solve questions from all four relevant areas of CAT/ XAT/ MAT, etc.
- 2. Orient the students for CAT/ XAT, etc. through mock tests
- Quantitative Ability: Arithmetic, Algebra, Geometry, Mensuration, Calculus, Trigonometry
- 2. Data Interpretation: Data Interpretation and Data Sufficiency
- Logical Reasoning: Data Management, Deductions, Verbal Reasoning and Non-Verbal Reasoning
- Verbal Ability: Critical Reasoning, Sentence Correction, Para Completion, Para Jumbles, Reading Comprehension

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

References:

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

CLAD2031: Preparation for Campus Placement-2 (Soft Skills 6A)

L	Т	Р	S	J	С
0	0	2	0	0	1

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 Objectives:

- 1. To comprehensively prepare all eligible and aspiring students for landing their dream jobs.
- 2. To sharpen the test-taking skills in all four major areas of all campus drives
- 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
- Quantitative Aptitude II: Number Systems, Algebra, Geometry, Data Handling, Data Sufficiency, Word Problems
- 4. Reasoning II: Logical and Verbal Reasoning

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.

References:

 Verbal Ability & Reading Comprehension by Arun Sharma and Meenakshi Upadhyay

- 2. Study material for CAT, SAT, GRE, GMAT by TIME, CareerLauncher and IMS etc.
- 3. Quantitative Aptitude by R S Agarwal S Chand Publications
- 4. Quantitative Aptitude by Pearson Publications

CLAD2041: Preparation for Higher Education (GRE/ GMAT)-2 (Soft Skills 6B)

L T P S J C 0 0 2 0 0 1

Course Description:

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

Course Objectives:

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

Course Outcomes:

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

References:

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

CLAD2051: Preparation for CAT/ MAT - 2 (Soft Skills 6C)

L	Т	Р	S	J	С
0	0	2	0	0	1

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 Objectives:

- Prepare the students to solve all types of questions from all four relevant areas of CAT/ XAT/ MAT, etc.
- Quantitative Ability II: Arithmetic, Algebra, Geometry, Mensuration, Calculus, Trigonometry
- 2. Data Interpretation II: Data Interpretation and Data Sufficiency
- 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

Course Outcomes:

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

References:

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

FINA3001: Personal Financial Planning

L	Т	Р	S	J	С
0	0	2	0	0	1*

Course Overview

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 nonmedical problems. There are certain planned and unplanned events in our life. On the one hand, education of our children, their marriage, our retirement etc. are some of the planned events of our life, but at the same time, some medical urgency, accident or death of an earning member might be some unplanned events. Many of these events are beyond our control, but the availability of funds can be planned to avoid any financial distress. In other words, we cannot stop the rain but can plan for an umbrella.

This course looks at the many challenges an individual faces in a complex financial environment and the rising uncertainties of one's life. It focuses on achieving long-term financial comfort of individual and family through goal setting, developing financial and life strategies, acquiring personal financial planning knowledge and managing risk throughout one's life.

Course Objectives:

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

Course Outcome:

- 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

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

Text Books

- 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

Reference Books

- 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.

MATH1151: Differential Calculus



Hours Per week: 3 Credit: 3 Semester Exam:30 Marks Sessionals: 70Marks

Preamble: 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

Preamble: 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.

Objective: To introduce

- Basic properties of continuity and differentiation
- Partial differentiation and application of Euler's theorem
- Tracing of curves and to find tangents and normals
- Rolle's theorem and mean value theorem
- Expansion of the function using taylor's series and Maclaurin's series

UNIT-I

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

Learning Outcomes:

The student will be able to:

Define the basic properties of limits and continuity Explain different types of discontinuities Define differentiability of functions and successive differentiation

UNIT-II

Partial differentiation, Euler's theorem on homogeneous functions. Learning Outcomes: The student will be able to: Define partial differentiation Evaluate problems on partial differentiation Apply Euler's theorem on homogeneous functions with the help of partial differentiation

UNIT-III

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.

Learning Outcomes: The student will be able to: Define tangents and normals Explain curvature and asymptotes Trace the parametric curves Define polar coordinates UNIT-IV Rolle's theorem, Mean Value theorems, Taylor's theorem with Lagrange's and Cauchy's forms of remainder Learning Outcomes: The student will be able to: Explain Rolle's theorem with an application Explain mean value theorems with some examples Evaluate Taylor's theorem with Lagrange's and Cauch's forms of remainder UNIT-V

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

Learning Outcomes: The student will be able to: Explain Taylor's series Explain Maclaurin's series Evaluate Maxima and minima of a function

Text Books:

1. Elements of Real Analysis, Shanthi Narayan and Dr. M.D. Raisinghania, S.Chand& Co.

2. A Text Book of B.Sc. Mathematics Volume-II, V.Venkateswara Rao, N Krishna Murthy,

B.V.S.S. Sarma and S. Anjaneya Sastry, S.Chand& Co.

3. Calculus Single Variable, Howard Anton, Irl Bivens

and Stephen Davis, John Wiley and Sons, Inc., 2002.

4. Calculus and Analytic Geometry, George B. Thomas, Jr. and Ross L. Finney, Pearson Education, 2007, 9th edition.

CHEM1011: Chemistry -1 (Faculty Core)

L T P C 3 0 0 3

Hours Per week: 3 Marks Credits: 3

End semester Exam:30

Sessionals: 70 Marks

Preamble: The students of undergraduate program in science in Chemistry need to be conversant with the various fields off 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.

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

Section A: Inorganic

Chemistry-1UNIT-I

Atomic Structure: Review of: Bohr's theory and its limitations, dual behaviour of matterand 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 ψ^2 , Schrödinger equation for hydrogen atom.graphical representation of 1s, 2s, 2p, 3s, 3p and 3d orbitals. Significance of quantum numbers, orbital angular momentum and quantum numbers ml and ms. Shapes of s, p and d atomic orbitals, nodal planes.

Rules for filling electrons in various orbitals, Electronic configurations of the atoms. Stability of half-filled and completely filled orbitals, concept of exchange energy. Relative energies of atomic orbitals, Anomalous electronic configurations.

Learning Outcomes

The student will learn about the fundamental assumptions of atomic theory and explain the composition of atoms including electronic configuration.

<u>UNIT-II</u>

Chemical Bonding and Molecular Structure

Ionic Bonding: General characteristics of ionic bonding. Energy considerations in ionicbonding, 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, Born-Haber cycle and its applications, polarizing power and polarizability. 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 basisof VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements.

MO Approach: Rules for the LCAO method, bonding and antibonding MOs and their characteristics for s-s, s-p and p-p combinations of atomic orbitals, nonbonding combination of orbitals, MO treatment of homonuclear diatomic molecules of 1st and 2nd periods (including idea of s- p mixing) and heteronuclear diatomic molecules such as CO, NO and NO⁺.

Learning Outcomes

The students will learn about ionic, covalent bonding in molecules . compare/contrast the properties of molecular and ionic compounds.

<u>UNIT-III</u> Section B: Organic Chemistry-1

Fundamentals of Organic Chemistry

Physical Effects, Electronic Displacements: Inductive Effect, Electromeric Effect, Resonanceand Hyperconjugation. Cleavage of Bonds: Homolysis and Heterolysis. Structure, shape and reactivity of organic molecules: Nucleophiles and electrophiles. ReactiveIntermediates: Carbocations, Carbanions and free radicals.

Strength of organic acids and bases: Comparative study with emphasis on factors affecting pKvalues. Aromaticity: Benzenoids and Hückel's rule.

Learning Outcomes

The students learn about the fundamental concepts of reaction mechanism, reactive species inorganic chemistry and concept of aromaticity.

<u>UNIT-IV</u>

Stereochemistry

Conformations with respect to ethane, butane and cyclohexane.Interconversion 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).

Aliphatic Hydrocarbons

Functional group approach for the following reactions (preparations & reactions) to be studied.Alkanes:(Upto5Carbons).Preparation:Catalytichydrogenation,

Wurtz reaction,Kolbe'ssynthesis, from Grignard reagent. Reactions: Free radical Substitution: Halogenation. Learning Outcomes

The student shall learn the essential concepts of chirality, configuration, isomerism in organicchemistry and nomenclature of isomers.

Students ill familiarize with the elementary concept of saturated aliphatic hydrocarbons anreactions

<u>UNIT-V</u>

Alkenes: (Upto 5 Carbons)Preparation:Elimination reactions: Dehydration of alkenes anddehydrohalogenation of alkyl halides (Saytzeff's rule); cis alkenes (Partial catalytic hydrogenation) and trans alkenes (Birch reduction). Reactions: cis-addition (alk. KMnO4) and trans-addition (bromine), Addition of HX (Markownikoff's and anti-Markownikoff's addition), Hydration, Ozonolysis.

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

Reactions: formation of metal acetylides, addition of bromine and alkaline KMnO4,ozonolysis and oxidation with hot alk. KMnO4.

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:Principlesof Structure and Reactivity, Pearson Education India, 2006.
- 4. McMurry, J.E. Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning India Edition,

CHEM1021: Chemistry-1 Lab (Faculty Core)

L T P C 0 0 2 1

Hours Per week: 2 Credits: 1 Marks

Sessionals: 100

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

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

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.

Learning Outcomes

The student will learn about the quantitative analysis concepts of redox chemistry

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, asparticacid, glutamic acid, tyrosine or any other amino acid) by paper chromatography

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

Learning Outcomes

The students will familiarize the concept of qualitative element detection in organic chemistryessential for functional group analysis. The students will also the elementary idea of the techniques of planar 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., TextbookofPractical Organic Chemistry, Prentice-Hall, 5th edition, 1996.
- 4. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry Orient-Longman, 1960.

MATH1161: Differential Calculus Tutorials/Lab (Faculty Core)

L T P C 0 0 2 1

Hours Per week: 2

Credit: 1 Sessionals: 100 Marks

- 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 theorm
- 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 Learning Outcomes: On successful completion of this course, students will be able to:

- Evaluate limits and continuity of a function
- Solve problems on partial differentiation
- Explain applications of Rolle's theorem, Mean valuetheorems, Taylor's and Maclaurin's series
- Define maxima and minima of functions

PHYS1111: Mechanics (Faculty Core)

L T P C 3 0 0 3

Hours Per week: 3

End semester Exam:30Marks

Credits: 3

Sessionals: 70 Marks

Preamble: 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

Objective: The student will determine equation of motion for systems and rigid bodieswith concepts

of Scalar and vector fields. Understand new concepts like Fourier coefficients and special theory of relativity.

UNIT -I

Vector Analysis

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, Curvillinear and Spherical coordinate systems.

Learning Outcomes:

1. To understand the significance of scalar and vector fields with its application to line, surfaceand volume elements (L2)

2. Make use of different coordinate systems. (L3)

UNIT – II

Mechanics of particles

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.

Learning Outcomes:

1. To outline the equation of system of particles corresponding to variable mass as consequence of conservation of energy and momentum(L2).

2 To interpret types of collision in two and three dimensions with its implications to atomic systemin determination of respective parameters(L5)

UNIT - III

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.

