4 Year B.Sc. HONOURS in PHYSICS/ B.Sc. HONOURS in PHYSICS with RESEARCH: Curriculum and Syllabi

In accordance with the
NATIONAL EDUCATIONAL POLICY (NEP-2020)

DEPARTMENT OF PHYSICS,
AMRITA SCHOOL OF PHYSICAL SCIENCES,
AMRITA VISHWA VIDYAPEETHAM, COIMBATORE, TAMIL NADU
MARCH 2025

1. Program Outcomes (POs)

A student completing the 4-year **B.Sc. Honours** and **B.Sc. Honours with Research** is expected to acquire the following skills:

i. **Disciplinary knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of the current program.

ii. **Problem-solving skills:** Develop problem-solving skills in familiar and non-familiar contexts and apply one's learning to real-life situations.

iii. **Critical and Analytical thinking:** Inculcate critical and analytical thinking to analyze and evaluate the reliability and relevance of evidence, scientific arguments, draw valid conclusions, and support them with examples.

iv. **Scientific reasoning and Research-related skills:** Ability to apply scientific reasoning in designing research-related problems, analyze, interpret, and draw conclusions from quantitative/qualitative data. Critically evaluate ideas, evidence, and report the results of an experiment or investigation.

v. **Communication Skills and Team work:** Develop the individual ability to express thoughts and ideas effectively in writing and orally; and also to communicate with members of diverse teams to work effectively and respectfully.

vi. **Moral and ethical awareness:** Capable of recognizing ethical issues, understanding intellectual property rights, promoting ethical practices in all tasks, and considering environmental and sustainability concerns.

vii. **Lifelong learning:** Ability to acquire knowledge and skills, including self-directed learning, for lifelong learning, personal development, and adapting to evolving workplace demands through continuous skill development and reskilling to meet economic, social, and cultural goals.

2. Program Specific Outcome (PSOs):

A student completing the 4-year **B.Sc. (Honours)/ (Honours with Research)** in **Physics** is expected to acquire the following skills:

i. Demonstrate comprehensive knowledge of *fundamental physics concepts*, *principles*, and *processes* across subfields (classical mechanics, electromagnetism, quantum mechanics, thermodynamics, etc.), and their connections to related disciplines.

ii. Plan and *conduct physics experiments*, *analyze data* using appropriate methods and software (e.g., programming languages), and *accurately report findings* while linking conclusions to relevant physics theories.

iii. Impart *essential skills in physics to become professionals* engaged in research and development, teaching, and other relevant sectors.

3. Categorization of Courses

Definition of the categories of Courses:

1. Major Courses: (Listed in Appendix I)

   All courses offered by the Dept. of Physics that are of 4 credits and must be taken by the student majoring in Honours in Physics/with Research with the requisite criterial that 50% of the total credits must be accrued from these.

   One major course is classified as, "Major special course" in the 8th semester which will be of 4 credits, but a student will be permitted to choose this major course depending on their interest, either from theoretical/experimental physics or on a specific area in Physics that will help the student to gain expertise in his/her research project. NPTEL courses may also be taken up, provided they are relevant to the discipline (Physics).

2. Minor Courses: (Listed in Appendix II-A, II-B)
   i. Courses that support the major courses in Physics and offered by departments of Chemistry and Mathematics (3 credits), *and*,
   ii. A number of specialized courses that are offered by the dept of Physics of 3 credits only. Some of these courses *may require prerequisites from other minor courses*. A choice is thus provided to the student to choose their minor course if it requires some pre-requisites. These courses are also marked as "Core Elective's in the curriculum layout.
3. Skill Enhancement courses (SEC): (Listed in Appendix III)
   i. Practical courses (1 credit)
   ii. Programming courses (1 credit)
   iii. Internships & Project/Dissertation
4. Multi/Inter-disciplinary Courses (MDC/IDC): (Listed in Appendix IV)
   a. Courses on AI, ML
   b. Courses from other departments including Mass Communication etc.
5. Ability Enhancement Courses (AEC): (Listed in Appendix V)
   a. Courses aimed at improving communication skills in a language (including English)
   b. Courses whose components are group discussions, interviews, presentations, debates and professional grooming.
6. Value Adding Courses (VAC): (Listed in Appendix VI)
   Courses offered by any department in the University, related to:
   a. Indian Heritage
   b. Indian Knowledge System
   c. Environmental awareness

4. Course layout/ Curriculum structure:

CURRICULUM

B. Sc. Honours in Physics/ B.Sc. Honours in Physics with Research

Course Code	Course Title	L T P	Cr		Course Code	Course Title	L T P	Cr	
SEMESTER 1					**SEMESTER 2**				
25PHY103	Mechanics	3 1 0	4	Major1	25PHY113	Basics of Electricity and Magnetism	3 1 0	4	Major2
25MAT107	Matrix Algebra & Calculus	2 1 0	3	Minor1	25PHY114	Analog Electronics	3 1 0	4	Major 3
25CHY104	General Chemistry	2 1 0	3	Minor2	25MAT113	Differential Calculus	2 1 0	3	Minor 3
25CHY184	Chemistry Lab	0 0 2	1	SEC 1	25CHY115	Principles of Physical Chemistry	2 1 0	3	Minor 4
25CSA102	Computer Aided Drafting	1 0 1	1	SEC 2	25PHY183	Physics Lab I – Mechanics, Electricity &	0 0 2	1	SEC3
	Open Elective I	3 0 0	3	MDC	25PHY190 *	Open Elective II/ Live in Lab*	3 0 0	3	MDC
	Modern Indian Language	2 0 0	2	AEC	24ENG101	English I	2 0 0	2	AEC
22ADM101	Foundations of Indian	2 0 1	2	VAC	22ADM111	Glimpses of Glorious	2 0 1	2	VAC
22AVP103	Mastery Over Mind	1 0 2	2	VAC					
TOTAL			**2**		**TOTAL**			**22**	
SEMESTER 3					**SEMESTER 4**				
25PHY202	Electricity and Magnetism in Matter	3 1 0	4	Major 4	25PHY212	Waves & Oscillations	3 1 0	4	Major 7
25PHY203	Basic Experimental Techniques	3 1 0	4	Major 5	25PHY213	Modern Physics	3 1 0	4	Major 8
25PHY204	Introduction to Mathematical Physics	3 1 0	4	Major 6	25CSA215	Introduction to Computational methods	2 1 0	3	Minor 6
25CSA205	Introduction to Scientific Computing Using Python	2 0 1	3	Minor 5	25PHY214	Applied Electronics	2 1 0	3	Minor 7
25PHY281	Physics Lab II - Electronics	0 0 2	1	SEC	25PHY282	Physics Lab III-Modern	0 0 2	1	SEC 6
25CSA285	Programming Lab 1	0 0 2	1	SEC 5	25PHY290	Research Internship	0 0 4	2	SEC 7
25PHY241	Professional elective – Machine Learning	3 0 0	3	MDC	23LSK211	Life Skills II	1 0 2	2	AEC
23LSK201	Life skills I	1 0 2	2	AEC		Amrita Value Programme	1 0 0	1	VAC
	Amrita Value Programme I	1 0 0	1	VAC	24ENV200	Environmental Science	3 1 0	4	VAC
24ENG111	English II	1 0 2	2	AEC					
TOTAL			**2**		**TOTAL**			**24**	
SEMESTER 5					**SEMESTER 6**				
25PHY302	Intermediate Mechanics	3 1 0	4	Major 9	25PHY312	Basics of Quantum Mechanics	3 1 0	4	Major 13
25PHY303	Mathematical Physics I	3 1 0	4	Major	25PHY313	Solid State Physics	3 1 0	4	Major
25PHY304	Thermodynamics	3 1 0	4	Major	25PHY314	Classical Mechanics	3 1 0	4	Major
25PHY305	Optics	3 1 0	4	Major	25PHY315	Statistical Mechanics	3 0 1	4	Major
Minor 8	Core Elective I	3 0 0	3	Minor 8	Minor 9	Core Elective II	3 0 0	3	Minor 9
25PHY383	Physics Lab IV – Solid State & Thermal lab	0 0 2	1	SEC 8	25PHY384	Physics Lab V-Optics	0 0 3	1	SEC 9
23LSK301	Life Skills III	1 0 2	2	AEC					
TOTAL			**22**		**TOTAL**			**20**	

					TOTAL (for B.Sc. Exit-option)			**134**	
SEMESTER 7					**SEMESTER 8**				
25PHY401	Quantum Mechanics	3 1 0	4	Maj	**B.Sc. Honours**				
25PHY402	Atomic and Molecular	3 1 0	4	Maj	25PHY411	Condensed Matter Physics		4	Major
25PHY403	Mathematical Physics II	3 1 0	4	Maj	25PHY412	Advanced Experimental		4	Major
25PHY404	Electrodynamics	3 1 0	4	Maj		Major Special Course		4	Major
25PHY405	Nuclear and Particle	3 1 0	4	Maj		Core Elective IV		3	Minor
	Core elective III	3 0 0	3	Min	25PHY498	Minor Project		7	SEC
	TOTAL	**23**				**TOTAL**		**22**	
					B.Sc. Honours with Research				
						Major Special Course		4	Major
						Core Elective IV		3	Minor
					25PHY499	Dissertation		15	SEC
					TOTAL			**22**	
					TOTAL (For B.Sc. Honours & B.Sc. Honours with Research)			**179**	

¶ Students can exit after securing the requisite credentials at this semester with a B.Sc. Physics degree.

1. Cumulative Credit Table:

Semester	Credits								
	Major	Minor	MDC	SEC	AEC	VAC	PRO/SEC	INT	**Total Credits**
I	4	6	3	2	2	4			21
II	8	6	3	1	2	2			22
III	12	3	3	2	4	1			25
IV	8	6	-	(2)+1	2	5		(2)	24
V	16	3	-	1	2	-			22
VI	16	3	-	1	-	-			20
B.Sc Exit¶	64	27	9	10	12	12			**134**
VII	20	3	-	-	-	-			23
VIII*	4/12	3/3	-	-	-	-	15/7		22
Total Credits$	88/96	33/33	9/9	10/10	12/12	12/12	15/7		**179/179**
Min. Credits Mandated for B.Sc Honours	**89** (50% of total and min. 80)	**32**	**9**	**9**	**8**	**6-8**	**12**	**2**	**160**

¶Mandated credits for exiting at the 6th semester, as per NEP is 120 credits.

*Students with ≥75% upto VI sem will be eligible for **B.Sc. Honours by Research (XX/--)** and <75% will be eligible for **B.Sc. Honours (--/XX).**

$ B.Sc. Honours by Research / B.Sc. Honours

PRO==Project; INT== Internship

5. APPENDICES

APPENDIX I: List of Major Courses Offered by Dept. of Physics

Major No.	Course Code	Course	Level
1	25PHY103	Mechanics	100
2	25PHY113	Basics of Electricity and Magnetism	100
3	25PHY114	Analog Electronics	100
4	25PHY202	Electricity and Magnetism in Matter	100
5	25PHY203	Basic Experimental Techniques	200
6	25PHY204	Introduction to Mathematical Physics	200
7	25PHY212	Waves & Oscillations	200
8	25PHY213	Modern Physics	200
9	25PHY302	Intermediate Mechanics	300
10	25PHY303	Mathematical Physics I	300
11	25PHY304	Thermodynamics	300
12	25PHY305	Optics	200
13	25PHY312	Basics of Quantum Mechanics	300
14	25PHY313	Solid State Physics	300
15	25PHY314	Classical Mechanics	300
16	25PHY315	Statistical Mechanics	300
17	25PHY401	Quantum Mechanics	300
18	25PHY402	Atomic and Molecular Spectroscopy	300
19	25PHY403	Mathematical Physics II	300
20	25PHY404	Electrodynamics	300
21	25PHY405	Nuclear and Particle Physics	300
22	25PHY411	Condensed Matter Physics	300
23	25PHY412	Advanced Experimental Techniques	300
24		Special Course/Online Course (Any one of)	300
	25PHY431	Compact Stars	
	25PHY432	Nanostructures: Theory and Applications	
	25PHY433	Thermodynamics of materials	
	25PHY434	Optoelectronics	

APPENDIX II-A: List of Minor Courses Offered by Depts. of Chemistry/Maths that can be taken by a student

Minor No.		Course	Level
1	25MAT107	Matrix Algebra and Calculus	100
2	25MAT 113	Differential Calculus	100
3	25CHY115	Principles of Physical Chemistry	100
4	25CHY104	General Chemistry	100
5	25CSA205	Introduction to Scientific Computing Using Python	100
6	25CSA215	Introduction to computational methods	>200

APPENDIX II-B: List of Minor (3-credit) Courses Offered by Dept. of Physics that can be taken by a student/ Core Electives

	Minor No.	Course	Level
25PHY214	7	Applied Electronics	200
	The Core Electives		
	Core Elective I		
25PHY341	Minor 8 (Any of)	Astronomy and Astrophysics	>200 (Intermediate Level)
25PHY342		Introduction to Radiation Physics	200
25PHY343		Physics of Semiconductors	200
25PHY344		Physics of Nanomaterials	200
	Core Elective II		
25PHY351	Minor 9	Nonlinear Dynamics	200
25PHY352		Advanced Classical Dynamics	200
25PHY353		Electrochemical Energy Storage Systems	200
25PHY354		Sustainable Physics: Principles and Applications	200
	Core Elective III		
25PHY441	Minor 10	Special Theory of Relativity	300
25PHY442		Fundamentals of Quantum Computation & Information	300
25PHY443		Thin Film Technology	300
25PHY444		Advanced Solar Cell Fabrication	300
	Core Elective IV		
25PHY451	Minor 11	Introduction to General Theory of Relativity	300
25PHY452		Physics of Radiation Therapy	300
25PHY453		X-Ray & Electron Diffraction Techniques	300
25PHY454		Micro and Nano Magnetism Materials and its Applications	300

APPENDIX III: Skill Enhancement Courses

SEC No.		Course
1	25CHY184	Chemistry Lab
2	25CSA102	Computer Aided Drafting
3	25PHY183	Physics Lab I – Mechanics, Electricity & Magnetism
4	25PHY281	Physics Lab II - Electronics
5	25CSA285	Programming Lab 1
6	25PHY282	Physics Lab III-Modern Physics lab
7	25PHY290	Research Internship
8	25PHY383	Physics Lab IV – Solid State & Thermal lab
9	25PHY384	Physics Lab V-Optics
10	25PHY499	Dissertation
11	25PHY498	Minor Project

APPENDIX IV: Multi/Inter-disciplinary Courses (MDC/IDC)

MDC No.		Course
1		Open Elective I
2	25PHY190*	Open Elective II/Live in Lab*
3	25PHY241	Professional elective == Machine Learning

APPENDIX V: Ability Enhancement Courses (AEC)

AEC No.		Course
1		Modern Indian Language
2	24ENG101	English I
3	24ENG111	English II
4	23LSK201	Life Skills I
5	23LSK211	Life Skills II
6	23LSK301	Life Skills III

MODERN INDIAN LANGUAGES (MIL)											
24MAL101	Malayalam I	2 0 0	2			24MAL111	Malayalam II	2 0 0	2		
24HIN101	Hindi I	2 0 0	2			24HIN111	Hindi II	2 0 0	2		
24KAN101	Kannada I	2 0 0	2			24KAN111	Kannada II	2 0 0	2		
24SAN101	Sankrit I	2 0 0	2			24SAN111	Sanskrit II	2 0 0	2		
24TAM101	Tamil I	2 0 0	2			24TAM111	Tamil II	2 0 0	2		

APPENDIX VI: Value Adding Courses (VAC)

VAC No.		Course
1	22AVP103	Mastery Over Mind (MAOM)
2	22ADM101	Foundations of Indian Heritage
3	22ADM111	Glimpses of Glorious India
4		Amrita Value Programme I
5		Amrita Value Programme II
6	24ENV200	Environmental Science and Sustainability

AMRITA VALUE PROGRAMMES FOR UG PROGRAMMES I & II			
22ADM201	Strategic Lessons from Mahabharata	1-0-0	1
22ADM211	Leadership from Ramayana	1-0-0	1
22AVP210	Kerala Mural Art and Painting	1-0-0	1
22AVP201	Amma's Life and Message to the modern world	1-0-0	1
22AVP204	Lessons from the Upanishads	1-0-0	1
22AVP205	Message of the Bhagavad Gita	1-0-0	1
22AVP206	Life and Message of Swami Vivekananda	1-0-0	1
22AVP207	Life and Teachings of Spiritual Masters of India	1-0-0	1
22AVP208	Insights into Indian Arts and Literature	1-0-0	1
22AVP213	Traditional Fine Arts of India	1-0-0	1
22AVP214	Principles of Worship in India	1-0-0	1
22AVP215	Temple Mural Arts in Kerala	1-0-0	1
22AVP218	Insights into Indian Classical Music	1-0-0	1
22AVP219	Insights into Traditional Indian Painting	1-0-0	1
22AVP220	Insights into Indian Classical Dance	1-0-0	1
22AVP221	Indian Martial Arts and Self Defence	1-0-0	1
22AVP209	Yoga and Meditation	1-0-0	1

List of Open Electives (MDC 1 and MDC 2) including both Humanities, Engineering and Management electives:

Open Electives from Engg and Management (Common to B.Tech electives also)			
Course Code	**Course Title**	**L-T-P**	**Cr**
23MNG331	Financial Management	3 0 0	3
23MNG332	Supply Chain Management	3 0 0	3
23MNG333	Marketing Management	3 0 0	3
23MNG334	Project Management	3 0 0	3
23MNG335	Enterprise Management	3 0 0	3
23MNG336	Operations Research	3 0 0	3
23MEE321	Industrial Engineering	3 0 0	3

23MEE324	Lean Manufacturing	3 0 0	3
23MEE323	Total Quality Management	3 0 0	3
23CSE322	Financial Engineering	3 0 0	3
24OEL231	Introduction to Accounting	2 1 0	3
24OEL232	Business Studies	2 1 0	3
24OEL233	Personal Financial Management	2 1 0	3
24OEL234	Working Capital Management	2 1 0	3
24OEL235	Non-Profit Organization	3 0 0	3
24OEL236	Digital Banking	3 0 0	3
24OEL237	Basics of Company accounts	3 0 0	3
24OEL238	Money market and Capital market	3 0 0	3
24OEL239	Macroeconomics	3 0 0	3
24OEL240	Microeconomics	3 0 0	3
24OEL241	Retail Banking	3 0 0	3
24OEL242	Business management	3 0 0	3
24OEL243	Introduction to travel and tourism	3 0 0	3
24OEL244	Basics of Insurance Management	3 0 0	3
24OEL245	Introduction to costing	2 1 0	3
24OEL246	Advertising	3 0 0	3
24OEL247	Green Marketing	3 0 0	3
24OEL248	Modern Banking	3 0 0	3
24OEL249	Project Management	3 0 0	3
24OEL250	Indian Financial System	3 0 0	3
24OEL251	B2B Marketing	3 0 0	3
24OEL252	Business Ethics	3 0 0	3
24OEL253	Sales and Distribution Management	3 0 0	3
24OEL254	Basics of Human ResourceManagement	3 0 0	3
24OEL255	Basics of Management	3 0 0	3
24OEL256	Introduction to EntrepreneurshipDevelopment	3 0 0	3
24OEL257	Understanding Travel and Tourism	3 0 0	3
24OEL258	Supply Chain Management	3 0 0	3
24OEL259	Introduction to Marketing	3 0 0	3
24OEL260	Film Appreciation	0 1 2	3
24OEL261	Introduction to Media Studies	3 0 0	3
24OEL262	Introduction to Psychology	3 0 0	3
24OEL263	Introduction to Gender Studies	3 0 0	3
24OEL264	Constitution and Media Ethics	3 0 0	3
24OEL265	Introduction to Calligraphy	3 0 0	3
24OEL266	Introduction to Branding	3 0 0	3
24OEL267	Introduction to Indian Sculptures	3 0 0	3
24OEL268	Introduction to figure drawing	0 1 2	3
24OEL269	Introduction to product sketching	0 1 2	3
24OEL270	Basics of Water Colour painting.	0 1 2	3