Learning Outcomes:

- 1. To develop equation of motion for rotational system and determination of energy for rigid bodyrotating about an axis. (L3)
- 2. Construct Euler equation of motion and its application to top and gyroscope. (L3)
- 3. Solve Fourier coefficient and its determination to complex vibrations. (L3)

UNIT IV Vibrating strings and Bars

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 oneend. Learning Outcomes:

- 1. To analyze of energy and impedance for stretching string in transverse mode of propagation(L4).
- 2. To classify longitudinal vibration in bars with its general solution(L2)
- Unit V

Introduction to Relativity

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 energy relation. Learning Outcomes:

1. Introduce the concept of relative terms like rest and motion.(L2)

2. Understanding the postulates of special theory of relativity with emphasis of length contractionand time dilation(L2)

Course Outcomes:

On completion of the course, the student is able to

- Applying different type of operators and understanding coordinate systems(L2 and L3)
- Understand motion of particles and interpret its conservation laws(L2 and L5)
- Realize rigid bodies for its equation of motion(L3)
- Analyze equation of motion of strings and bars(L4)
- Understand the concept of relativity(L2)

Text Books:

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

Reference Books:

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

PHYS1121: Mechanics Lab (Faculty Core)

Hours Per week: 2

Credit: 1

Preamble: Determination and analyzing physical constants

Objective: To find Physical constants and analyze for its accuracy

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)
- 8. Fly-wheel
- 9. Determination of Y of bar (metal Scale) –cantilever.
- **10.** Simple pendulum normal distribution of errors-estimation of time period and the error of the mean by statistical analysis

Course Outcomes:

Enable to determine physical constants estimate with illustration (L4 and L5) •

Sessionals: 100 Marks

LTPC 0 0

2 1

PHYS1131: Basic Circuit Theory (Faculty Core)

L T P C 3 0 0 3

Hours Per week: 3 Credits: 3

End semester Exam:30 Marks Sessionals: 70 Marks

Preamble: Underst anding of Basics of Electronic Circuits and mathematical andgraphical solutions to Electrical Circuits.

Objective: To explain the basics of Circuit theory and circuit analysis

UNIT -I

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

Learning Outcomes:

1.Understanding of the fundamentals of AC, generation of AC and impedance of a circuit

2. Able to solve the currents and voltages in resistive circuit using nodal and mesh analysis methods

UNIT – II

Network Theorems

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

Learning Outcomes:

- 1. Understand the distribution of currents and voltages in electrical circuits.
- 2. Able to apply network theorems to solve the resultant currents and voltages in circuit

UNIT - III

RC And RL Circuits

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

Learning Outcomes:

- 1. Understand the Switching characteristics of reactive components like Capacitors and Inductors
- 2. Understanding the Frequency response of RL and RC networks and their functioning asFilters and wave shaping networks and also able to solve the numerical problems

UNIT - IV

Resonance in Electric Circuits

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

Learning Outcomes:

- 1. Understand the concept of electrical Resonance and their applications
- 2. Able to analyze the RLC circuit and obtain graphical solutions for the Resonance of a circuit

UNIT - V

Cathode Ray Oscilloscope

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

Learning Outcomes:

- 1. Understand the basic working principle and internal blocks of CRO Instrument
- 2. Basic understanding of measurement of voltage, current, frequency and phase of waveforms

Course Outcomes:

- Understanding of **How** to generate AC and List the parameters and **recall** the conceptof impedance (L1).
- Apply the concept of Kirchhoff laws to solve the circuit currents and make use of network theorems (L3).
- Understand **what** is the time response of RC networks and **apply** to solve the transientanalysis problems (L1 and L3)
- Analysis of RLC series and parallel circuit, understand the frequency selection circuitand Compare series and parallel resonance (L4 and L5)
- Understanding of **How** the CRO works and **make use of** CRO for measuring the frequency voltage and phase of AC (L1 and L3)

Text Books:

- 1. Electric circuits by David A. Bell 7th edition 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.

PHYS1141: Basic Circuit Theory Lab (Faculty Core)

L T P C 0 0 2 1

Hours Per week: 2 100 MarksCredit: 1

Sessionals:

Preamble: Understand and realize the working of Instruments and Measurement ofVoltages and currents in the electrical Circuits and results analysis.
Objective: To Design and analyze the electrical circuits.

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:

- Understand **How** Filters work, **classify** the filters **Distinguish** the high pass, low passfilters and Series and parallel resonance (L1, L2 and L3).
- Make use of CRO for the AC measurements and apply the Kirchhoff's laws andNetwork theorems to solve the currents and voltages (L3).
- Analyze the electrical circuits using network theorems (L4).

PHYS1231: Basic Instrumentation Skills

No.of hrs/week:2 Credits: 2

Course Objectives

1. To know the basics of electronic and electrical components

- 2. To get hands on experience with the electronic components
- 3. To understand the basic operation and application of PN diode and BJT
- 4. To learn construction and working of power supply

5. To know the basics of electric motors and heaters.

Unit – I

Fundamental quantities and components

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.

Learning Outcomes

Recall the fundamental Units (L1) To calculate the currents and voltages in a Circuit (L4) Understanding of AC and DC generation (L2)

Unit – II

Measurement of electrical quantities

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.

Learning Outcomes

Able to use Oscilloscope practically (L1)

Understand the basic working or Measurement Meters (L2) Able to calculate the R, L and C values (L4)

Unit – III

Basic electronic components

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.

Learning Outcomes

Recall the semiconductor Basics (L1)

Understand the operation of semiconductor devices (L3) Able to construct logic generation Circuits (L3)

Unit – IV

Rectifier and power supply

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. **Learning Outcomes**

Recall the Electromagnetism basics (L1)

Understand the working of rectifiers (L3)

Able to construction simple DC power supply (L3)

Unit – V

Basic Electrical components and devices

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,

L T P C 2 0 0 2 External Examination 30

External Examination 30 Sessionals 70Marks

Learning Outcomes

Understand basic electrical wiring (L2) Able to make use of switches and circuit breakers (L4) Understand the working of basic electrical appliances (L3)

Course Outcomes:

CO-1 Recall the fundamental Units, measurements and semiconductor Physics

CO-2 Understand the currents and voltages in circuits

CO-3 Calculate the currents and power and unknown component values

CO-4 Applications of PN diode and BJT as switches

CO-5 Understand basic Electrical wiring, switches and appliances

Reference Books

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.,

4. A text book in Electrical Technology -B L Theraja -S Chand and Co.

5. Performance and design of AC machines -M G Say ELBS Edition

6. Digital Circuits and systems, Venugopal, 2011, Tata McGr

PHYS1151: Waves & Optics (Major Academic Core)

Hours Per week: 3 Credits: 3 3 0 0 3 End semester Exam:30 Marks Sessionals: 70 Marks

L

ТРС

Preamble: To introduce the concept of waves and understand the phenomena oflight by division of amplitude and division of wave front

Objective: To visualize wave motion and develop intuition about waves forvarious light phenomena UNIT- I

Superposition of Two Collinear Harmonic oscillations: Linearity and SuperpositionPrinciple. (1) Oscillations having equal frequencies and (2) Oscillations having different frequencies (Beats). **Superposition of Harmonic Oscillations**: Graphical and Analytical Methods. Lissajous Figures with equal an unequal frequency and their uses.

Waves Motion- General: Group velocity, Phase velocity.Plane waves.Spherical waves (complex notation), Wave intensity.

Learning outcomes

- **1.** Understanding superposition principle and realization to harmonic oscillators for determiningparameters related to waves (L2)
- 2. Analyze the relation between inherent parameters of wave(L4)

UNIT-II

Interference 1(Division of wavefront)

Principle of superposition, Interference of light, types of interference, Young's experiment, Intensity at a point in a plane, coherence-temporal coherence and spatial coherence-conditions for interference of light, Frenel's Biprism, determination of wavelength of light, determination of thickness of thin film, Llyod's single mirror, Verification of change of phase on reflection.

Learning Outcomes

1. Applying interference of light with concept of wave front with experiments in determination of wavelength, thickness and phase change on reflection.(L3)

2. Analyze the construction of optical instruments(L4)

UNIT-III

Interference: (Division of Amplitude)

Oblique incidence of a plane wave on a thin film due to reflected and transmitted light (cosine law) –colors of thin films. Interference by a film with two non-parallel reflecting surfaces (Wedge shaped film). Determination of diameter of wire, Newton's rings in reflected light. Determination of wavelength of monochromatic light, Michelson interferometer-types of fringes, Determination of wavelength of monochromatic light.

Learning Outcomes

1. Applying interference of light with concept of amplitude with experiments relevant to thin filmsfor determination of wavelength , thickness and fringe width. (L3)

2. Analyze for confirmation for various types of fringes (L4)

UNIT- IV

Diffraction:

Introduction, distinction between Fresnel and Fraunhoffer diffraction, Fraunhoffer diffraction – Diffraction due to single slit and circular aperture-Diffraction grating -Limit of resolution- Resolving power of grating.

Fresnel's half period zones-area of the half period zones-zone plate-comparison of zone plate with convex lens-fresnel diffraction at a straight edge-difference between interference and diffraction. **Learning Outcomes**

1. To demonstrate the concept of diffraction its types to different apertures for optical parameters (L2)

2. Applying to different zones of diffraction (L3)

UNIT -V

Polarisation:

Polarized light: methods of polarization polarization by reflection, refraction, double refraction, scattering of light-Brewster's law-Mauls law-Nicol prism polarizer and analyzer-Quarter wave plate, Half wave plate-optical activity and Babinet's compensator.

Learning Outcomes

1. To understand polarization of light with various phenomena and its activity with optical elements (L2).

- 2. Applying to different optical instrument (L3). Course Outcomes:
- Understanding superposition principle and Analyze the relation between inherent parameters of wave(L2 and L4)
- Applying and analyze interference of light for optical parameters and construct optical instruments (L3 and L4)
- Applying and analyze interference of light for optical parameters and fringes (L3 and L4)
- To demonstrate the concept of diffraction and applying to different zones of diffraction(L2and L3)
- To understand polarization of light and utilize to different optical instrument (L2 and L3)

Text Books:

- 1. BSc Physics, Vol.2, Telugu Akademy, Hyderabad
- 2. A Text Book of Optics-N Subramanyam, L Brijlal, S.Chand& Co.
- 3. Unified Physics Vol.II Optics & Thermodynamics Jai Prakash Nath&Co.Ltd., Meerut Reference Books:
- 1. Optics, F..A. Jenkins and H.G. White, Mc Graw-Hill
- 2. Optics, Ajoy Ghatak, Tata Mc Graw-Hill.
- 3. Fundamentals of Physics. Halliday/Resnick/Walker.C. Wiley India Edition 2007
- 4. Introduction of Lasers Avadhanulu, S.Chand& Co.
- 5. Fundamentals of Optics, H.R. Gulati and D.R. Khanna, 1991, R. Chand Publication
- 6. Principles of Optics- BK Mathur, Gopala Printing Press, 1995

PHYS1171: Thermal Physics and Statistical Mechanics (Major Academic Core)

Hours Per week: 3 Credit: 3 3 0 0 3 End semester Exam:30 Marks Sessionals: 70 Marks

LTPC

Preamble: The course provides an introduction to the basic concepts in thermodynamics, various thermodynamic transport phenomena, general thermodynamic property relations and different law for energy spectrum emitted by black body. It develops the problem solving skills in problems in basic thermodynamics.

Objective: To understand the basic laws of thermodynamics and their application to the nonflow and flow processes, thermodynamic properties of ideal and real gases and thermodynamic probability ingaseous medium

UNIT I

Kinetic theory of gases

Introduction –Deduction of Maxwell's law of distribution of molecular speeds, experimental verification. Toothed wheel experiment. Transport phenomena-Viscosity of gases-thermal conductivity-diffusion of gases.

Learning Outcomes

- 1. Understanding molecular speed distribution in gases. (L2)
- 2. Understanding transport phenomena of gases.(L2)

UNIT II

Thermodynamics

Introduction- Isothermal and adiabatic process- Reversible and irreversible processes- Carnnot's engine and its efficiency-Carnot's theorem-Second law of thermodynamics. Kelvin's and Claussius statements-Thermodynamic scale of temperature-Entropy, physical significance –Change in entropy in reversible and irreversible processes-Entropy and disorder-Entropy of Universe-Temperature-Entropy (T-S) diagram-Change of entropy of a perfect gas-change of entropy when ice changes into steam.