24OEL271	Basics of Landscape painting in water Colour	0 1 2	3
24OEL272	Basics of Oil painting	0 1 2	3
24OEL273	Anchoring and Programme Casting	0 1 2	3
24OEL274	Basics of Photography	0 1 2	3
24OEL275	Basics of Videography	0 1 2	3
24OEL276	Introduction to Fashion Photography	0 1 2	3
24OEL277	Introduction to Advertising	3 0 0	3
24OEL278	Film Theory	3 0 0	3
24OEL279	Event Management	3 0 0	3
24OEL280	Documenting Social Issues	0 1 2	3
24OEL281	Communication Strategies for Event Management	2 1 0	3
24OEL282	Effective Leadership through Non-Violence in Communication	3 0 0	3
24OEL283	Basics of Psychology and Personality Development	3 0 0	3
24OEL284	Introduction to Sci-Fi Studies	3 0 0	3
24OEL285	Campus Novels	3 0 0	3
24OEL286	Technical Communication	3 0 0	3
24OEL287	English for Academic Writing	3 0 0	3
24OEL288	English for Informal Communication	2 0 1	3
24OEL289	Orientation in Creative Writing	2 0 1	3
24OEL290	English for Competitive Exams and Interviews	3 0 0	3
24OEL291	Introduction to Comic Studies	3 0 0	3
24OEL292	Introduction to Food Studies	3 0 0	3
24OEL293	Film and Literature	3 0 0	3
24OEL294	Computer Aided Language Learning	3 0 0	3
24OEL295	Theatre and Communication	3 0 0	3
24OEL296	Women's Writing in India	3 0 0	3

B.Sc. HONOURS IN PHYSICS
B.Sc. HONOURS IN PHYSICS WITH RESEARCH - 2025

SYLLABI OF COURSES OFFERED

I. MAJOR COURSES

LAYOUT OF MAJOR COURSES IN THE CURRICULUM

Course Code	Course Title	L T P	Cr
	SEMESTER 1		
Major 1	Mechanics	3 1 0	4
	SEMESTER 2		
Major 2	Basics of Electricity and Magnetism	3 1 0	4
Major 3	Analog Electronics		
	SEMESTER 3		

Major 4	Electricity and Magnetism in Matter	3 1 0	4
Major 5	Basic Experimental Techniques		
Major 6	Introduction to Mathematical Physics		
SEMESTER 4			
Major 7	Waves C Oscillations	3 1 0	4
Major 8	Modern Physics		
SEMESTER 5			
Major 9	Intermediate Mechanics	3 1 0	4
Major 10	Mathematical Physics I		
Major 11	Thermodynamics		
Major 12	Optics		
SEMESTER 6			
Major 13	Basics of Quantum Mechanics	3 1 0	4
Major 14	Solid State Physics		
Major 15	Classical Mechanics		
Major 16	Statistical Mechanics		
SEMESTER 7			
Major 17	Quantum Mechanics	3 1 0	4
Major 18	Atomic and Molecular Spectroscopy		
Major 19	Mathematical Physics II		
Major 20	Electrodynamics		
Major 21	Nuclear and Particle Physics		
SEMESTER 8			
Major 22	Condensed Matter Physics	3 1 0	4
Major 23	Advanced Experimental Techniques		
Major 24	Special Course/Online Course (Any one of)		
25PHY431	Compact Stars		
25PHY432	Nanostructures: Theory and Applications		
25PHY433	Thermodynamics of materials		
25PHY434	Optoelectronics		

25PHY103 (Major 1)	Mechanics	3 1 0 4

Prerequisites: Higher secondary level Mathematics course

Course Objectives

This course is intended to impart students basic understanding of Newtonian mechanics involving both translational and rotational motions of bodies, vector algebra, curvilinear coordinates, concepts such as work-energy theorem, conservation of energy and momentum along with center of mass. Also basic knowledge on elastic properties of matter and fluid mechanics will be imparted to students.

Course Outcomes

At the end of the course students will be able to

CO1. Understand and analyze one, two and three dimensional translational motion problems including conservation laws.

CO2. Understand and apply Newton's laws of motion and the universal law of gravitation to solve problems.

CO3. Acquire knowledge on the concept of center of mass, collision and rotational motion.

CO4. Apply Hooke's law, determine elastic constants of solids, and apply law of buoyancy, Archimedes principle, Bernoulli's theorem to solve problems related to fluid mechanics.

CO5: Learn about different frames of reference and acquire knowledge on special theory of relativity.

UNIT 1

One-dimensional Kinematics. Kinematics in 2D and 3 D: Projectile Motion, Circular Motion. Non-inertial frames and pseudo Forces-Rotating Coordinate Frame, Fictitious Forces, Coriolis Force, Tides, Foucault Pendulum.

UNIT 2

Newton's Laws of Motion - Forces, Frictional Forces-Work, Kinetic Energy, Work-Energy Theorem, Potential Energy, Conservation of Energy Newton's law of gravitation, Motion in uniform gravitational field.

UNIT 3

Centre of Mass, Conservation of linear momentum, collisions, and systems with variable mass. Torque, Angular momentum, Moment of Inertia, Conservation of Angular momentum, Kinetic Energy of Rotation.

UNIT 4

Stress, Strain, Hooke's law Elastic properties of matter. Kinematics of moving fluids, Equation of continuity, Euler's equation, Bernoulli's theorem, Viscous fluids, Reynold's number, Surface tension, Surface energy.

UNIT 5

Special theory of Relativity-Lorentz transformations, relativistic kinematics and mass-energy equivalence.

Text Books

1. David Halliday, Robert Resnick & Jearl Walker, Fundamentals of Physics, John Wiley, 9E, 2012.
2. Kittel et al, Mechanics, Berkeley Physics Course Vol-1, Tata McGraw Hill, 2011.

Suggested Reading

1. R.P. Feynman, R. P. Leighton and M. Sands, Feynman Lectures on Physics Vol.1, Narosa, 2003
2. Landau, Lev D., and Evgenij M. Lifshitz. Mechanics: Course of Theoretical Physics. Vol. 1. 3rd ed. Butterworth-Heinemann, 1976. ISBN: 9780750628969.
3. https://ocw.mit.edu/courses/physics/8-01sc-classical-mechanics-fall-2016/index.htm
4. Lectures by Walter Lewin on Classical Mechanics, https://www.youtube.com/watch?v=wWnfJ0-xXRE&list=PLyQSN7X0ro203puVhQsmCj9qhlFQ-As8e

25PHY113 (Major2)	**Basics of Electricity and Magnetism**	**3 1 0 4**

Prerequisites: Nil

Course Objectives

Having successfully completed this module, the student will be able to demonstrate knowledge and understanding of: Vector algebra and vector calculus from the perspective of electrodynamics, Coulomb's law, Superposition principle, Concept of electric field, Potential formalism and its importance, working of capacitors and RC circuits, Magnetic fields and their origin, Ohm's law, Faraday's law, Lenz's law and working of LC, LR, LCR circuits.

Course Outcomes

At the end of the course students will be able to

CO1. Apply vector algebra, vector calculus and orthogonal curvilinear coordinates to solve problems

CO2. Understand electric field, electric potential concepts to solve problems in electrostatics

CO3. Acquire knowledge in magnetostatics in order to calculate magnetic field for different current distributions

CO4. Understand electrodynamics and working of LC, LR and LCR circuits

UNIT 1: Vector analysis

Review of vectors, Dot products, Cross products, and Triple products. Differential calculus: Gradient, Divergence, Curl, Second derivatives, Integral calculus: Fundamental theorem of calculus, Fundamental theorem of gradient, Fundamental theorem of divergence, Fundamental theorem of curls, Curvilinear coordinates: Spherical coordinates, Cylindrical coordinates. Dirac delta function.

UNIT 2: Electrostatics

Coulomb's law. Superposition principle. Electric field – discrete and continuous distribution, Gauss's law, Applications of Gauss's law.

UNIT 3: Electric Potential

The curl of electric field, Electric potential, meaning of electric potential, Equipotential surfaces, Potential of localized charge distribution, Work and energy in electrostatics, Energy of a point charge distribution, Energy of continuous charge distribution, Conductors and Capacitors, Charging and discharging of RC Circuit.

UNIT 4: Magnetostatics

Magnetic fields, Magnetic forces, Currents, Biot-Savart law, Divergence and Curl of magnetic field, Ampere's law and its applications.

UNIT 4: Electrodynamics

Ohm's law, EMF, Motional EMF. Electromagnetic induction: Faraday's law, Lenz's law, induced electric field, Maxwell's correction to Ampere's law, Examples of LC, LR, LCR circuits.

Text Books

1. Introduction to Electrodynamics – David J. Griffiths, 4th edition, Pearson Publication, 2015.

2. David Halliday, Robert Resnick, and Jearl Walker, Fundamentals of physics, 9th Edition, John Wiley, 2012.

Reference books

1. Richard P. Feynman, Robert P. Leighton and Matthew Sands, Feynman Lectures on Physics Vol.1, 1E, Narosa Publishing House, 2008.

2. Lectures by Prof. Dipan Ghosh on "Electromagnetic Theory" - https://nptel.ac.in/courses/115/101/115101005/

3. Lectures by Prof. Walter Lewin on Electricity and Magnetism - https://www.youtube.com/watch?v=x1-SibwIPM4&list=PLyQSN7X0ro2314mKyUiOILaOC2hk6Pc3j&index=2

25PHY114 (Major 3)	**Analog Electronics**	**3 1 0 4**

Course objectives:

The objective of the course is to understand, analyze, and construct various DC circuits for multiple applications.

Course Outcomes:

At the end of the course, students will be able to

CO1: Analyse the DC and AC circuits using circuit theory

CO2: Understand and analyze the circuits comprised of diodes

CO3: Understand and analyze the circuits comprised of transistors

CO3: Analyse Op-amp-based DC and AC circuits for various applications.

UNIT 1:

Introduction: Ohm's Laws, Kirchhoff's Laws, Series, Parallel Resistors and Voltage, Current Division, Wye-Delta Transformations.

Circuit Theory: Nodal and Mesh analysis of current and Voltage sources, Thevenin's theorem, Norton's Theorem, Open and closed circuit.

UNIT 2:

Semiconductors (qualitative): Intrinsic& Extrinsic semiconductors, Doping in a semiconductor, PN Junction, Diode: forward and reverse biasing and energy bands.

Diodes and Transistors: Diode characteristics, Ideal diode, rectifiers and filters, Clippers and clampers, Zener diode; Line and load regulation, Optoelectronic devices: LED, Photodiode, Schottky diode,

UNIT 3:

Transistor: Bipolar Junction Transistor, Transistor biasing, Load line analysis, Operating points, Transistor amplifier: current and voltage amplifiers.

JFET (qualitative): Construction, biasing and applications in switches, variable resistance and choppers

MOSFET: Characteristics and operation of D- MOSFET & E- MOSFET, Digital switching using MOSFET.

UNIT 4 :

Integrated Circuits: Differential amplifier, Operational Amplifier, Characteristics of ideal op-amp, negative feedback, nonlinear Op-amp circuits: Integrators, Differentiator, Instrumentational amplifier.

UNIT 5:

Inductors & Capacitors: Series and Parallel Capacitors, Series and Parallel Inductors, Integrator, Differentiator.

First-Order Circuits: Source-free RL, RC Circuit, Step Response of an RC and RL Circuits, First-order Op Amp Circuits and filters.

TEXT BOOKS:

1. Fundamental of Electrics circuits: C. K. Alexander and M. N. O. Sadiku, Third edition, Tata McGraw Hill.
2. The Art of Electronics: P. Horwitz and W. Hill (1989) 2nd edition, Cambridge University Press.
3. Electronic Devices and Circuits: Robert L. Boylestad & Louis Nashelsky.

25PHY202 (Major 4)	Electricity and Magnetism in Matter	3 1 0 4

Prerequisites: Basics of Electricity and Magnetism

Course Objectives

Having successfully completed this module, the student will be able to demonstrate knowledge and under-standing of: Electric Potential, Boundary conditions, Maxwell's equations, various techniques of solving Laplace's equation, Electric field and Magnetic fields in matter.

Course Outcomes

After completion of the course students will be able to:

CO1: Understand the concept of electric potential, Laplace's equations, and uniqueness theorems
CO2: Apply special techniques to calculate the electric potential
CO3: Acquire knowledge related to bound charges and hence calculate the electric field of polarized objects
CO4: Understand magnetic vector potential, the magnetic field in the matter, and different types of magnetic materials

UNIT 1:

Review of electrostatics: Electric Potential, boundary conditions, Poisson's and Laplace's equations, La-place equation in one, two, and three dimensions, Boundary conditions and Uniqueness theorem, Conductors and second Uniqueness theorem.

UNIT 2:

Techniques of solving Laplace's equation: Finite difference method, Relaxation method, and other methods of finding the potentials: Method of images, Separation of variables, Spherical co-ordinates, Multipole expansion, Electric field of a dipole.

UNIT 3:

Electric field in matter: Induced dipoles, Polarization, Field of polarized Object, bound charges, Physical interpretation of bound charges, Field inside a dielectric, Electric displacement, Linear dielectrics, Boundary value problem with linear dielectrics, Energy in dielectric systems, Force on dielectrics.

UNIT 4:

Magnetostatics with vector potential: Maxwell's equations for magnetostatics, Magnetic vector potential, Aharanov-Bohm effect, Magnetostatic boundary conditions, Multipole expansion of magnetic vector potential.

UNIT 5:

Magnetic field in matter: Diamagnets, Paramagnets, Ferromagnets. Torques and Forces on Magnetic di-poles, Effect of magnetic field on atomic Orbits, Magnetization, Bound currents, Physical interpretation of bound currents, Magnetic field inside matter, Ampere's law in

magnetized materials, Magnetostatic Bounda-ry Conditions, Linear and Nonlinear media: Magnetic susceptibility and permeability. Ferromagnetism

Text Books:

1. David J. Griffiths, Introduction to Electrodynamics, 4th Ed., Pearson Publication, 2015.

Reference Books:

1. Richard P. Feynman, Robert P. Leighton and Matthew Sands, Feynman Lectures on Physics Vol.1, 1E, Narosa Publishing House, 2008.
2. J.D. Jackson, Classical Electrodynamics, 3rd Ed., Wiley, 2007.
3. David Halliday, Robert Resnick, and Jearl Walker, Fundamentals of physics, 10thEdition, John Wiley, 2017.
4. Lectures by Prof. Dipan Ghosh on "Electromagnetic Theory" https://nptel.ac.in/courses/115/101/115101005/

25PHY203 (Major 5)	**Basic Experimental Techniques**	**3 1 0 4**

Course Objectives: The objective of the course is to introduce the concept of errors and error propagation, and to perform linear and non-linear regression analysis including goodness of fits. It is also aimed at introducing the student to electronic noise and pressure and temperature measurements.

Course Outcomes

At the end of the course, the students will be able to:

CO1: Determine errors in measurements and analyze the error propagation

CO2: Perform curve fitting and regression analysis and estimate the goodness of fits

CO3: Understand basic electronics instrumentation- pick out the signal from noise, describe the noise, optimization, and signal averaging

CO4: Understand vacuum science and temperature measurements

UNIT 1:

ERROR ANALYSIS: Introductory probability – Random experiment, discrete random variable, continuous random variable, probability distributions, Definition of mean, median, mode, standard deviation, and standard error.

Definition of Errors: Random error and systematic error, Uncertainties, precision and accuracy, reporting errors (error bars), Error Propagation.

UNIT 2:

DATA ANALYSIS: Curve fitting, Linear regression analysis, goodness of fits ($\chi 2$ test), correlation analysis (R^2) – with relevance to simple physics experiments.

UNIT 3:

EXTRACTION OF SIGNAL FROM NOISE: Signal-to-noise ratio, Types of noise, Hardware and software methods for noise reduction

UNIT 4:

VACUUM PHYSICS: Definition of pressure – Vacuum Classification and Ranges - Vacuum

Basics: Ideal Gas laws - Kinetic theory of gases - average velocity - mean free path - impingement rate - Gas Flow: Regimes – Flow rate – Pumping speed and throughput – Conductance – Leaks

Vacuum Pumps: Positive Displacement Pump: Rotary Pump – Kinetic Pumps: Diffusion Pump – Turbomolecular Pump – Entrapment Pump: Cryopump

Vacuum Gauges: Direct measurement: McLeod gauge – Membrane Gauge - Indirect measurement: Pirani Gauge -Penning Gauge – Hot Ionization Gauge

UNIT 5:

TEMPERATURE MEASUREMENT: Thermometry: Scales of temperature, Mechanical expansion thermometers: Bimetallic thermometers, Filled system thermometers: mercury-filled thermometers, liquid-filled thermometers, constant volume-gas thermometers, vapour pressure thermometers. Electrical Thermometers: platinum resistance, thermistors, thermocouples. Radiation Pyrometers. Low-temperature measurement, creation of low-temperatures.

TEXT BOOKS:

1. Shailaja Mahamuni, Deepti Sidhaye and Sulabha Kulkarni, Foundations of Experimental Physics, CRC Press, 2021.
2. Philip Bevington, D. Keith Robinson, Data Reduction and Error Analysis for the physical sciences, 3rd edition, McGraw-Hill Education, 2002.
3. John. R Taylor, An introduction to error analysis: The study of uncertainties in physical measurements, University Science Books, 1998.

REFERENCE BOOKS:

1. Paul Horowitz and Winfield Hill, The Art of Electronics, 3rd edition, Cambridge University Press, 2015.
2. Milton Ohring, The Materials Science of Thin Films, 2nd edition Academic Press Inc, 2001.
3. William Mendenhall, Robert J. Beaver, Barbara M. Beaver, Introduction to Probability and Statistics, 13th Edition, Brooks Cole, 2008.
4. Sayer and A. Mansingh, Measurement, Instrumentation and Experiment Design in Physics and Engineering, M. PHI Learning Pvt. Ltd. 2015.

25PHY204 (Major 6)	**Introduction to Mathematical Physics**	**3 1 0 4**

Course Objectives:

The objective of this course is to introduce the Fourier and Laplace transforms, and the uses of these transforms in the solution of partial differential equations. This course is intended to lay a mathematical foundation to other theoretical courses such as quantum mechanics and

act as a primer to a student who opts to take up a higher course in physics.

Course Outcomes:

At the end of the course, the students will be able to:

CO1: Understand and Apply Fourier Analysis to various types of periodic functions

CO2: Understand and Analyze Fourier Integrals and Transforms

CO3: Understand the significance of Laplace Transforms and apply it to various problems

CO4: Understand the methods of solving PDEs using Series and Transforms.

UNIT 1:

Periodic Functions, Trigonometric Series, Fourier Series, Functions of any Period p = 2L, Even and Odd Functions, Half Range Expansions.

UNIT 2:

Fourier Integrals, Sine and Cosine Integrals, Fourier Transforms - Sine and Cosine Transforms and inverse transforms, Properties, Convolution Theorem, Differentiation and Integration of Transforms.

UNIT 3:

Laplace Transforms, Inverse Transforms, Properties, Transforms of Derivatives and Integrals, Second Shifting Theorem, Unit Step Function and Dirac-Delta Function; Differentiation and Integration of Transforms.

UNIT 4:

Solving Linear Ordinary Differential Equations with constant coefficients - use of the integral transforms; solving linear circuits integro differential equations with Laplace transforms.

UNIT 5:

Types of PDEs, Separation of Variables method, Wave equation - Use of Fourier Series to solve PDE, Heat Equation; Solution by Fourier Series

Text Books:

1. E Kreyszig, Advanced Engineering Mathematics, 10th Ed., John Wiley and Sons, 2015.
2. P. P. G. Dyke,An Introduction to Laplace Transforms and Fourier series, 2nd Ed., Springer, 2014.
3. Larry C. Andrews and Bhimson, K. Shivamoggi, The Integral Transforms for Engineers, Prentice Hall India Learning Private Limited, 2003.

25PHY212	**Waves and Oscillations**	**3 1 0 4**
(Major 7)		

Course Objective: This course is framed to provide analytical knowledge of waves and oscillations and their applications in physics.

Course Outcomes:

At the end of the course, students will be able to

CO 1: Understand the phenomenon of free oscillations in one and two degrees of freedom

and their applications
CO 2: Understand and analyze the modes of vibrations in continuous and non-continuous systems and their applications
CO 3: Understand and analyze phenomenon of forced, damped driven and harmonic oscillations.
CO 4: Apply Fourier techniques to analyze wave characteristics.

UNIT 1:

Simple Harmonic Motion (SHM): the governing equation, kinetic energy, total energy of particles showing SHM; Free oscillations with one degree of freedom; SHM of masses between springs.

UNIT 2:

Forced oscillations and resonance: Damped driven one-dimensional harmonic oscillator, Resonance, sharpness of resonance and quality factor, Examples of forced and resonant oscillations. Free oscillations of systems with two degrees of freedom, linearity, and superposition principle; Beats – analytical treatment

UNIT 3:

Free oscillations of systems with many degrees of freedom: Transverse and continuous mode of continuous string, General mode of continuous string; Modes of non-continuous system with N degrees of freedom.

Travelling wave: Harmonic travelling waves in one dimension and phase velocities.

UNIT 4:

Description of wave motion: Particle velocity and wave velocity, distribution of velocity and pressure in a plane progressive wave, energy of a progressive wave

UNIT 5:

Modulation, Pulse, and wave packets: Group velocity, Pulse, Fourier analysis of pulses, Fourier analysis of travelling wave packets.

TEXT BOOKS:

1. Frank S. Crawford, Jr., Waves, Berkeley Physics Course, Vol. 3, McGraw-Hill Book Company.
2. N Subrahmanyam and Brij Lal, Waves and Oscillations, Vani Educational Books.
3. D C Tayal and Praveen Tayal, Waves and Oscillations
4. Richard Fitzpatrick, Oscillations and Waves: An Introduction.