Learning Outcomes

- 1. Understanding basic concepts in thermodynamic and Carnnot's heat ideal heat engine.(L2)
- 2. Develop the problem solving skill in basic thermodynamics.(L3)

UNIT III

Thermodynamic potentials and Maxwell's equations

Thermodynamic potentials-Derivation of Maxwell's thermodynamic relations-Clausius- Clayperon's equation-Derivation for ratio of specific heats-Derivation for difference of two specific heats for perfect gas.Joule Kelvin effect-expression for Joule Kelvin coefficient for perfect and Van der waal's gas.

Learning Outcomes

- 1. Understanding and applying Maxwell thermodynamic relations.(L2 and L3)
- 2. Examine temperature change by using Joule Kelvin effect(L4)

UNIT IV

Black body radiation

Blackbody-Ferry's black body-distribution of energy in the spectrum of black body-Wein's displacement law, Wein's law and stefans law Rayleigh-Jean's law-Quantum theory of radiation-Planck's law-Measurement of radiation.

Learning Outcomes

- 1. Understanding different law for energy spectrum emitted by black body.(L2)
- 2. Determine measurement of radiation by different techniques. (L5)

UNIT V

Introduction to Statistical Mechanics

Phase space, Macrostate and Microstate Statistical basis, Probability, Principle of equal aprioriprobability, Maxwell-Boltzmann statistics, Bose-Einstein statistics, Fermi-Dirac statistics (qualitative treatment), Entropy and Thermodynamic probability.

Learning Outcomes

1. Understanding basic concepts of statistical thermodynamics. (L2)

2. Analyzing the average distribution of non-interacting material particles over various energy states in thermal equilibrium by using different laws.(L4)

Course Outcomes:

- Understanding molecular speed distribution and transport in gases. (L2)
- Understanding basic concepts in thermodynamics and solve basic equations (L2 and L3)
- Understanding and applying Maxwell thermodynamic relations and examinetemperature change by using Joule Kelvin effect(L2 and L4)
- Understanding and measure energy spectrum emitted by black body.(L2 and L5)
- Understanding basic concepts of statistical thermodynamics and analyzing theaverage distribution of non-interacting material particles (L2 and L4)

Text Books:

- 1. BSc Physics, Vol.2, Telugu Akademy, Hyderabad
- 2. Thermodynamics, R.C. Srivastava, Subit K. Saha & Abhay K. Jain EasternEconomy Edition.
- 3. Unified Physics Vol.2, Optics & Thermodynamics, Jai Prakash Nath&Co.Ltd.,Meerut
- 4. Heat ,Thermodynamics and Statistical Physics, Brij lal, Dr.N Subrahmanyam, P.S. Hemne, S Chand & Co
- 5. A text Book of Heat J.B.Rajam **Reference Books:**
- 1. Fundamentals of Physics. Halliday/Resnick/Walker.C. Wiley India Edition 2007
- 2. Heat, Thermodynamics and Statistical Physics-N Brij Lal, N Subrahmanyam, PSHemne, S.Chand& Co.,2012
- 3. Heat and Thermodynamics- MS Yadav, Anmol Publications Pvt. Ltd, 2000
- 4. University Physics, HD Young, MW Zemansky, FW Sears, Narosa Publishers, NewDelhi
- 5. Text Book of +3 Physics Samal, Mishra & Mohanty, National Library, Min.of Culture, Govt of India.
- 6. Modern Engineering Physics, A.S. Vasudeva, S.Chand& Co.,

PHYS1161: Waves & Optics Lab (Major Academic Core Lab)

L T P C 0 0 2 1

Hours Per week: 2	Sessionals: 100 Marks
Credit: 1 Preamble:	Determination and analyzing of optical constants with light
Objective:	To find Physical constants and analyze for its accuracy

List of Experiments

- 1. Determination of radius of curvature of a given convex lens-Newton's rings.
- 2. Resolving power of grating.
- 3. Dispersive power of a prism.
- 4. Determination of wavelength of light using diffraction grating- minimum deviation method.
- 5. Wavelength of light using diffraction grating-normal incidence method.
- 6. Determination of thickness of a thin fiber by wedge method
- 7. Spectrometer- i-d curve.
- 8. Cauchys constants
- 9. Hallow prism

Course Outcomes:

Enable to determine optical constants, estimate and illustrate (L4 and L5)

PHYS1181: Thermal Physics and Statistical Mechanics Lab (Major Academic Core Lab)

Hours Per week: 2 Credit: 1

Sessionals: 100 Marks

LTPC 0 0

2 1

Preamble: Determination and analyzing of thermo dynamical parameters.

Objective: To find thermo dynamical constants and analyze for its

accuracy.List of Experiments

- 1. Specific heat of a liquid –Joule's calorimeter –Barton's radiation correction
- 2. Thermal conductivity of bad conductor-Lee's method
- 3. Measurement of Stefan's constant.
- 4. Specific heat of a liquid by applying Newton's law of cooling correction.
- 5. Heating efficiency of electrical kettle with varying voltages.
- 6. Thermoemf- thermo couple potentiometer
- 7. Coefficient of thermal conductivity of copper- Searle's apparatus.
- 8. Thermal behavior of an electric bulb (filament/torch light bulb)
- 9. Temperature variation of resistance- thermistor.

Course Outcomes:

Enable to determine thermo dynamical constants, analyze and illustrate (L4 and L5)

PHYS2001: Electricity and Magnetism

3 0 0 3

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End semester Exam:30

Т Р С

Hours Per week: 3 Marks Credit: 3 Marks

Course Objectives

1. To introduce the concepts of electric charges, fields and potentials

2. To familiarize the students with electric field and the magnetic field concepts

3.To understand the relation between electricity and magnetism via electromagnetic induction

4.To combine the understanding of fundamental concepts in Electricity and Magnetism more rigorously and their relation to understand the physical systems

5.To analyze simple circuits like LR CR and LCR with AC and DC inputs

Unit I Electric field and potential:

Hours

Gauss's law statement and its proof- Electric field due to (1) Uniformly charged sphere (2) an infinite conducting sheet of charge and (3) Uniformly charged cylinder. Electrical potential equipotential surfaces- potential due to i) a point charge, ii) charged spherical shell and uniformly charged circular disc. Electric field strength due to an electric dipole.

Learning Outcomes

1. Understands the concept of electric flux and apply Gauss's law to calculate electric flux (L2 and L3).

2.Understand electrostatic interactions of point charges physical parameters. (L2)

3. To calculate the electric potentials due to different charge distributions (L2)

Unit II Capacitance and dielectrics:

Electric capacitance - Derivation of expression for capacity of (i) a parallel plate capacitor (ii) a spherical capacitor. Dielectrics- effect of dielectric on the capacity of a condenser, Energy stored in a capacitor. Electric dipole moment and molecular polarizability- Electric displacement D, electric polarization P - relation between D,E and P- Dielectric constant and susceptibility.

Learning Outcomes

1.Understand the working of capacitor and different types of capacitors (L2)

2. To realize charge and energy stored in a capacitor. (L2)

3.Learn about dielectrics, dielectric breakdown, and how dielectrics make capacitors more effective (L3)

Unit III Moving charges in electric and magnetic field Hours

Hall effect, cyclotron, synchrocyclotron and synchrotron- Force on a current carrying conductor placed in a magnetic field, force and torque on a current loop, Biot-Savart's law, explanation and calculation of B due to long straight wire, a circular current loop and solenoid.

Electromagnetic induction

Faraday's law-Lenz's law-expression for induced emf-time varying magnetic field Betatron -Moving coil ballistic galvanometer-theory, working. Self and mutual inductance, coefficient of coupling.

Learning Outcomes

1.To learn about the construction and principles of cyclotron, synchrocyclotron and synchrotron and their working (L3).

2.To understand mutual relation between electric and magnetic fields (L2).

3.To learn about faraday's Laws and coefficient of coupling (L2)

Unit IV Varying and alternating currents

Hours

Growth and decay of currents in LR, CR and LCR dc circuits-critical damping, Alternating current relation between current and voltage in pure R, C and L. LCR series and parallel resonant circuit, Q -factor.

13



9 Hours

9

9

9

Learning Outcomes

1.To Interpret circuits with Capacitance (C), inductor (L) and Resistor (R) during charging and discharging when connected or disconnected to a battery (L2).

2. Function of an LC circuit for the change in oscillations due to resistance in series and parallel combinations (L4)

3. To learn about resonance circuits and Q factor (L2)

9 Hours

Unit V Maxwell's equations and electromagnetic waves A review of basic laws of electricity and magnetism-displacement current. Maxwell's equations in differential form, Maxwell's wave equation, plane electromagnetic waves. Transverse nature of electromagnetic waves. Poynting theorem.

Learning Outcomes

1.To understand about Maxwell's equations of electromagnetic theory (L2)

2.To Infer how Maxwell modified Ampere's law for wave equation for the transfer of electromagnetic energy (L4).

3.To learn the nature and behavior of electromagnetic waves (L4)

Course Outcomes

CO-1Understands the concept of electric flux, interactions of point charges and apply Gauss's law to calculate electric flux. (L2 and L3)

CO-2 Understand capacitor types and analyze the potential and energy stored in a capacitor. (L2 and L4)

CO-3 Learns about different particle accelerators cyclotron, synchrotron, betatron (L3)

CO-4 Interpret and examine RLC circuits with battery connected and battery Disconnected (L2 and L4)

CO-5 Examines Maxwell's equations of electromagnetic theory and electromagnetic wave equation for the transfer of electromagnetic energy.(L2 and L4)

Textbooks:

- 1. BSc Physics, Vol.3, Telugu Akademy, Hyderabad
- 2. Electricity and Magnetism, D.N. Vasudeva. S. Chand & Co.
- 3. Unified Physics Vol.3, Electricity, Magnetism and Electronics, S.L. Gupta and Sanjeev Gupta, Jai Prakasah Nath& Co., Meerut.

Reference Books:

- 1. Fundamentals of Physics- Halliday/Resnick/Walker Wiley India Edition2007.
- 2. Berkeley Physics Course Vol. II Electricity and Magnetism Edward M Purcell-The McGraw-Hill Companies.
- 3. Electricity and Magnetism Brijlal and Subramanyam. RatanPrakashanMandir.
- 4. Electricity and Magnetism, C.J. Smith, Edward Arnold Ltd.

PHYS2041 Elementary Mathematical methods of Physics

Hours per week: 3 Credits: 3

Course Objective

To understand and attribute various mathematics aspects for its application

To become familiarize with vector analysis, operators and integrals for application

To understand various coordinate systems

Apply differential equations for certain specified systems and interpret its solution

To understand representation of complex plane for its application

Unit-I Vector Analysis

Vector identities:scalar and Vector fields:Vector Differentiation: Directional derivatives and normal derivative. Gradient of a scalar field and its geometrical interpretation. Del and Laplacian operators, Divergence and curl of a vector field; Vector Integration: Ordinary Integrals of Vectors, Line, surface and volume integrals of Vector fields, Gauss' divergence theorem, Green's and Stokes Theorems.-Problems/applications

Learning Outcomes

1 Understand various vector quantities(L2)

2 To choose various vector operators for its representation(L3)

3. To execute vector fields to various applications

Unit II Orthogonal Curvilinear Coordinates

Derivation of Gradient, Divergence, Curl and Laplacian in orthogonal curvilinear coordinate system. Calculation of scale factor ,calculation of line surface and volume integrals in three coordinate systems. Applications-Gauss Law; Stokes law;

Learning Outcomes

1.To compare various coordinates (L2)

2.Examine coordinates to specific applications(L3)

3. To categorize various coordinates for application (L4)

Unit III Applications of Differential Equations

Introduction, Linear differential equations and their solution methodologies, Application of Linear differential equations: Harmonic Oscillator, LCR Circuit, Bending of Beams, Applications of Simultaneous Linear equations: Projectile motion with resistance, Coupled Oscillator.

Learning Outcomes

1.Understand and Articulate to differential equations(L2 and L3)

2.Determine solutions to specific problems(L3)

3.Implement to simultaneous equations and deduce results of systems(L3 & L4)

Unit IV Complex numbers

Brief Revision of Complex Numbers and their Graphical Representation on Argand's diagram. Euler's formula, De Moivre's theorem, Roots of Complex Numbers, Complex algebra, Complex functions: exponential, circular, hyperbolic, logarithmic and inverse of these, Derivative of complex functions, Cauchy-Riemann Equations and analytic functions. Singular functions: poles and branch points, order of singularity, branch cuts, Integration of complex functions, Cauchy Integral theorem and Cauchy integral formula-related problems

Learning Outcomes

1.summarize and determine arithmetic with complex numbers \mathbb{C} in rectangular form a + ib and Illustrate and read complex numbers on an Argand diagram. (L2 & L3)

2. Calculate the conjugate of a complex number. (L2)

3. Solve quadratic equations for specific applications(L3)

Unit- V Calculus of Variations

Introduction, The Euler Equation, Using the Euler Equation, The Brachistochrone Problem, Cycloids Several Dependent Variables, Lagrange's Equations Isoperimetric Problems, Variational Notation and Miscellaneous Problems 15

Learning Outcomes

1.Recognise the fundamental concepts of current mathematical theories.(L2)

End Examination: 30 Marks Sessional: 70 Marks

12 Hours

10 Hours

LTPC 3 0

0 3

8 Hours

15 Hours

10 Hours

2. Establish the main connections between these theories, analyze them and explain (L2 & L3)

3. Apply to various problems for its behavior.(L3)

Course Outcomes

1. To choose various vector operators for its representation and execute to various Applications

2. Understand different coordinate systems and analyze to specific applications

- 3. Understand and Articulate to differential equations to determine solutions to specific problems
- 4 .Summarize complex numbers for its representation and apply to specific problems
- 5. Recognise the fundamental concepts of important current mathematical theories.(L2)

Text Books

1. Vector analysis, M R Spiegel, McGraw-Hill, 1974

2. Mathematical Methods for Physicists by Arfken and Weber, Elsevier, Sixth Edition, 2005

PHYS3001 Mechanics of System of Particles

Hours per week: 3 Credits: 3 **Course Objective**

1. To understand and interpret with equation of motion the system of particles

2. To identify harmonic oscillators and analyze equations of motion

3. To define central forces and explain equation of motion

4. To understand different coordinate systems and determine its effects in non inertial frame

5. To interpret scattering phenomena for different properties and examine its parameters

Unit I Mechanics

Newtonian Mechanics- Newton laws, Inertial and non-inertial frames, Motion under constant force, timedependent force and velocity dependent force, conservative and non-conservative forces. Application of Newton Laws.

System of Particles- Centre of mass, Conservation of linear and Angular momentum, Relation between angular momentum (J) and angular momentum about centre of mass (J_{CM}). Kinetic energy- work-energy Theorem. Lagrangian and Hamiltonian (Definitions only).

Learning Outcomes

1.Understand different concepts of newtonian mechanics (L2)

2. Analyze its equation of motion(L4)

3.Extend newtonian mechanics to system of particles(L2)

Unit 2 Harmonic Oscillators

Linear oscillators- equation of motion and solutions, Energy of simple harmonic oscillators. Non-Linear Oscillators, damped harmonic oscillator- Quality factor, Forced harmonic oscillator, Amplitude resonance and Energy resonance.

Learning Outcomes

1.Undwerstand various types of harmonic oscillators(L2)

2. Apply equations of motion to find solution(L3)

3. Analyze its behavior(L4)

Unit III Central Force Motion

Reduction to one body problem, Lagrangian in central force field in polar coordinates, General Properties of motion under central force. Centrifugal and Effective potential, Classification of orbits, Motion in a central force field- General solution(Energy method)-Inverse Square law force, Kepler's laws, Law of Gravitation from Kepler's Laws.

Learning Outcomes

1.Remember central force and understand its motion and its force field(L1)

2.Understand and classify various central forces (L2)

3.Interpret related laws of central forces(L4)

Unit IV Noninertial coordinate system

Translating coordinate systems-Fictitious force, Rotating coordinate systems-Coriolis theorem. Motion on rotating earth- static and dynamic effects. Foucault Pendulum- Earth as non-inertial system.

Learning Outcomes

1. Understand different coordinate systems(L2)

- 2. Apply to different systems for its solution(L3)
- 3. Understand noninertial frame (L2)

Unit V Scattering and Fluid Dynamics

Elastic and Inelastic scattering, Expression for final velocities and value of scattering angle, scattering in central force field- differential and total scattering cross sections, scattering of charged particles by Coulomb field. Relation between Lab and Centre of mass cross sections.

Fluids dynamics

9 hours

9 Hours

Sessional: 70 Marks

9 Hours

9Hours

9Hours

3 0 0 3 **End Examination: 30 Marks**

LTPC

Archimedes principle, Fluids in motion- Continuity equation, Equation of motion for an ideal fluid flow and Bernoulli's equation.

Learning Outcomes

- 1.Understand concept of scattering(L2)
- 2. Analyze scattering for determining scattering parameters(L4)
- 3.Understand fluid mechanics and determine equation of motion (L2 & L3)

Reference Books

- 1. A. Arya, Introduction to Classical Mechanics, 2nd edition (Pearson, Upper Saddle River, N.J, 1997).
- 2. G. Aruldhas, Classical Mechanics (PHI learning, Delhi, 2013).
- 3. D. S. Mathur, Mechanics for B. Sc. Pass and Honours Classes of Indian Universities (S. Chand & Company, New Delhi, 2009).
- 4. J. C. Upadhyaya, Classical Mechanics (Himalaya Publishing House, 2019).

Course Outcomes

CO-1: Understand newtonian mechanics and extend to systems of particles for new formalism

CO-2: Identify various types of harmonic oscillators and analyze equation of motion

CO-3: Realize various central forces, classify and interpret the laws

CO-4: Understand different coordinate systems, apply to systems for its solution

CO-5: Understand scattering for various properties and understand new concept of fluid mechanics

PHYS2011 Electricity and Magnetism Lab

L T P C 0 0 2 1

Hours per week: 2 Credits: 1

Continuous Evaluation: 100 Marks

Course Objectives

1.To verify laws of currents

2.Implement network theorems for determination of electrical quantities

3.Understand phenomena of conversion of current to voltage

4. Analyze magnetic field for coil

5.Implement electromagnet for determination of fields

List of Experiments:

1.Verification of Kirchoff's laws

2.Maximum power transfer theorem

3.Internal resistance of a cell by potentiometer.

4.LCR circuit series resonance, Q factor

5.LCR circuit parallel resonance

6.Conversion of galvanometer into ammeter

7.Conversion of galvanometer into voltmeter.

8. Field along the axis of a circular coil carrying current.

9.Hall probes-Magnetic field measurement (electromagnet calibration)

Course Outcomes

CO-1 Determine currents and voltages for electrical circuits

CO-2. Analyze phenomena of magnetic field

CO-3. Design of electrical circuits

CO-4. Illustrate phenomena of electromagnet

CO-5.Observe conversion of ammeter to voltmeter

PHYS2051 Elementary Mathematical methods of Physics Lab

L T P C 0 0 2 1

Continuous Evaluation: 100 Marks

Hours per week: 2 Credits: 1

Course Objectives

1: To create sets of simultaneous linear equations arising from physical problems.

2: To apply the required mathematical skills to solve problems in quantum mechanics, electrodynamics and other fields.

3: To understand the mathematical expressions which are useful for the development of equipment, structure, and techniques for mankind.

4: The student will be able to analyse advanced techniques of mathematical methods.

5. Analyze solutions

List of Problems

1. Determination of Divergence and curl of electric field due to charge

2. Verification of Gauss divergence theorem

3. Determination of Electric flux for spherical surface

4. Numerical solution of linear harmonic oscillator

5. Projectile motion

6. Numerical solution of LCR circuit

7. Numerical solution of damped harmonic oscillator

8. Simulation of LCR circuit

Course Outcomes

CO1: Learn and understand calculus. Starting with review of differentiation, exponential and logarithm functions, trigonometric functions, plotting functions, differentials and basics of integration.

CO2: Understand Gaussian integrals, integration by parts, differential and integral calculus for many variables, Lagrange multipliers and Jacobins, Taylor series and their applications in physics.

CO3: Understand math of complex number and application of Cauchy-Riemann Equations, Residue Theorem and Taylor Series for analytic functions.

CO4: Understand basics of vector calculus.

CO5: Understand divergence, gradient and curl and their physical interpretation.

PHYS3011 Mechanics of System of Particles Lab

L T P C 0 0 2 1

Continuous Evaluation: 100 Marks

Hours per week: 2 Credits: 1

Course Objectives

1.To familiarize with laws of motion

2, To Understand systems of particles

3. To analyze specific systems for characteristics

4.Determine related parameters

5.Understand collision and its principle

List of Experiments (Virtual Lab)

1. Torque and angular acceleration of a fly wheel

2. Torsional oscillations in different liquids

3.Moment of Inertia of Flywheel

4.Newton's Second Law of Motion

5.Ballistic Pendulum

6.Collision balls

7.Projectile Motion

8.Elastic and Inelastic Collision

Course Outcomes

CO-1Students should understand the drawbacks of Newtonian approach and necessity of new approaches to solve advanced problems involving the dynamic motion of classical mechanical systems.

CO-2. The students will introduce about the forces, angular momentum and knowledge about the constraint.

CO-3. The course provides the students about the knowledge of collision

CO-4. Use differential equations for obtaining the solution

CO-5. How to use conservation of energy and linear and angular momentum to solve dynamics problems.
PHYS2021 Elements of Modern Physics

Hours per week: 3 Credits: 3

Course Objective

1.To understand the concepts of Modern Physics

2. To understand atomic spectra of atom

3.Comparison of atomic and molecular spectra

4. Analyze principles of LASER

5.Understand role of optical fibre in communication

Unit I Atomic Physics

Introduction –Drawbacks of Bohr's atomic model-Sommerfeld's elliptical orbits-relativistic correction (no derivation). Vector atom model and quantum numbers associated with it. L-S and j-j coupling schemes. Selection rules, intensity rules- Pauli's Exclusion Principle, Larmor precision frequency. Fine structure of Sodium D lines. Stern and Gerlach experiment.

Learning Outcomes

1. To develop the atomic models (L3)

2. Pauli's Exclusion Principle, Larmor precision are understood (L2)

3.To attribute coupling schemes(L3)

Unit II Atoms in Electrical and Magnetic Fields

Zeeman Effect, Normal Zeeman Effect, Experimental arrangement, Explanation of NormalZeeman Effect by Vector Atom Model. Anomalous Zeeman Effect. Paschen- Back Effect, Stark Effect Explanations (Elementary ideas only). Vibrational Spectroscopy

Learning Outcomes

- 1. Analyze influence of electric and magnetic effects on atomic spectral lines (L4)
- 2. Understanding Raman Effect (L2)
- 3. To familiarize with spectroscopy(L3)

Unit III Matter waves and Uncertainty Principle

Matter waves, de Broglie's hypothesis-wavelength of matter waves and their properties, Wave or Phase and group velocities- Davisson and Germer experiment-G.P.Thomson Experiment, de Broglie Standing waves of electron in Bohr orbits. Heisenberg's uncertainty principle for position and momentum (x and p), & energy and time (E and t).Gamma ray microscope. Diffraction by a single slit, position of electron in Bohr orbit, Complementary principle of Bohr.