25PHY213 (Major 8)	**Modern Physics**	**3 1 0 4**

Objectives: The objective of the course is to introduce special theory of relativity and provide fundamental understanding of quantum mechanics.

Course Outcomes

At the end of the course, the students will be able to

CO1: Understand and explain the essential concepts of special relativity and its significance.
CO2: Acquire the knowledge in wave particle duality.
CO3: Understand the fundamental development of quantum mechanics and its application in angular momentum and coupling schemes.
CO4: Explain the statistical distributions and their applications

UNIT 1:

Special theory of relativity: Reference frames, inertial systems and Galilean transformations-introduction, postulates of special theory of relativity, Michelson-Morley experiment and its consequences, Lorentz transformations, Length contraction, Time dilation, relativistic velocity addition, simultaneity, relativistic Energy and momentum, mass–energy equivalence, particles with zero rest mass, relativistic Doppler effect.

UNIT 2:

Origin of quantum theory of radiation: Black body radiation, photo-electric effect, Compton Effect – pair production and annihilation, De-Broglie hypothesis, description of waves and wave packets, group velocities. Evidence for wave nature of particles: Davisson-Germer experiment, Heisenberg uncertainty principle.

UNIT 3:

Quantum mechanics: Wave function, Probability density, expectation values - Schrodinger equation – time dependent and independent, Linearity and superposition, expectation values, operators, Eigen functions and Eigen values, Application of 1D Schrodinger Wave equation: Free particle, Particle in a box, Finite potential well, Tunnel effect, Harmonic oscillator. Quantum theory of the hydrogen atom. Schrodinger wave equation in spherical coordinates, separation of variables, quantization of energy and orbital angular momentum,

UNIT 4:

Statistical distributions - Maxwell Boltzmann's statistics - molecular energies in an ideal gas - Quantum statistics - Rayleigh Jean's formula, - Planck's radiation law - Free electron in a metal, - Electron energy distribution - Specific heat of solids - Evolution of stars.

UNIT 5:

Many-electron atoms: Electron Spin, exclusion principle, symmetric and antisymmetric wave functions, Many-electron atoms, atomic structures, Spin-Orbit Coupling, total angular momentum, X- ray Spectra.

TEXT / REFERENCE BOOKS:

1. Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, *Concepts of Modern Physics*, Tata McGraw-Hill, 7thEd., 2017.
2. Robert Eisberg and Robert Resnick, *Quantum Physics of Atoms, Molecules, Solids, Nuclei and particles*, 2ndEd., Wiley, Reprint: 2012
3. Kenneth Krane, *Modern Physics*, 2nd Ed., John Wiley and Sons, 1996
4. Raymond A. Serway, Moses, Moyer, *Modern Physics*, 3rd Ed., Thomson Learning, 2005

5. T. Thornton and A. Rex, *Modern Physics for Scientist and Engineers*, 2nd Ed., Fort Worth: Saunders, 2000.

25PHY302 (Major 9)	INTERMEDIATE MECHANICS	3 1 0 4

Course Objectives

The objective of the course is intended to impart a basic knowledge on Central forces and Rotational dynamics.

Course Outcomes

At the end of the course, students will be able to

CO1: Understand the significance of conservative systems and Phase Space dynamics.
CO2: Understand the concept of constraint, principle of least action and formulation of Lagrange's method and apply Lagrange's equation for simple dynamical systems.
CO3: Understand Central force and its applications in Kepler's, Scattering problems and Centre of mass problems.
CO4:Understand the basics of rotating frames of references, Euler angles and Euler's equations.
CO5: Apply Hamilton's equations in solving dynamical problems.

UNIT 1:

Review of basic principles, Conservative systems, Conservation of linear momentum, Phase space-phase portrait - Dynamical Systems - Phase space dynamics - stability analysis.

UNIT 2:

Lagrangian and Hamiltonian Mechanics with Constraints-Euler-Lagrange Equations, D'Alembert and Hamilton principles, Conservation Laws, holonomic and nonholonomic constraints – Generalized co-ordinates -Calculus of Variation, Principle of least action - The Lagrangian, Lagrange's Equations, Degrees of Freedom, Generalized momentum & Hamilton's Equations.

UNIT 3:

Central forces - Kepler's laws - bound state and scattering states. Determining the Motion using Energy Integral- Laboratory frame and centre of mass frame- Scattering.

UNIT 4:

Rotational Dynamics of Rigid Bodies: Conservation of Angular momentum, Moment of Inertia, Rotational Kinetic Energy, Euler Angles, Inertia Tensor, The Euler Equations-Analysis of a symmetric Top-Gyroscopes.

UNIT 5:

Hamiltonian: Hamilton's equations using Legendre Transformation- Cyclic co-ordinates-Application of Hamilton's formalism in solving dynamical Problems.

TEXT / REFERENCE BOOKS:

1. Herbert Goldstein, John Safko Charles P. Poole, Classical Mechanics, Pearson, 3rd Ed, 2011.
2. Landau, Lev D., and Evgenij M. Lifshitz. Mechanics: Course of Theoretical Physics. Vol. 1. Butterworth-Heinemann; 3rd Ed, 1982. ISBN 978-0750628969.
3. John Taylor, Classical Mechanics, University Science Books, 1st Ed, 2004.
4. S. T. Thomton and J B Marion, Classical Dynamics of Particles and Systems, Brooks Cole, 1st Ed, 2009.
5. Walter Greiner, Classical Mechanics: Point Particles and Relativity, Springer Verlag, 1st Ed, 2004.

25PHY303 (Major 10)	**Mathematical Physics I**	**3 1 0 4**

Course Objectives: The purpose of the course is to introduce the methods of mathematical physics and to develop the required mathematical skills to solve advanced problems in theoretical physics.

Course Outcomes:

After completing the course, the student should be able to:

CO1: Understand mathematical methods used in various advanced physics courses and apply the techniques in solving problems involved
CO2: Understand the theory of vector calculus in orthogonal and general curvilinear coordinates and apply it to solve physically relevant problems
CO3: Perform basic operations with tensors in algebra and calculus; formulate and express physical laws in terms of tensors, and simplify it by the use of coordinate transforms
CO4: Understand the properties of the Dirac delta function, various special functions, Fourier series, and integral transforms and application of the same in solving integrals and differential equations

UNIT 1:

VECTOR CALCULUS: Coordinate transformations, Definition of vectors, Index notation, Cartesian Tensors, Kronecker delta, Levi-Civita tensor and its application in Vector algebra and calculus. The vector differential operators, Integrals of vectors, Integral forms of gradient, divergence and curl, Line, surface and volume integrals – Stoke's, Gauss's and Green's theorem.

UNIT 2:

CURVILINEAR COORDINATES: Cartesian, spherical and cylindrical coordinates. General curvilinear coordinates, Coordinate curves, Scale factors, Unit vectors in curvilinear systems, Arc length, area elements, volume elements. Gradient, divergence, curl, and Laplacian. Special orthogonal coordinate systems: Parabolic and cylindrical coordinates, Paraboloidal coordinates, Elliptic cylindrical coordinates, and applications.

UNIT 3:

TENSOR ANALYSIS: Definition and basic properties of tensors. Covariant, contravariant, and mixed tensors. The summation convention, Fundamental operations with tensors. The line element and metric tensor. Tensor algebra, Christoffel symbols and their transformation laws, Covariant differentiation. Tensor form of gradient, divergence, and curl. Geodesic equation, Curvature tensors.

UNIT 4:

Introduction to Generalised functions, delta sequences. One dimensional Dirac delta function, properties and representations, higher dimensional Dirac delta function. Dirac Delta function in curvilinear coordinates. Heaviside unit step function. Applications and properties of Fourier series and its Complex form, Fourier representation of Dirac Delta. Integral transforms and properties, Parseval's theorem, Convolution theorem, applications. Green's function

UNIT 5:

Gamma, Beta and Error functions – definitions, properties and applications. Orthogonal functions, Bessel's equation, General solution for non-integer ν; general solution for integer ν; Bessel function of first kind and second, properties of Bessel functions, Integral representations. Recurrence Relation, Orthogonality, Ro-drigues Formula. Modified Bessel functions, Henkel functions. Equations transformed into Bessel's equa-tion. Other special functions: Legendre, Hermite, Laugerre functions- Recurrence relations and generating functions-. Applications.

TEXT BOOKS:

1. Riley K F, Hobson M P, Bence S J, Mathematical Methods for Physics and Engineering, CUP, 3rd Ed, 2010

2. Arfken & Weber, Mathematical Methods for Physicists, Elsevier Indian Reprint, 7th Ed., 2012.

Reference Books:

1. M Boas, Mathematical Methods in Physical Sciences, Wiley Indian Reprint 3rd Ed, 2006.
2. Mathews J and Walker R L, Mathematical Methods of Physics, Pearson India, 2nd Ed, 2004.
3. C. W. Wong, Introduction to Mathematical Physics: Methods & Concepts, Oxford, 2013.

25PHY304 (Major 11)	**Thermodynamics**	**3 1 0 4**

Course Objective:

The course aims to introduce the fundamental concepts of thermodynamics, including its laws, heat transfer mechanisms, and the behaviour of gases, with an emphasis on practical applications. It also focuses on advanced thermodynamic models and the use of thermodynamic potentials and relations to analyze real-world systems.

Course Outcomes:

CO1: Understand and apply fundamental thermodynamic concepts, laws, and heat transfer mechanisms.

CO2: Understand the thermodynamic concepts related to material's properties such as heat capacity.

CO3: Use thermodynamic potentials, Maxwell's relations, and phase transitions to solve practical problems.

CO4: Understand the mathematical concepts such as exact and inexact differentials and their connections to thermodynamic processes.

UNIT 1:

Temperature & Zeroth law of thermodynamics: state variables, Thermal equilibrium, Zeroth law of thermodynamics. Concept of temperature & its measurement, Scales of measurement. Construction and calibration of various Liquid, gas, resistance, and radiation thermometers, Thermal expansion, Equation of state. Extensive and intensive variables: Kinetic theory of gases: Pressure exerted by ideal gas, molecular properties of temperature, Mean free path, Molecular speed distribution

UNIT 2:

First law of thermodynamics: Methods of work transfer, free expansion, work as a path function, heat: Specific heat capacity and latent heat First law of thermodynamics: Internal energy and work, Heat and Enthalpy, Path function and state function, Corollaries of First law of thermodynamics;

UNIT 3:

Work and Heat: Heat Capacity: equation of state, measurement of specific heat, Work done in various Processes, Mayer's relation, Poisson's relation. Einstein's and Debye theory of Specific heat capacity Heat transfer mechanisms: Conduction, Convection, and Radiation. Methods of thermal conduction, conductivity measurements, Kirchhoff's laws, Pressure of radiation, Stefan Boltzmann law. Wien's law, Rayleigh jeans law, Planck's law (qualitative analysis),Solar constant, temperature of sun, Solar spectrum.