Learning Outcomes

- 1. Interpret the concept of wave and particle nature (L2).
- 2. Experimental studies on de Broglie's hypothesis and Heisenberg uncertainity principle. (L3)
- 3.To understand the orign of quantization (L2)

Unit IV Wave mechanics

Basic postulates of quantum mechanics-Schrodinger time independent wave equationderivation. Physical interpretation of wave function and its significance. Solution of Schrodinger Equations. Eigen functions, Eigen values. Application of Schrodinger wave equation to particle in one dimensional infinite box.

Learning Outcomes

1. Interpretation of quantum mechanics for probability (L2)

2 Attribute its equation of motion (L4)

3.Numerical solution of specific application (L5)

Unit V Lasers and Fiber optics

Lasers: introduction, spontaneous emission, stimulated emission, Population Inversion, Types of lasers-He-Ne laser, Ruby laser, Applications of lasers. Introduction- different types of fibers, rays and modes in an optical fiber, fiber material, advantages of fiber optic communication **Learning Outcomes**

9 Hours

9 Hours

9 Hours

9 Hours

9 Hours

End Examination: 30 Marks

Sessional: 70 Marks

LTPC 3 0 0 3

1. Compare the process in LASERS (L2)

2. Analyse optical fibers for its structure(L3)

3. Application of optical fibres in communication (L4)

Course Outcomes

CO-1.To develop the atomic models and understand underlying principles in it

CO-2 Analyze influence of electric and magnetic effects on atomic models

CO-3 Interpret the concept of wave and particle nature and related experimental studies

CO-4 Interpretation of quantum mechanics for probability and its equation of motion

CO-5 Compare the process in LASERS and outline optical fibers for application

Text Books:

1. Introduction to Solid State Physics, CharlesKittel,8 thEd.,2004, Wiley India Pvt.Ltd.

2. Elements of Solid State Physics, J.P.Srivastava, 2 nd Ed., 2006, PHI

- 3. Introduction to Solids, Leonid V.Azaroff, 2004, TataMc-Graw Hill
- 4. Solid StatePhysics, Neil W. Ashcroft and N. David Mermin, 1976, Cengage Learning

5. Elementary Solid State Physics: Principles and Applications Addison-Wesley Series 1993

PHYS3021 Introduction to Electromagnetic Theory

Hours per week: 3 Credits: 3

Course Objective

1.To introduce the basic mathematical concepts related to electromagnetic vector fields.

2.To aspire the students regarding the computation of vector potential, electric field of a localizedcurrent distribution using multipole expansion problems.

3. To acquaint the students regarding the concepts of electrodynamics and Maxwell equations and apply it in numerous problems.

4.Understand Maxwell's equations; Gauge transformations; Concept of retardedpotentials; 5.Analyze Electromagnetic radiation from both localized and movingsource

Unit I: Vector Analysis

Vector algebra: triple products, how vectors transform, position, displacement and separation vectors, Gradient of a scalar field, the divergence and the curl of vector fields, line, surface and volume integrals, spherical polar and cylindrical coordinates, dirac delta function in one dimension and three dimension, Laplacian operator.

Unit II: Electric fields and potentials

Divergence and curl of electric field, Poisson's equation and Laplace equation, Applications of Laplace equation: potential between two parallel planes, potential between two concentric cylinders and two concentric spheres, Boundary conditions at the dielectric surface, boundary conditions between a dielectric and a conductor

Unit III: Electromagnetic Waves

Review of Maxwell's equations, Displacement Current, electromagnetic (EM) wave equation, Poynting Theorem and Poynting Vector, EM Energy Density, momentum, nature and properties of EM waves, production and detection of EM waves, Hertz experiment, EM spectrum.

Unit IV: EM Waves in Matter - I

Induction current in continuous material medium, eddy currents, application of eddy currents, skin effect, EM waves in matter, EM Wave Propagation in non conducting medium, refractive index and dielectric constant, wave impedance, propagation of EM waves in a conducting medium, relaxation time, skin depth.

Unit V: EM Waves in Matter - II

Polarization of plane waves, Boundary conditions on the fields, transmission and reflection from a dielectric interface at normal and oblique incidence, p-polarization and s-polarization, critical angle, Brewster angle, reflection and transmission at a conducting surface, optical dispersion in materials, anomalous dispersion, Cauchy's relation, dispersion in solids and liquids, Free electrons in conductors and plasma, Introduction to waveguides.

Text Books

1. Electricity and Magnetism by D. C. Tayal (Himalaya Publishing) 2. Introduction to Electrodynamics by D. J. Griffiths (Prentice Hall Publishers)

Course Outcomes

CO-1Use Maxwell equations in analysing the nature of electromagnetic field due to time varying charge and current distribution.

CO-2. Describe the nature of electromagnetic wave and its propagation

CO-3. Analyse EM waves through different media and interfaces involved in different situations.

CO-4. Simplify charged particle dynamics and radiation from localized time varying

electromagnetic sources.

CO-5 Attribute significance of Maxwell equations

End Examination: 30 Marks Sessional: 70 Marks

8 Hours

8 Hours

10 Hours

8 Hours

11 Hours

24



PHYS3041 Introduction to Quantum Mechanics

Hours per week: 3 Credits: 3

Course Objective

1.To understand the origin of Quantum Mechanics and failure of Classical Mechanics

2. To know the postulates of Quantum mechanics

3.To understand the Schrodinger equation and its interpretation

4.To understand the energy eigen value in 1D potential well

5. To interpret zero point energy and wave function for 1D harmonic oscillator

Unit 1: Origin of Quantum theory

Failures of classical mechanics, Black body Radiations, Distribution of energy in the Spectrum of black body Radiation- wien's displacement law, Rayleigh Jeans's law, Planck's radiation law, Photoelectric effect, Laws of photoelectric emission, Compton effect, Shortcomings of old quantum theory.

Learning Outcomes

1.To Understand the failure of classical mechanics and necessity of quantum mechanics (L2)

2. Extend the quantum mechanical analogue in the understanding of black body radiations(L3)

3.Understand the particle nature of radiation with Photoelectric emission and Compton effect (L4)

Unit 2: De Broglie's Waves and Uncertainty Principle

Two slit experiments with photons and particles, superposition Principle, Wave particle duality, De Broglie's hypothesis, De Broglie's model of the atom, wave Velocity and group velocity, Heisenberg uncertainty Principle. Application of uncertainty Principle -(1) Energy and radius of Bohr First Orbit (2) Nonexistence of electrons in the nucleus.

Learning Outcomes

1.To understand the wave particle duality of radiation (L2)

- 2. To understand the De Broglie hypothesis, group and wave velocity (L4)
- 3. Understand the Heisneberg uncertainty principle and its applications (L2)

Unit 3: Wave function and operators

Wave Function-definition Properties and physical significance of Wave function "Y" and Normalization condition, Operators - Parity operator, Hermitian operator, Unitary operator, Commutation relations, Eigenvalues and eigenfunctions, orthonormality and completeness, Kronecker delta and Dirac Delta functions Learning Outcomes

1.Understand the properties and significance of wave function Ψ (L2)

2. Understand the Eigenvalues, eigenfunction, Physical observables and their associated quantum mechanical operators (L4)

3. Understand the kronecker delta and Dirac Delta functions (L2)

Unit 4: Schrodinger's Equation

Schrodinger Equations- Time Independent and time dependent form, Expectation Value, Momentum and energy operators, Stationary states, Probability current density, Ehrenfest's theorem, boundary conditions at the surface of infinite potentials.

Learning Outcomes

1.Understand the time independent and time dependent schrodinger equations (L2)

2. To analyze the expectation values for different quantum mechanical operators (L4)

3.Undestand the probability current density and Ehrenfest theorem (L2)

End Examination: 30 Marks Sessional: 70 Marks

8 Hours

10 Hours

8 Hours

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3

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8 Hours

Unit 5: Applications of One Dimensional Schrodinger Equation

Energy and wave function of a free particle, Particle in an infinite rigid box rectangular potential barrier, Reflection and transmission at a Step potential, 1D linear harmonic oscillator (no derivation required) eigenfunction, eigenvalues and zero-point energy.

Learning Outcomes

1. To apple the Schrodinger equation to estimate energy and wave function of a free particle (L2)

2. Extending the one dimenstional Schrodinger equation for infinite rigid rectangular potential barrier and analyze reflection and transmission coefficients (L4)

3.Extend the 1D Schrodinger equation to obtain the energy eigen values and eigen function for 1 D linear Harmonic oscillator (L2)

Text Books

1. Concepts of Modern Physics by Arthur Beiser. Tata McGraw-Hill Edition.

2. Quantum Mechanics, Mahesh C Jain, Eastern Economy Edition.

3. Introduction to Quantum Mechanics, David J. Griffiths, 2005, Pearson Education

4. Quantum Mechanics, A Textbook for Undergraduates, M. C. Jain, Prentice-Hall of India Private Limited

5. Quantum Mechanics, Arul das, PHI Learning Pvt. Ltd, New Delhi, 2009.

6. Quantum Mechanics: Concept and Applications, Nouredine Zettili, Second Edition, Wiley

Course Outcomes

CO-1:Understand the basis of quantum mechanics and its applications

CO-2:Realization of wave particle duality and Heisenberg uncertainty principle

CO-3:Understand the wave function formalism and Quantum mechanical operators

CO-4:Understand the expectation values and eigenfunctions for different physical observables

CO-5: Understand the application of 1D Schrodinger equations for the potentials barrier

11 Hours

PHYS2031 Elements of Modern Physics Lab

L T P C 0 0 2 1

Hours per week: 2 Credits: 1

Continuous Evaluation: 100 Marks

Course Objective

- 1. To understand the dependence of equilibrium properties of various systems on their microscopic constituents
- 2. To learn to use methods of quantum mechanics
- 3. To grasp the concepts of some principles in modern physics
- 4. To understand optical fibres
- 5. To learn to obtain optical properties to some apertures.

List of Experiments:

- 1 .e/m of an electron by Thomson method.
- 2. Determination of Planck's Constant (photocell)
- 3. Franck and Hertz Experiment
- 4. Laws of Photoelectric effect -
- 5. Numerical aperture of optical fiber
- 6. Characteristics of optical fibers
- 7. Bending losses in Optical Fiber
- 8. Diffraction due to single slit.
- 9. Diffraction due to circular aperture.
- 10. Wavelength of He-Ne laser-Diffraction grating.

Course Outcomes:

- CO1. Use various concepts for determination of specific charge.
- CO2. Compute parameters of light photons.
- CO3. Classify laws of photoelectric effect.
- CO4. Understand and determination of apertures.
- CO5. Understand the and analyze in diffraction of light.

PHYS3031 Electromagnetic Theory Lab

L T P C 0 0 2 1

Hours per week: 2

Credits: 1

Course Objective

1. To familiarize with concepts related to electromagnetic vector fields.

2.To impart knowledge on the concepts of electrostatics, electric potential, energy density andtheir applications.

Continuous Evaluation: 100 Marks

3.To impart knowledge on the concepts of magnetostatics, magnetic flux density, scalar and vector potential and its applications.

4. To impart knowledge on the concepts of Faraday's law, induced emf and Maxwell's equations.

5. To impart knowledge on the concepts of electromagnetic waves for specific application

List of Experiments (Virtual Lab)

1. Tangent Galvanometer

2. Magnetic Field Along The Axis of A Circular Coil Carrying Current

3.Deflection Magnetometer

4.Van De Graaff Generator

5.Barkhausen Effect

6. Temperature Coefficient of Resistance

7.Anderson's Bridge

8.Quincke's Method

Course Outcomes

CO-1. Illustrate the physical concepts of static electric fields.

CO-2. Describe the physical concepts of static magnetic fields.

CO-3. Apply the maxwell equations to solve problems in electromagnetic field theory.

CO-4. Analyze the propagation of waves

CO-5. Determine the parameters at given frequency

PHYS3051 Quantum Mechanics Lab

L T P C 0 0 2 1

Continuous Evaluation: 100 Marks

Hours per week: 2 Credits: 1

Course Objective

1.To analyse quantum mechanical phenomena

2.To interpret behaviour of photons

3.To determine constants of light

4. To understand solar principle with pulse

5. Analyze hysteresis of magnetic materials

List of Experiments (Virtual Lab)

Franck-Hertz Experiment
Photoelectric effect
Determination of Planck's Constant
Abbe's Refractometer
Emission spectra
Millikan's oil drop experiment
Solar Panel Experiment (Remote Trigger)
Magnetic Material Characterization via Hystersis (Remote Trigger)

Course Outcomes

CO-1. To Understand quantum phenomena of waves

CO-2. To attribute the threshold of photons

CO-3. To analyse refraction of light

CO-4. To interpret and analyse solar principle with pulse

CO-5. To calculate hysteresis of magnetic materials

Hours per week: 3 Credits: 3

Course Objectives

1. To understand the origin of semi-empirical mass formula and shell model.

- 2. To explain the different forms of radioactivity and to study alpha, beta and gamma decay at a basic particle physics level and perform calculations.
- 3. To understand the mechanism of working of nuclear detectors.
- 4. Learn the classification of elementary particles according to their quantum numbers
- 5. Learns the basic concepts of Quark model

Unit-I General Properties of Nuclei

Rutherford scattering experiment, Introduction to nuclear properties, Nuclear size, Mass, Density, Angular momentum, Nuclear magnetic dipole moment, Mass defect, Packing fraction, Binding energy, Binding energy per nucleon curve, Semi empirical mass formula.

Learning outcomes

To learn the origin of nucleus and basic properties of nucleus (L2)

Understands the different contributions to nuclear binding energies (L3)

Perform calculations of nuclear size and binding energy of the nucleus (L4)

Unit-II Radioactivity and Nuclear Decay

The radioactive decay law, Natural radioactivity and radioactive series, Alpha decay: Basics of α-decay processes, Gamow's theory of α -decay, Geiger Nuttal law, β -decay, Energy kinematics for β -decay, Positron emission, Electron capture, Neutrino hypothesis.

Learning outcomes

To distinguish different nuclear radiations and the reasons for the radioactive emissions from the nucleus(L3) To understand the concept of neutrino and its hypothesis (L2)

To learn the theory behind the radio-active decay(L2)

Unit III Nuclear Forces and Models

Introduction to nuclear forces, Properties of nuclear forces, Meson exchange theory of nuclear forces, Liquid drop model, Nuclear magic numbers, basic ideas of nuclear shell model.

Learning outcomes

The student is able to distinguish the nuclear forces from other basic forces (L3)

Learns the arrangement of nuclear shell type structure of nuclear levels (L4)

He understands the basics nuclear models (L2)

Unit IV Nuclear Detectors

Introduction, Interaction of nuclear radiation with matter - Compton effect, Pair production and Photo-electric effect, Detectors of nuclear radiation - Ionization chamber, Proportional counter, Geiger-Muller counter, Scintillation counter.

Learning outcomes

The student gets the basic idea of detection of nuclear radiation (L2)

Learns the working principles of different nuclear detectors (L4)

Understands the operations and use of nuclear detectors (L3)

Unit-V Introduction to Particle Physics

Discovery of cosmic rays, Latitude effect, Altitude effect, Cosmic ray showers, Classification of elementary particles, Particles and antiparticles, Fundamental particle interactions, Conservation laws of energy and momentum, Angular momentum, Parity, Baryon number, Lepton number, Isospin, Strangeness quantum number, Basics of Quark model.

Learning outcomes

Understands the different elementary particles and their antiparticles (L3)

Learns about the cosmic rays and their properties (L2)

Student learns the classification of elementary particle and their interactions (L4)

Course outcomes

9 Hours

9 Hours

30

8 Hours

10 Hours

9 Hours

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End Examination: 30 Marks

Sessional: 70 Marks

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Р С CO-1 Basic characteristics of the nucleus will be explored

CO-2.Nucleoinc configurations will be understood

CO-3.A clear insight on working mechanism of nuclear radiation detectors will be achieved CO-4.Attribute classification of particles

CO-5.Explain interaction of particles

Text Books

- 1. Introductory Nuclear Physics-Kenneth S. Krane
- 2. Nuclear Physics by D.C. Tayal, Himalaya publishing Co.,
- 3. Introduction to Nuclear Physics by Harald A. Enge
- 4. Atomic Nucleus by RD Evans

PHYS 2151 Nuclear Physics and Solid State Physics Lab

L T P C 0 0 2 1

Hours per week: 2 Credits: 1 Continuous Evaluation: 100 Marks

Course Objectives

- 1. Understand basic and valuable theoretical knowledge
- 2. Provide an overview of the fundamental applications of the physics of solids
- 3. Describe of crystal and electronic structure and lattice dynamics
- 4. Determine losses of matrials
- 5. Characterize properties of radiation

List of Experiments

- 1. Characteristics of Zener diode
- 2. Characteristics of Thermistor
- 3. Resistivity by Four Probe Method
- 4. B-H Curve
- 5. Hall effect experiment:- Determination of charge carrier density
- 6. Zener Diode as Voltage Regulator
- 7. Crystal Structure
- 8. Geiger Muller Tube
- 9. Intensity Variation of GM tube

Course Outcomes

CO-1 Experimental techniques pertinent to studies in condensed matter physics.

CO-2 Interpreting results, error analysis, writing reports, analyzing data.

CO-3 Learning more advanced physics topics, not encountered at the introductory level

CO-4 Evaluate properties of different materials

CO-5 Characterize radioactive materials

Computational methods in Physics

Hours per week: 3 Credits: 3

Course 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 solution

Unit I 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.

Learning Outcomes:

1.To understand the scope of computational methods in physics (L1).

2. To appreciate the role of visualization and curve-fitting methods (L2).

3.To outline the error assessment, and measures in analyzing the real-world problems (L3)

Unit II 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.

Learning Outcomes:

1.Write program to perform differentiation with different order of accuracies for various functions(L3)

2. Write program to perform definite integrals with different order of accuracies for various functions(L3)

3. Apply the programs for practical calculations e.g., centroid calculation for a two dimensional plane (L3)

Unit III Solution of Ordinary Differential Equations 9 Hours 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.

Learning Outcomes:

1.Understand applicability of numerical method to solve initial value and boundary value problems(L2)

2. Write programs to numerically solve ordinary differential equations arising in initial value problem(L3)

3.Write programs to numerically solve ordinary differential equations arising in boundary value problem(L3)

Unit IV 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 Nonbonded 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.

Learning Outcomes

1. Understand concept of molecular mechanics (L2)

- 2. Attribute interactions for potential energies and optimization of structures(L3)
- 3. Analyze approximate methods for solution (L4)

Unit V DFT and Plane Waves

Introduction to Electronic Structure, Independent Particle Approximation (Hartree; Hartree-Fock), Crystal

9 Hours

9 Hours

9 Hours

33

3 0 0

9 Hours

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End Examination: 30 Marks Sessional: 70 Marks

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.

Learning Outcomes:

1.Understand electronic structure of solids (L2)

2.Apply the principles of DFT to determine Band structure of solids (L3)

3. Analyze the effect of various functionals in determining the electronic structure of solids (L4)

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:<u>https://www.physics.unlv.edu/~pang/cp2.html</u>

3.Essentials of Computational Chemistry-Theories and Models 2nd ed., 2004, Christopher J Cramer, Wiley 4.Solid State Physics, 2003, Ashcroft and Mermin, Cengage Learning India Private Limited

5.Electronic Structure:Basic Theory and Practical Methods (2nd ed.), 2020, Richard M. Martin, Cambridge University Press;

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?

Course Outcomes:

CO-1 Understands the importance of programming, visualization tools, errors assessment

CO-2 Perform numerical differentiation and definite integrals for a given function with programs

CO-3 perform numerical solution of ordinary differential equations associated with initial value and boundary value problems

CO-4 Understand and apply the principles of DFT in determining the electronic structure of solids CO-5 Analyze solutions for interpretation

Computational Methods in Physics Lab

L T P C 0 0 2 1

Hours per week: 2 Credits: 1 Continuous internal Assessment: 100 Marks

Course Objectives

1. Understand programming tactics and numerical methods for its implementation

2. Analyze computational methods to specific systems or problems

3. Apply high performance methods for significance

4. Visualize properties of specific systems

5. Comparison of methods

List of Experiments

1. Determination of bandgap of Silicon and ZnO through SCF calculation (Quantum espresso) using LDA pseudopotentials

2. Determination of DOS and Band structure of Silicon (Quantum espresso) using LDA and GGA pseudopotentials

3. Comparison of band gap values of Silicon obtained using GGA and metaGGA pseudo potentials

4. Determination of centroid of an isosceles triangular shaped thin sheet using trapezoid rule, Simpson rule and Gaussian quadrature rule

5. Determination of position and velocity of a harmonic oscillator using Runge-Kutta method

6. Solution of 2D Laplace equation with relaxation method

7. Determination of the position and velocity of a particle moving in 1D under elastic force f(x)=-kx (k is constant) using predictor-corrector scheme.

8. Comparison of second order differentiation results of exp(x) at a given x using two point formula, three point formula and five point formula.

9. Plotting the function

10. Least squares method for given data

11. Exponential methods to fit a given data using polynomial

Course Outcomes

CO-1 Identify modern programming methods and describe the extent and limitations of computational methods in physics,

CO-2 Identify and describe the characteristics of various numerical methods.

CO-3 Independently program computers using leading-edge tools,

CO-4.formulate and computationally solve a selection of problems in physics

CO-5 Use the tools, methodologies, language and conventions of physics to test and communicate ideas and explanations.

Software required:

1. Quantum espresso: https://www.quantumvitas.org/download/

Gnuplot: http://www.gnuplot.info/ or any other plotting software

PHYS3121 Astronomy and Astro Physics

End Examination: 30 Marks Sessional: 70 Marks

1. To understand the celestial sphere and the coordinate system to locate the astronomical objects in space and time, and the observational mechanisms.