UNIT 4:

Second law of thermodynamics: Kelvin Planck Statements, Entropy and its variation, State function, Engines-external and internal combustion engines-Carnot engine:-Steam engine, Gasoline engine, Diesel Engine; Stirling engine, Clausius statement of second law, Refrigerator, Equivalence of Kelvin-Planck and Clausius statement. Entropy:- entropy in reversible and irreversible process, Clausius inequality,TS diagram,

UNIT 5:

Thermodynamical Potentials. Maxwell's Thermodynamical relations, Applications: Specific heat equation, Joule Thomson cooling, Temperature inversion, Clausius Clapeyron equation. Thermodynamic Potentials; Relation with Thermodynamic variables, Tds equation, Heat capacity equations, Phase transitions; First and second order, Pure substances: PV,PT,TS Phase diagram and PVT Surface. Applications of fundamental concepts, Mean free path, Equipartition of energy, Equilibrium distribution.

TEXT BOOKS:

1. M. W. Zemansky and R. H. DittmanAmit K. Chattopadhyay, Heat and Thermodynamics, 8th edition, Tata McGraw- Hill, 2011.
2. David Halliday, Robert Resnick, and Jearl Walker, Fundamentals of Physics,10th Edition, John Wiley, 2012.

REFERENCE BOOKS:

1. Walter Greiner, Ludwig Neisse, Horst Stocker, Thermodynamics and statistical mechanics, 1st Ed, Springer, 1995,3rd reprint 2001 .
2. Sears.F.W and Salinger.G.L, Thermodynamics Kinetic Theory and Statistical Thermodynamics,3rd Ed, Addison Wesley,1998
3. Hugh.D. Young and Freedman, Sears& Zemansky's University Physics, 13th Ed, Pearson, 2013.
4. Richard P. Feynman, Robert. P. Leighton and Matthew Sands, Feynman Lectures on Physics, Vol.1, 1E, Narosa ,2008
5. P.K.Nag,Basic & Applied Thermodynamics,2nd edition McGraw Hill Education; 2017.

25PHY305 (Major 12)	**Optics**	**3 1 0 4**

Course Objective:

The course is designed to provide a clear understanding of wave optics phenomena such as diffraction, interference, and polarization. It will also provide an introductory knowledge of Lasers.

Course Outcomes:

On Successful completion of the course, the student will be able to

CO1. Understand and explain the superposition of waves and the concept of coherence
CO2. Explain the different types of interference and working of optical interferometers
CO3. Clarify the phenomena of diffraction and distinguish the Fresnel and Fraunhofer diffractions
CO4. Acquire significant knowledge of polarization concepts and laser systems.

UNIT 1:

Wave Equation – Plane Wave, Spherical waves – Maxwell's Equation, Poynting Vector – Superposition of waves of Same Frequency: Algebraic method, Complex method, Phasor addition - Random and Coherent Sources – Superposition of waves different frequency: Beat Phenomena – Phase and Group velocities – Materials Dispersion – Concept of Coherence: Temporal coherence - Partial Coherence and Spatial Coherence

UNIT 2:

Interference: Two beam interference - Wavefront Splitting Interference: Young's Double Slit Experiment- Shape of Interference Fringe - Amplitude Splitting Interference: Dielectric Film interference -Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes). Newton's Rings: Measurement of wavelength and refractive index. Stoke's Relations.

Optical Interferometers: Michelson Interferometer – and its applications – Intensity distribution in multiple-beam interference – Fabry-Perot interferometer and etalon

UNIT 3:

Diffraction: Huygens-Fresnel theory - Fraunhofer diffraction: Single Slit – Double Slit – diffraction by many slits - Grating: Dispersion of a Grating – Resolution of a Grating – Rectangular and Circular Aperture.

Fresnel Diffraction: Fresnel – Kirchhoff diffraction integral – Half-period Zone – Zone Plate – Diffraction from an Aperture: Rectangular Aperture - Circular Aperture - Cornu spiral and its applications – Babinet's principle

UNIT 4:

Polarizations: Nature of Polarized light: Linear, Circular, and Elliptical Polarization – Matrix treatment: Jones Matrix - Production of polarized light: Dichroism -Reflection -Scattering – Birefringence -Double refraction

UNIT 5:

LASER: Laser Characteristics -Spontaneous, Stimulated Emissions and Absorptions – Rate Equations – Gain Media: Two-level – Three-level - Four-level – Broadening - Laser Systems - Ruby Lasers, Nd: YAG Laser, He–Ne Laser, CO_2 Laser.

TEXT BOOKS:

1. Eugene Hecht, Optics, 5th Editon, Pearson Education Ltd., 2017.
2. Frank L. Pedrotti, Leno M. Pedrotti, Leno S. Pedrotti, Introduction to Optics, 3rd Edition, Pearson Education Ltd., 2014.
3. Ajoy K. Ghatak, Optics, 8th Edition, McGraw Hill, 2024.
4. Francis A. Jenkins, Harvey E. White, Fundamentals of Optics, 4th Edition, McGraw Hill, 2001.
5. K. Thyagarajan, Ajoy K. Ghatak, Lasers: Fundamentals and Applications, 2nd Edition, Springer, 2010.

REFERENCE BOOKS:

1. Subrahmaniyam, Brijlal, and Avadhanulu, A Textbook of Optics, 12th Edition, S. Chand, 2011.
2. Max Born and Emil Wolf, Principles of Optics, Cambridge University Press, 2019.
3. F.G. Smith and J.H. Thomson, Optics, Wiley, 1988.
4. K.D. Mőller, Optics, Springer, 2007.

25PHY312 (Major 13)	Basics of Quantum Mechanics	3 1 0 4

Course Objectives

The course emphasizes the students familiarize the mathematical background (Hilbert space) required to understand the basic and applied quantum mechanics, postulates, standard one-dimensional problems and quantum theory of angular momentum.

Course Outcomes

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

CO 1: Understand and familiarize the mathematical framework (Hilbert space) required for the basic and applied quantum mechanics.

CO 2: Understand the basic postulates and apply them to solve standard one-dimensional problems in quantum mechanics.

CO 3: Understand and learn the basic properties of harmonic oscillators.

CO 4: Learn the basic concepts of quantum theory of angular momentum and apply them realistic physical problems.

CO 5: Understand the concepts of addition of quantum angular momentum, standard coupling schemes and apply them in solving standard physics problems.

UNIT 1:

Introduction to Quantum mechanics: Wave function, expectation values, Schrodinger equation for free particles, Bound state problems.

Linear Vector Spaces: Basics, Inner Product Spaces, Dual spaces and the Dirac Notation, Subspaces, Linear Operators, Matrix elements of linear operators, Active and Passive transformations, The Eigenvalue problem, Functions of Operators and related concepts, Generalization to infinite dimensions

UNIT 2:

The Postulates, Basic postulates of quantum mechanics, Observables and operators, Measurements in quantum mechanics, Time evolution of the system's state, Symmetries and conservation laws. Connecting quantum mechanics and classical mechanics.

Properties of One-Dimensional Motion: Bound, Unbound, and Mixed States, Symmetric potentials and parity, free particle, Potential step, Potential barrier and Well, Infinite square well potential, Finite square well potential.

UNIT 3:

Review of the Classical Oscillator, Quantization of the Oscillator (Coordinate Basis), The Oscillator in the Energy Basis, Passage from the Energy Basis to the position Basis. Matrix

Representation of Various Opera- tors, Expectation Values of Various Operators. General expression for uncertainty relations.

UNIT 4:

Introduction, Orbital Angular Momentum, General Formalism, Matrix Representation, Geometrical Representation, Spin Angular Momentum, Experimental Evidence, theory of Spin, Spin 1/2 and Pauli Matrices. Eigen functions of orbital angular momentum: The Eigen value Problem of L2 and Lz, Properties of the Spherical Harmonics.

UNIT 5:

Rotations in Quantum Mechanics: Infinitesimal and Finite Rotations, Properties of the Rotation Operator, Euler Rotations, Rotation Matrices. Addition of Angular Momenta: Addition of two Angular Momenta: General formalism, Calculation of the Clebsch–Gordan Coefficients, Addition of more than two angular momenta, Coupling of Orbital and Spin Angular Momenta, Rotation matrices for coupling two angular momenta, Scalar, Vector, and Tensor Operators.

TEXT BOOKS:

1. N Zettili, Quantum Mechanics Concepts and Applications, John Wiley & Sons, 2nd Ed, 2009.
2. J Sakurai, Modern Quantum Mechanics, Pearson, 2nd Ed, 2016.

REFERENCE BOOKS:

1. S Gasiorowicsz, Quantum Physics, Wiley India, 3rd Ed, 2003.
2. L I Schiff, Quantum Mechanics, McGraw Hill Education; 4th edition (1 July 2017).
3. David Griffiths, Introduction to Quantum Mechanics, Pearson India (LPE), 2E, 2013.
4. R Shankar, Principles of Quantum Mechanics, Pearson India (LPE), 2nd Ed, 2005.

25PHY313 (Major 14)	**Solid State Physics**	**3 1 0 4**

Course objectives:

To develop a clear perception of crystal classes and different properties of solid-state materials.

Course Outcomes

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

CO1: Classify the crystal system based on symmetry and explain the nature of imperfections in the solids

CO2: Understand the concept of phonons in mono and diatomic lattice and explain phonon's heat capacity of solids

CO3: Familiar with the free-electron theory of metals and the basics of the band theory of solids

CO4: Acquire essential knowledge in magnetism, superconductivity, and dielectrics of solids.

UNIT 1:

Crystals: Periodic array of atoms, fundamental types of lattices**,** index system for crystal planes. Crystal structure data. Crystal symmetry - point and space groups. Lattice Vacancies, Frenkel and Schottky defects, Colour centers, Dislocations, Edge and Screw dislocation, Surface defects. Reciprocal lattice and Brillouin zone, Laue Condition, Bragg's law

UNIT 2:

Lattice Vibrations and Thermal Properties: Vibrations of crystals with monatomic basis atoms per primitive basis. Quantization of Elastic Waves, phonon momentum, inelastic scattering by phonons. Phonon heat capacity: Einstein and Debye models of phonon specific heat, anharmonic crystal interactions, Thermal Conductivity.