2. To apply gravitational laws and calculate the elliptic orbits of astronomical objects

3. To gain detailed knowledge on the planets, their physical structure and other constituents of solar system

4. To able to calculate the equilibrium configuration of a star and learn it's evolution with time

5. To develop detail understanding of a main sequence star and it's end stage

Unit I: Introduction to Astronomy and Astrophysics

History: Plato, Copernican model, Coordinates: Altitude-Azimuth Coordinate System, Equatorial Coordinate System, Distance measurement: AU, lightyear, parallax method, parsec, Time measurement: Modified Julian Date, Photometric concept, Magnitude of star: Apparent Magnitude, Absolute Magnitude, Opacity, Luminosity, Overview of electromagnetic spectrum and different types of telescopes

Learning outcomes

Hours per week: 3

Course Objectives:

Credits: 3

1. Understand celestial sphere and coordinate system system (L1)

2. Apply parallax method for distance calculation (L2)

3. Gain knowledge on the intensity of star (L1)

Unit II: Celestial mechanics

Newton's law of motion and gravitation, Equations of Motion, Kepler's law, Derivation of Kepler's law, Escape velocity, Virial theorem

Learning outcomes

1. Derive Kepler's law using Newton's gravitational law (L2)

- 2. Calculate escape velocity for various objects (L2)
- 3. Develop dynamical equations for objects moving under gravity (L2)

Unit III: Solar system

Planetary configuration, Orbit of the Earth and Visibility of the Sun, The Orbit of the Moon, Eclipses and Occultations, The Structure and Surfaces of Planets, Albedos, Overview of all planets, Minor Bodies of the Solar System, Origin of the Solar System

Learning outcomes

- 1. Learn about the constituents of solar system (L1)
- 2. Calculate albedos for various planets (L2)
- 3. Gain knowledge on the structure of different planets (L1)

Unit IV: Stellar Structure and Evolution

Internal Equilibrium Conditions, Stellar Energy Sources, Different chains and energy production mechanisms, Stellar Models, HR Diagram, Evolutionary Time Scales, Different stages of evolution, Evolution of Close **Binary Stars**

Learning outcomes

- 1. Calculate the equilibrium configuration of a star (L2)
- 2. Develop knowledge on Luminosity-Temperature variation (L1)
- 3. Gain knowledge on the energy production mechanisms of star (L1)

9Hours

9Hours

9Hours

36

9Hours

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3 0

Unit V: Structure of star

9Hours

Internal structure of Sun, Solar Atmosphere, Solar Activity, Variable Star, Brief overview of pulsating, eruptive and eclipsing variables, Compact stars: White Dwarfs, Neutron Star, Black Holes, X-ray binaries

Learning outcomes

1. Develop knowledge on solar interior and atmosphere(L1)

2. Develop knowledge solar activities and coronal mass ejections (L1)

3. Understand compact stars (L1)

Text Books

1. Astrophysics for Physicists (2010), Arnab Rai Choudhuri, Cambridge University Press

2. An Introduction to Modern Astrophysics (second edition 2014), Bradley Carroll and Dale Ostlie, Pearson New International Edition

3. Introductory Astronomy and Astrophysics (Fourth edition), Michael Zeilik and Stephen A. Gregory, Thomson Learning

Link:

https://nptel.ac.in/courses/115/105/115105046/

Course Outcomes:

CO-1: Ability to understand the astronomical measurement systems and calculate the distance using parallax method

CO-2: Understand an object's motion in gravitational field of another object

CO-3: Understand the solar system: the planets, satellites and other minor objects

CO-4: Understand the evolutionary phase of stellar structure

CO-5: Develop understanding of main sequence stars and their end states

Mathematical Method and Analysis with Simulation

L T P C 3 0 0 3

Hours per week: 3

Credits: 3

End Examination: 30 Marks

Sessionals: 70 Marks

Course Objectives:

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

UNIT -I Introduction to MATLAB

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.

Learning Outcomes

To recall the MATLAB syntax for arithmetic operations (L1).

To use MATLAB to write mathematical expressions and equations(L1)

To implement MATLAB syntax to perform matrix operations, differentiation, and integration (L3)

UNIT -II Graphics and handling files with MATLAB

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), $y=x^2$. 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.

Learning Outcomes

To exemplify 2d and 3D plotting with MATLAB (L2).

To understand the usage of conditional statements and loops in MATLAB(L2) To practise file handling in MATLAB(L3)

UNIT- III Laplace and Fourier Transforms using MATLAB.

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.

Learning Outcomes

To use laplace and ilaplace functions of MATLAB (L2) To find fourier and inverse fourier transforms using MATLAB. (L2) To understand the usage of built-in MATLAB function to carryout DFT and FFT(L2)

UNIT- IV DC Circuit Analysis using MATLAB

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.

Learning Outcomes

To use MATLAB to find parallel & series combination of Resisters and Capacitors (L1).

To visualize the transient response of RC, RL, RLC circuits (L3)

To perform nodal analysis and loop analysis using MATLAB (L3)

38

UNIT-V Mathematical Application

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.

Learning Outcomes

To solve algebraic equations in matrix method (L2). To explore differential equations using ode function (L2) To perform curve fitting methods(L3)

Course Outcomes: After finishing the course, the student will be able to

Demonstrate arithmetic operations and matrix operations in MATLAB(L3). Visualize basic 2D and 3D plots, and handle csv, excel files in MATLAB (L2). Compute the Laplace, Fourier transforms and their inverse transforms (L2) Perform basic circuit analysis using MATLAB (L3). Write MATLAB codes to perform curve fitting, and solve algebraic and differential equations (L2)

Text Books:

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

ENVIRONMENTAL PHYSICS

Hours per week: 3 Credits: 3 L T P C 3 0 0 3 End Examination: 30 Sessionals: 70 Marks

Course Introduction: 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

Objective:

- 1. To understand the basic concepts of thermodynamics of the atmosphere, and human thermal environments
- 2. To comprehend the radiation coming 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-I

Physics of the Atmosphere: 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.

LO-1: To outline the scope of environmental physics (L2).

LO-2: To apply the basic thermodynamics to understand the dynamics of the atmosphere (L2)

LO-3: To understand the human thermal environment(L1)

Unit-II

Environment and Radiation

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

LO-1: To understand the Earth's radiation budget (L1).

LO-2: To introduce cosmic radiation and production of cosmogenic radionuclides (L1)

LO-3: To understand the biological effects of radiation and waste management of radioactive elements (L2)

Unit-III

Elements of Hydrologic cycle and underlying Physics:

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).

LO-1: To outline the physics of clouds and Earth's hydrosphere (L2).

LO-2: To understand the nature of soils in connection with the hydrological cycle (L1)

LO-3: To introduce the concepts of soil pollution and water pollution (L1)

Unit-IV

Elements of Weather, climate and underlying Physics:

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.

LO-1: To outline the basics of weather and climate (L2).

LO-2: To understand the horizontal motion of air in the atmosphere and relevant topics (L2)

LO-3: To study the adverse effects of environmental pollution and the future concerns (L1)

Unit-V

Energy for living:

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.

LO-1: To outline the various methods and means of power generation (L1).

LO-2: To understand the future concerns of energy demand and side effects of power plants (L1)

LO-3: To know the earth's ecosystem dynamics (L1)

Course Outcomes: After finishing the course, the student will be able to

CO-1: interpret the role of the concepts of heat and thermodynamics in connection with the atmosphere, and human being (L3).

CO-2: understand the earth's radiation budget, its elements and interconnection (L2).

CO-3: familiarize with water cycle of Earth's environment, and pollution of water and soil(L1)

CO-4: articulate the physics of elements of hydrological cycle; water pollution, soil pollution, and their concerns (L1).

CO-5: to identify the future concerns of energy crisis and understand underlying science (L1)

Text Books:

- 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. Dželalija
- 4. Introduction to Environmental Soil Physics by Daniel Hillel

Reference Books:

- 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

Online resource:

https://aapt.scitation.org/doi/10.1119/1.5094745 https://physicsworld.com/c/environment-energy/ **Biosensors**

Т Р С L 0 3 3 0

End Examination: 30 Marks Sessional: 70 Marks

Credits: 3 **Course Objectives:**

Hours per week: 3

1.Learn about the standard structure of Biosensor

2.Use mathematical methods of biosensors.

3.Use circuit analysis models for the Biosensors.

4. The conceptual study on Bio-sensing elements.

5. Familiarize with the advancements in the designing of biosensor for various applications

Unit-I Introduction

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

Learning outcomes:

1. Able to understand the importance of biosensor(L2)

2. To know the structure of the biosensor(L2)

3.Attrinute components of sensor (L3)

Unit-II 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.

Learning outcomes:

1. Able to know importance of surface roughness of a biosensor(L3)

2.To understand the significance of SEM and TEM analysis(L2)

3.Characterize the techniques (L3)

Unit-III Transducers and Biosensors

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

Learning outcomes:

1.To understand the working of transducer(L2)

2. To know the various types of the biosensors(L3)

3. Classify transducers (L3)

Unit-IV Applications of Biosensors

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

Learning outcomes:

1.To know the various fields of applications of biosensors(L2)

2. To realize the importance of biosensor in Health diagnosis.(L3)

3.Importance of in specific treatments(L4)

Unit-V 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.

Learning outcomes:

1. Able to understand the implementation of Nanotechnology(L3)

2.To know emerging technology issues(L2)

3. Analyze the role of nano materials in technology (L4)

Text Books:

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 ZviLiron; Publisher:

7 hours

8 hour

7 hour

8 hours

10 hours

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

PHYS2121 Solid State Physics

Hours per week: 3 Credits: 3

Course Objectives

1 will enable the student to employ classical and quantum mechanical theories needed to.

- 2 Understand the physical properties of solids
- 3 Emphasis is put on building models able to explain several different phenomena in the solid state.
- 4. Analyze various properties of magnetic materials

5. Understand materials related to present day technologies

Unit I **Crystallography:**

Classification of solids, fundamental concepts of crystals, lattice points and space lattice, crystal systems, Bravais lattices, directions, planes, and Miller indices, atomic packing fraction, the structure of simple cubic, body-centered cubic (CsCl), face-centered cubic (NaCl), hexagonal closed packed (HCP), diamond structure, X-ray diffraction, Bragg's law.

Learning Outcomes

1. Understand various properties of crystals (L2)

2. Classify various types of solids (L3)

3. Draw different crystal structures(L4)

Unit II Dielectric Properties:

Introduction, fundamental definitions, local field, Clausius-Mossotti relation, different types of electric polarization, electronic, ionic, and dipolar polarization (qualitative), dielectric loss, dielectric breakdown, piezoelectricity and ferroelectricity, spontaneous polarization in BaTiO3, applications of dielectrics and ferroelectrics.

Learning Outcomes

- 1. Understand properties of dielectric materials (L2)
- 2. Classify various types of polarization (L3)
- 3. Interpret certain specific magnetic materials for their phenomena(L4)

Unit III Magnetic Properties:

Introduction, fundamental definitions, classification of magnetic materials, Weiss theory of ferromagnetism, domain theory of ferromagnetism, hysteresis, soft and hard magnetic materials, eddy current losses, ferrites (structure and magnetic properties), Applications: transformer cores, magnetostrictive sensors, data storage.

Learning Outcomes

- 1. Understand various magnetic materials (L2)
- 2. Analyze its various types for roperties (L4)
- 3. Apply to specific applications(L4)

Unit IV Superconductors:

Introduction, Superconducting phenomenon- Occurrence, BCS theory (qualitative), Meissner Effect, The magnetic penetration length, the thermodynamic critical magnetic field of a superconductor, Type I and Type II superconductors, Josephson effects (qualitative), High-temperature superconductors, Applications of Superconductivity.

Learning Outcomes

- 1. Understand superconductors (L2)
- 2. Classify various types of semiconductors (L3)
- 3. Application to technologies (L4)

Unit V Nanomaterials

Introduction, nanoparticles, metal nanoclusters, semiconductor nanoparticles, carbon clusters, carbon nanotubes, quantum nanostructures-Applications of nanomaterials.

Learning Outcomes

1. Understand various nano materials (L2)

2. Classify types of nanomaterials (L3)

8 hours

9 hours

9 hours

9 hours

44



3 0 $\mathbf{0}$ 3 End Examination: 30 Marks

10 hours

Sessional: 70 Marks

3. Applications to nanomaterials to technologies(L4)

Course outcomes

CO-1 Explain properties of solid matter and connect these to crystals

CO-2 Interpret polarization phenomena in dielectrics

CO-3 Know the basic physics behind dia, para and ferromagnetism.

CO-4 Know what superconductivity is and qualitatively relate it to lattice vibrations and the density of state

CO-5 Understand various naanomaterials for applications

Text Book(s)

- 1. Elements of Solid-State Physics, J.P. Srivastava, Prentice Hall of India Pvt., Ltd.
- 2. Modern Physics, R. Murugeshan and Kiruthiga Siva Prasath, S. Chand& Co.
- 3. Unified Physics, Vol.4. Modern Physics, S.L. Gupta & Sanjeev Gupta, Jai Prakash Nath & Co. Meerut.

4. M.N.Avadhanulu, P.G. Kshirsagar, A Textbook of Engineering Physics, S. Chand, 2014

References

- 1. Simon M. Sze, Kwok K. Ng, Physics of Semiconductor Devices, 3/e, John Wiley, 2006.
- 2. S. O. Pillai, Solid State Physics, 7/e, New Age International, 2014
- 3. B.G. Streetman, S. Banerjee, Solid State Electronic Devices, 6/e, PHI 2006
- 4. P. K. Palanisamy, Applied Physics, SciTech Publications, 2009.
- 5. Marius Grundmann, The Physics of Semiconductors, 2/e, Springer, 2010.

PHYS2141 Physics of Nano Materials

P C Т L 3 0 0 3

End Examination: 30 Marks

Sessional: 70 Marks

Hours per week: 3

Credits: 3

Course Objectives:

1.Foundational knowledge of Nanoscience and related fields.

2. To make students understand the influence of dimensionality of the object at nanoscale on their properties 3.Understand the microstructural changes that arise at nanoscale

4.Understand the synthesis of nanomaterials

5.Know their future applications in industry.

Unit I Nanotechnology:

Introduction, significance of nanotechnology, finite size effects and properties; classification of nanostructure materials, challenges and future prospects.

Learning Outcomes:

1.Understand the significance of nanomaterials and nanotechnology (L2)

2.Relate the properties of nanomaterials to their size and shape (L3)

3.Know the applications of nanotechnology (L1)

Unit II Properties of Nanomaterials:

Microstructure and defects in nanomaterials, dislocations, twins, stacking faults and voids, grain boundaries, effect of nano-dimension on material behaviour, mechanical properties, melting point, diffusivity, grain growth characteristics, solubility, magnetic, electrical and thermal properties of nanomaterials.

Learning Outcomes:

1.understand the microstructure of materials (L2)

2.Relate the defects arising in nanomaterials to their size (L3)

3. Apply the changes in microstructural changes to properties of nanomaterials (L3)

Unit III Growth Techniques in Nanomaterials:

Introduction, top down and bottom up approaches, lithographic process, Laser ablation, nonlithographic processes plasma arc discharge, Thermal evaporation, Sputtering, chemical vapor deposition, sol-gel technique, electrodeposition.

Learning Outcomes:

1.Understand top-down and bottom-up approaches of synthesis of nanomaterials (L2)

2.Understand physical methods of nanoparticle synthesis (L2)

3.Understand chemical methods of nanoparticle synthesis (L2)

Unit IV Characterization techniques of Nanomaterials:

X-ray diffraction, small angle X-ray scattering, scanning electron microscopy with EDS, transmission electron microscope, scanning tunneling microscope, Atomic force microscopy, Raman spectroscopy, UV-Vis absorption spectrometer, Photoluminescence spectroscopy.

Learning Outcomes:

1. Apply X-ray diffraction to study the crystal structure (L3)

2.Determine grain size and particle size using SEM and TEM (L3)

3.Understand the molecular, surface and optical properties (L2)

Unit V Application of Nanomaterials:

Sectors influenced by nanomaterials- health (drug delivery agents), communication, energy, environment, safety, security and defence, nanophotonic devices, nanosensors (bio-sensors), Quantum dots, MEMS & NEMS.

Learning Outcomes:

1.Understand areas in which nanomaterials are used (L2)

2.Understand the required safety measures to be taken while using nanomaterials (L2)

3.Know the advanced application of nanomaterials (L1)

Course Outcomes:

CO-1Understand the influence of dimensionality of the object at nanoscale on their properties CO-2Relate the structural changes to the size and shape of nanoparticles

9 hours

12 hours

8 hours

6 hours

10 hours

CO-3Synthesize nanomaterials using various methods

CO-4 Use various characterization techniques to study the nanomaterials

CO-5 Understand the careful application of nanomaterials

Textbook(s)

1.P.P. Charles, J.O. Frank Introduction to Nanotechnology, Wiley InterScience, 2003.

2.K.K Chattopadhyay, and A.N Banerjee, Introduction to Nanoscience and Nanotechnology, PHI, 2011. **References**

1.L.W. Edward, Nanophysics and Nanotechnology, An Introduction to Modern Concepts in Nanoscience, 2/e, Wiley – VCH, 2006

2.C. Guozhong, Ying Wang, Nanostructures and Nanomaterials: Synthesis, Properties, and Applications, 2/e. 3.Mitin, V., Sementsov, D., & Vagidov, N. (2010). Quantum Mechanics for Nanostructures. Cambridge: Cambridge University Press. doi:10.1017/CBO9780511845161

Materials Science

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End Examination: 30 Marks Sessional: 70 Marks

Course Objectives 1. Give basic knowledge of science behind materials

- 2. Introduce the concept of structure property relations.
- 3. Provide methods for characterization
- 4. Understand studies in fields such as solid-state physics and mechanical behaviour of materials
- 5. Analyze phase & phase diagram, heat treatment, failure of materials and its applications

Unit I

10 hours

Crystallography: Forces between atoms, bonding in solids ionic, covalent and metallic bonding; Fundamental concepts of crystals, lattice points and space lattice, crystal systems, Bravais lattices, directions, planes and Miller indices, atomic packing fraction, structure of simple cubic, body centered cubic (CsCl), face centered cubic (NaCl), hexagonal closed packed (HCP), diamond structure.

Learning outcomes

Hours per week: 3

Credits: 3

- 1. Define structure of crystals (L1)
- 2. Classify its types for analysis (L4)
- 3. Explain related properties (L3).

Unit II

Characterization Techniques: Xray diffraction, Bragg's law, powder X ray diffractometer construction and working, crystalline phase analysis; transmission electron microscopy construction and working; scanning electron microscopy construction and working; atomic force microscopy construction and working, scanning tunneling microscope construction and working.

Learning outcomes

- 1. Understand specific laws to relevant techniques (L2)
- 2. Classify types of characterization methods (L4)
- 3. Predict atomistic properties (L5).

Unit III

Crystal Imperfections: Point defects vacancies, impurities, Frankel defect, Schottkey defects; linear defectsedge and screw dislocation; surface and grain boundary defect-grain boundaries, tilt boundaries, twin boundaries, stacking faults.

Learning outcomes

- 1. Understand imperfections in crystals (L2)
- 2. Categorize various types of defects (L4)
- 3. Discriminate these defects (L5).

Unit-IV

Mechanical Behavior: Elastic behavior of metals, atomic model of elastic behavior; plastic deformationstress-strain curve, plastic deformation by slip; ductile and brittle materials, tensile strength, hardness, fatigue; creep-mechanism of creep, creep resistant materials; fracture types of fracture (elementary concepts only)ductile fracture, brittle fracture.

Learning outcomes

- 1. Understand specific laws to relevant techniques (L2)
- 2. Classify its types of characterization methods (L4)
- 3. Predict atomistic properties (L5).

Unit V

10 hours

Diffusion and phase transformation in solids: Classification of diffusion; diffusion mechanisms-Vacancy mechanism, interstitial mechanism, direct interchange mechanism; Fick'slaws of diffusion; factors effecting the diffusion coefficient-self diffusion, inter diffusion, diffusion couple.

Mechanism of phase transformation, homogeneous nucleation, heterogeneous nucleation, nucleation and

8 hours

8 hours

9 hours

growth.

Learning outcomes

- 1. Understand diffusion and phases (L2)
- 2. Implement various mechanisms during phase transformation (L3)
- 3. Determine related parameters during these processes (L5).

Text Books

1.V. Raghavan, Materials Science and Engineering: A First Course PHI publishing, 2007 2.G.K.Narula, K.S.Narula and V.K.Gupta, Materials Science: Tata-McGraw Hill,2011

Reference Books

1.S.O.Pillai, Solid State Physics, New Age International, 2008.

2.M. Arumugam, Materials Science, Anuradha Agencies, Kumbhakonam, 2007.

3.Callister's Materials science and engineering (adapted by R.Subramaniam), Willey India, 2013.

Course outcomes

CO-1. Analyze the Structure of materials at different levels

CO-2.Experimental methods for determination of properties of materials

CO-3.Understand and categorize defects in crystals

CO-4 Understand concept of mechanical behavior of materials and calculations

CO-5 Explain the concept of phase & phase diagram & understand the basic terminologies

PHYS3131 Essentials of Biophysics

Hours per week: 3 Credits: 3

Course Objective

1.To understand and interpret radiation and its effects on biological materials.

2. To identify diffusion related phenomena and biophysical properties in biological systems.

3.To understand different types of light and electron microscopes.

4. To understand different spectroscopic techniques and laser theory.

5.To understand and interpret XRD and XAFS spectra.

Unit I Radiation Biology:

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.

Learning Outcomes

1.To understand Natural and Artificial radioactivity(L2).

2.To interpret units, half-life time of radioactivity(L3).

3. To learn about different measurement techniques of radioactivity(L2)

Unit- II Transport process:

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. Hemodynamics: Rheologybiophysical properties of plasma, viscosity of blood, comparison of Newtonian and Non-Newtonian fluids and dielectric constant.

Learning Outcomes

1.To understand diffusion laws in biological fluids(L2).

- 2. Analyze ph measurement and centrifugation techniques(L4).
- 3.To compare Newtonian and non-newtonian fluids.(L4)

Unit III Microscopy in biology and Medicine:

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.

Learning Outcomes

1.To learn the design of different light and electron microscopes(L4)

2. To understand the working principles of light and electron microscopes.(L2)

3. To understand the ultrasound and its effects on biological elements(L2).

Unit – IV Spectroscopic studies in biology:

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.

Learning Outcomes

1.To understand the light spectroscopic technique(L2)

2. To understand the concepts of laser and its working principles(L3)

3.To learn about different vibration in molecules and interpretation of IR spectra(L4)

Unit- V Advanced Spectroscopic Techniques:

Atomic spectroscopy-Atomic absorption spectroscopy and double beam atomic absorption spectroscopy-ray spectroscopyAbsorption spectroscopy, diffraction spectroscopy, transmission photographic method, X_0 ray ionization spectrometer, rotating crystal spectrometer and powder crystal diffraction spectrometer. Learning Outcomes

9 Hours

9 Hours

9 Hours

9 Hours

9 Hours

L T P C

3 0 0 3 End Examination: 30 Marks

Sessional: 70 Marks

1.To understand the atomic absorption spectroscopy(L2)

2. To get acquainted with the different approaches of X-ray diffraction techniques.(L3)

3.To learn about the XRD spectra and its interpretation(L4).

Recommended Books

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

Course Outcomes

CO-1: Understanding of nuclear radiation, its measurement and effects of samples

CO-2: To analyze diffusion related processes in biological fluids and blood.

CO-3: To attribute different light and electron microscopes.

CO-4: Analyze spectroscopic techniques and their usage

CO-5: Understand the different absorption spectroscopy and diffraction techniques.