UNIT 3:

Free Electron Fermi Gas: Energy levels in one dimension, effect of temperature on Fermi-Dirac distribution, free electron gas in three dimensions. Heat capacity of the electron gas. Electrical conductivity and Ohm's law, motion in magnetic fields, thermal conductivity of metals. Temperature-dependent conductivity in metals- Matthiessen's rule, Nordheim rule.

UNIT 4:

Magnetism: Dia-, Para-, Ferri- and Ferromagnetic Materials, Classical Langevin Theory of Diamagnetism and Paramagnetic Domains, Quantum Mechanical Treatment of Paramagnetism, Curie's law, Weiss's Theory of Ferromagnetism and Ferromagnetic Domains, Discussion of B-H Curve, Hysteresis and Energy Loss.

Superconductivity: Experimental Results, Critical Temperature, Critical magnetic field, Meissner effect, Type I and type II Superconductors, Isotope effect, Idea of BCS theory.

UNIT 5:

Dielectrics: Maxwell's equations, Macroscopic electric field, Depolarization field, Local electric field at an atom, Lorentz field, Dielectric constant, and polarizability- Clausius-Mossotti relation, Electronic polarizability, classical theory of Electronic polarizability, Ferroelectric crystals, Displacive Transitions - Landau Theory of Phase Transitions anti-ferroelectricity and piezoelectricity.

TEXT BOOKS:

1. Charles Kittel, Introduction to Solid State Physics, Eighth Edition, Wiley, 2016.

REFERNCE BOOKS:

1. Wahab M A., Solid State Physics, Narosa Publishing House Pvt. Ltd. - New Delhi, 2015.
2. Ali Omar, Elementary Solid State Physics, Pearson India; Revised edition, 2007.
3. M Vijaya, Rangarajan G, Materials Science, McGraw Hill Education, 2004.
4. Azaroff Leonid V., Introduction to Solids, McGraw-Hill Education, 2017.
5. S. O. Kasap, Principles of Electronic Materials and Devices Fourth Edition, McGraw-Hill Education, 2021.

25PHY314 (Major 15)	Classical Mechanics	3 1 0 4

Pre-requisites: Mechanics, Classical Mechanics 1, Mathematics 1&2

Course Objectives: To study, understand and apply principles of Hamiltonian dynamics to solve dynamical systems

Course outcomes:

CO1: Study canonical transformations and apply it to mechanical problems
CO2: Study the properties of Poisson's bracket and apply it to dynamical problems
CO3: Apply Hamilton Jacobi theory for Harmonic oscillator and Kepler problem
CO4: Apply small oscillation theory developed in getting the frequencies of different of modes of oscillations in a coupled system
CO5: Introduction to Chaos and Nonlinear dynamics

UNIT 1:

Canonical Transformations: Equations of Canonical transformation, Examples-Simple Harmonic Oscilla- tor, Liouville's Theorem. Volume preservation in phase Space, Generating function, Conditions for canonical transformation and problem.

UNIT 2:

Poisson Brackets: Definition, Identities, Poisson theorem, Jacobi-Poisson theorem, Jacobi identity, invariance of PB under canonical transformation- Angular momentum Poisson bracket- Symmetry, invariance and Noether's theorem.

UNIT 3:

Hamilton- Jacobi Theorem: Hamilton- Jacobi Equation for Hamilton's principal function, Hamilton- Jacobi Equation for Hamilton's Characteristic Function, Harmonic oscillator problem, Action–angle variable in Systems of one variable, Kepler Problem in Action-angle variable.

UNIT 4:

Small oscillations: Formal theory of small oscillations as Eigenvalue problems, applications to diatomic and triatomic molecules, modes of vibrations.

UNIT 5:

Introduction to Chaos and Nonlinear Dynamics: Fixed points, Bifurcation, and Limit cycles, Lorenz Equations, The Logistic Map, Fractals, and Strange Attractors.

TEXT BOOKS:

1. H. Goldstein, C. Poole and J. Safko, Classical Mechanics, Pearson Education, 3rd Edition, 2011.
2. Landau and Lifshitz, Mechanics, Butterworth-Heinemann, 3rd Edition, 1982.
3. S.T. Thornton and J.B. Marion, Classical Dynamics of Particles and Systems, Cengage, 5th edition, 2012.
4. Walter Greiner, Classical Mechanics: Systems of Particle and Hamiltonian Dynamics, Springer,2nd Edition, 2009
5. Lecture Series on Classical Physics by Prof. V. Balakrishnan - https://www.youtube.com/ watch?v=Q6Gw08pwhws&list=PL5E4E56893588CBA8
6. Steven H Strogatz, Non Linear Dynamics and Chaos, Perseus Books Publishing, 1994.

25PHY315 (Major 16)	Statistical Mechanics	3 1 0 4

Course Objective:

This course aims to provide a comprehensive understanding of thermodynamic potentials, ensembles, partition functions, and phase transitions. Students will develop the ability to apply statistical and thermodynamic concepts to both classical and quantum systems.

Course Outcomes:

CO 1: Understand the basic laws of Thermodynamics and thermodynamic potentials
CO 2: Understand basic ideas of probability, probability distribution, and statistics and their correlation to physical principles
CO 3: Understand the concept of ensembles and partition function and the use of the partition function in thermodynamics for both classical and quantum systems
CO 4: Understand phase transitions from Thermodynamics and Statistical mechanics principles.

UNIT 1:

Review of thermodynamic variables and thermodynamic potentials. The meaning of probability- definitions of sample space, events etc., types of random variables and probability mass and distribution functions; Functions of one and two random variables; Joint probabilities; Moments of a distribution; Correlation; The binomial distribution, Normal distribution, and the 1D random walk problem.

UNIT 2:

Foundations of statistical mechanics- specification of micro and macro states of a system- contact between statistics and thermodynamics-classical ideal gas- ensembles in statistical mechanics.

UNIT 3:

Micro, canonical, and Grand canonical ensembles – Partition functions of the ensembles – relation between partition function and thermodynamic quantities - Partition function of the ideal gas in a canonical ensemble - phase space - trajectories and density of states - calculation of statistical quantities - Energy and density fluctuations.

UNIT 4:

Statistics of particles from partition functions – Classical and Quantum statistics: Maxwell-Boltzman, Fermi Dirac and Bose Einstein statistics-properties of ideal Bose and Fermi gases- Bose-Einstein condensation

UNIT 5:

Phase transitions- thermodynamic phase diagram for real gas- the Ising model

TEXT BOOKS:

1. Mark Zemansky, Richard Dittman, *Heat and Thermodynamics*, 8th Edition, McGraw-Hill, 2017.
2. F Reif, *Foundations of Statistical and Thermal Physics*, Tata McGraw-Hill, 2008
3. Kuriakose and Rajaram, *Chemical Thermodynamics: Classical, Statistical and Irreversible*, First Edition, Pearson Education India.

REFERENCE BOOKS:

1. Statistical Thermodynamics for Beginners, Howard D Stidham, World Scientific Pub., 2017.
2. Walter Greiner, Ludwig Neisse, Horst Stocker, *Thermodynamics and statistical mechanics*, 1st Ed, Springer, 1995, 3rd reprint 2001.
3. Sears. F. W and Salinger. G. L, *Thermodynamics Kinetic Theory and Statistical Thermodynamics*, 3rd Ed, Addison Wesley, 1998.
4. Hugh. D. Young and Freedman, *Sears & Zemansky's University Physics*, 13th Ed, Pearson, 2013.

25PHY401 (Major 17)	**Quantum Mechanics**	**3 1 0 4**

Prerequisites: Knowledge of basic and advanced mathematical physics.

Course Objectives:

The course emphasizes the students to familiarize the mathematical background (Hilbert space) required to understand the basic and applied quantum mechanics, postulates, standard one dimensional problems and quantum theory of angular momentum.

Course Outcomes:

After completion of this course students able to

CO1: Understand and familiarize the mathematical framework (Hilbert space) required for the basic and applied quantum mechanics.

CO2: Understand the basic postulate and apply them to solve standard one dimensional problems in quantum mechanics.

CO3: Understand and learn the basic properties of harmonic oscillators.

CO4: Learn the basic concepts of the quantum theory of angular momentum and apply them to realistic physical problems.

CO5: Understand the concepts of addition of quantum angular momentum, standard coupling schemes and apply them in solving standard physics problems.

UNIT 1:

Introduction to Quantum mechanics: Wave function, expectation values, Schrodinger equation for free particles, Bound state problems.

Linear Vector Spaces: Basics, Inner Product Spaces, Dual spaces and the Dirac Notation, Subspaces, Line-ar Operators, Matrix elements of linear operators, Active and Passive transformations, The Eigenvalue prob-lem, Functions of Operators and related concepts, Generalization to infinite dimensions

UNIT 2:

The Postulates, Basic postulates of quantum mechanics, Observables and operators, Measurements in quantum mechanics, Time evolution of the system's state, Symmetries and conservation laws. Connecting quantum mechanics and classical mechanics.

Properties of One-Dimensional Motion: Bound, Unbound, and Mixed States, Symmetric potentials and pari-ty, free particle, Potential step, Potential barrier and Well, Infinite square well potential, Finite square well potential.

UNIT 3:

Review of the Classical Oscillator, Quantization of the Oscillator (Coordinate Basis), The Oscillator in the Energy Basis, Passage from the Energy Basis to the position Basis. Matrix Representation of Various Opera-tors, Expectation Values of Various Operators. General expression for uncertainty relations.

UNIT 4:

Introduction, Orbital Angular Momentum, General Formalism, Matrix Representation, Geometrical Representation, Spin Angular Momentum, Experimental Evidence, theory of Spin, Spin 1/2 and Pauli Matrices. Eigenfunctions of orbital angular momentum: The Eigenvalue Problem of L^2 and L_z, Properties of the Spherical Harmonics.

UNIT 5:

Rotations in Quantum Mechanics: Infinitesimal and Finite Rotations, Properties of the Rotation Operator, Euler Rotations, Rotation Matrices.

Addition of Angular Momenta: Addition of two Angular Momenta: General formalism, Calculation of the Clebsch–Gordan Coefficients, Addition of more than two angular momenta, Coupling of Orbital and Spin Angular Momenta, Rotation matrices for coupling two angular momenta, Scalar, Vector, and Tensor Operators.

TEXT BOOKS:

1. N Zettili, *Quantum Mechanics Concepts and Applications*, John Wiley & Sons, 2nd Ed, 2009.
2. J J Sakurai, *Modern Quantum Mechanics*, Pearson, 2nd Ed, 2016.

REFERENCE BOOKS:

1. S Gasiorowicsz, *Quantum Physics*, Wiley India, 3rd Ed, 2003.
2. L I Schiff, *Quantum Mechanics*, McGraw Hill Education; 4th edition, 2017.
3. David Griffiths, *Introduction to Quantum Mechanics*, Pearson India (LPE), 2nd Ed, 2013.
4. R Shankar, *Principles of Quantum Mechanics*, Pearson India (LPE), 2nd Ed, 2005

25PHY402 (Major 18)	Atomic and Molecular Spectroscopy	3 1 0 4

Course Objectives:

This course provides a fundamental understanding of atomic and molecular physics such as selection rules, spin-orbit coupling, hyperfine structure, rotational and vibrational spectra, and resonance spectroscopy.

Course Outcomes:

CO1: Explain the spectroscopic selection rules, fine and hyperfine transitions in atomic spectra
CO2: Examine rotational and vibrational spectra of diatomic and polyatomic molecules using rigid/non-rigid rotator and oscillator models.
CO3: Analyze vibrational and rotational energy levels in IR and Raman spectroscopy for molecular structure determination.
CO4: Explain the principles of ESR and NMR, including Lande g-factor and fine structures

UNIT 1:

Atomic Physics**:** Dipole selection rules examples, Natural and Doppler Broadening, Spin-orbit coupling, Lamb shift and Rutherford experiment,

UNIT 2:

Hyperfine structure: Hyperfine structure of lines, Normal and specific mass shifts, Anomalous Zeeman effect, Paschen-Back and Stark Effects, Quantum defect.

UNIT 3:

Molecular Physics**:** Rotational Spectra: Transition probabilities, selection rules. Rotational spectra of diatomic molecule- rigid and non-rigid rotator models. The Franck Condon principle. Dissociation energy. A brief discussion of Intensity alternation and missing lines in rotational spectra.

UNIT 4:

Vibrational spectra: Vibrational spectra of a diatomic molecule - harmonic and anharmonic oscillator models. Normal modes of vibration and their distribution into symmetry species of the molecule, Overtone and Combination Bands, Vibrational Potentials, Infrared and Raman Selection rules. Vibration-Rotation Energy Levels and Spectra: Spectra of rotational vibrational levels, Rotational Raman and IR Spectra of linear molecules and Determination of their Geometry. Rotation-Vibration Band of a Diatomic Molecule and polyatomic molecules. Vibrational structure of electronic transition

UNIT 5:

Resonance Spectroscopy: ESR and NMR. Lande g factor, Splitting of degenerate states. Precession and spectra, selection rules, fine structure, Resonance spectra of some organic molecules.

TEXT/REFERENCE BOOKS:

1. B.H. Bransden and C.J. Joachain, *Physics of Atoms and Molecules*, Pearson 2nd edition, 2003.
2. H.E. White, *Introduction to Atomic Spectra*, McGraw-Hill Education, 1963.
3. H.G. Kuhn, *Introduction to Atomic Spectra*, Prentice Hall Press; 2nd edition, 1970.
4. N Zettili, *Quantum Mechanics Concepts and Applications*, John Wiley & Sons, 2nd Ed, 2009.
5. J J Sakurai, *Modern Quantum Mechanics*, Pearson, 2nd Ed, 2016.

25PHY403 (Major 19)	**Mathematical Physics II**	**3 1 0 4**

Course Objectives: The purpose of the course is to introduce students to the methods of mathematical physics and to develop required mathematical skills to solve advanced problems in theoretical physics.

Course Outcomes

After completing the course, the student should be able to

CO1: Understand mathematical methods used in various advanced physics courses and apply the techniques in solving problems involved

CO2: Understand the theory of complex functions, with conditions, theorems related to Complex differentiation and Integration, and apply them in solving various types of real and complex integrals

CO3: Analyse and solve second-order ordinary differential equations using Series solution method etc.

CO4: Understand the Sturm-Liouville Problem and Green's functions and its usage in Physics, solutions of differential equations in rectilinear and curved coordinates with special importance to PDEs of physically relevant systems; introduction to group theory.

UNIT 1:

Complex numbers, Roots, Functions of a complex variable, Differentiation of a complex function, Cauchy-Riemann conditions, Analytic functions, Harmonic functions, Special Analytical functions, Multivalued functions and branch cuts, Singularities, and zeros of complex functions

UNIT 2:

Complex integrals, Contour integrals, Darboux inequality, Cauchy's theorem, Cauchy's integral formula, Derivatives of analytic functions, Taylor and Laurent series, Uniqueness and Convergence. Poles, Residues at Poles, Residue Theorem, Evaluation of integrals using the Residue Theorem, Jordan's lemma, Application of Residue Theorem. Applications of Complex variables.

UNIT 3:

Basics of series and first-order ODE, Second-order linear ordinary differential equations, Ordinary and singular points, Series solution: Frobenius Method, second solution, the Wronskian method, the derivative method, series form of the second solution, Polynomial solution, Solutions of Legendre, Bessel equations etc. and properties.

UNIT 4:

Partial differential equations (PDEs) in Physics: Laplace, Poisson, Helmholtz equations, treatment in curvilinear coordinates. Other PDEs of Mathematical Physics: diffusion and wave equations, Separation of variables, and other methods, Applications.

UNIT 5:

Sturm-Liouville Problem and its usage in Physics, Problems with Cylindrical symmetry: Bessel functions, Problems with Spherical Symmetry- Spherical Harmonics, Classical Orthogonal Polynomials.

Introduction to Green's function: Introduction to Green's function, Properties, Green's function in one-dimension, Application in differential equations, Eigen function expansion.

Elements of Group theory: Definition, Cyclic groups, group multiplication table, Isomorphic group, Representation, Special groups: SU(2), O(3).

TEXT BOOKS:

1. K.F. Riley, M.P. Hobson, S.J. Bence, Mathematical Methods for Physics and Engineering, Cambridge University Press, 3rd Edition, 2018.
2. G. Arfken, H. Weber and F.E. Harris, Mathematical Methods for Physicists, Elsevier Indian Reprint, 7th Edition, 2012.

REFERENCE BOOKS:

1. M.L.Boas, Mathematical Methods in Physical Sciences, Wiley, 3rd Edition, 2006.
2. J. Mathews and R.L. Walker, Mathematical Methods of Physics, Pearson India, 2nd Edition, 2004.
3. C. W. Wong, Introduction to Mathematical Physics: Methods & Concepts, Oxford, 2nd Edition, 2013.

25PHY404 (Major 20)	Electrodynamics	3 1 0 4

Prerequisites: Basics of Electricity and Magnetism, Electricity and Magnetism in Matter

Course Objectives: The aim of the course is to introduce the essential conservation laws in electrodynamics, Connection between electromagnetic phenomena and light. It also describes the physical basis of radiation, Special theory of relativity and its connection to electrodynamics, Applications of electrodynamics in particle accelerators.

Course Outcomes:

After completing the course, the student should be able to

CO1: Understand Maxwell's equations and different conservation laws used in electrodynamics

CO2: Describe electromagnetic waves, their propagation in different media, and waveguides

CO3: Acquire knowledge on potential formulations, basic theory of radiation

CO4: Understand basic aspects of the special theory of relativity, relativistic electrodynamics, and applications of electrodynamics

UNIT 1:

Review of Maxwell's equations, The Continuity Equation, Poynting's Theorem, Newton's Third Law in electrodynamics, Maxwell's Stress Tensor, Conservation of Momentum, Angular momentum

UNIT 2:

The wave equation, Sinusoidal waves, Boundary conditions: Reflection and Transmission, Polarization, The wave equation for *E* and *B*, Monochromatic plane waves, Energy and Momentum in Electromagnetic Waves, Propagation in linear media, Reflection and Transmission at Normal Incidence, Reflection and Transmission at Oblique Incidence. Electromagnetic Waves in Conductors, Reflection at a Conducting Surface, The fre- quency dependence of Permittivity, Wave Guides, The waves in a Rectangular Wave Guide, The Coaxial Transmission Line.

UNIT 3:

Scalar and Vector Potentials, Gauge transformations, Lorenz and Coulomb Gauge, Retarded Potentials, Jefimenko's equations, Lienard-Wiechert Potentials, The Fields of a Moving Point Charge.

UNIT 4:

Definition of radiation, Electric dipole radiation, Magnetic dipole radiation, Radiation from an arbitrary source, Power radiated by a point charge, Radiation reaction, The physical basis of radiation reaction.

UNIT 5:

Einstein's postulates, Geometry of relativity, The Lorentz transformations, The Structure of space time, Proper time and proper velocity, Relativistic energy and momentum, Relativistic kinematics, Relativistic dynamics, Relativistic Electrodynamics: Magnetism as a relativistic

phenomenon, How the fields transform, The field tensor, Electrodynamics in tensor notation. Relativistic potentials, Lagrangian and Hamiltonian for a relativistic charged particle in external electromagnetic fields. Applications of electrodynamics in particle accelerators.

TEXT BOOKS:

1. David J Griffiths, Introduction to electrodynamics, 4th Ed, Pearson Education India Learning Pvt. Ltd., 2015.

REFERENCE BOOKS:

1. J.D. Jackson, Classical Electrodynamics, 3rd Edition, Wiley, 2007.
2. W. Greiner, Classical Electrodynamics, 1st Ed, Springer, 2006.
3. The Physics of Particle Accelerators: An Introduction - Klaus Wille, Oxford University Press, 2000.
4. Robert Resnick, Introduction to Special Relativity, John Wiley and Sons, Inc., 2013.

25PHY405 (Major 21)	**Nuclear and Particle Physics**	**3 1 0 4**

Prerequisites

Knowledge of basic and advanced Quantum Mechanics.

Course Objectives:

The objective of the course is to impart knowledge about basic nuclear physics properties and nuclear models for understanding of related reaction dynamics and basic concepts and fundamental principles of particle physics.

Course Outcomes:

After completing the course, the student should be able to

CO1: Understand fundamental properties of nuclei and particles such as binding energy, angular momentum etc.
CO2: Understand key theories and models of nuclear structures
CO3: Familiarize the mechanism of nuclear reactions
CO4: Gain insights into the classification of fundamental particles and their interactions

UNIT 1

Basic Concepts: History and Overview, Units and Dimensions, Nuclear Properties, Radius, Mass and Abundance of nuclides, Binding energy, Angular Momentum, Spin and Parity, Electromagnetic moments, and nuclear excited states

UNIT 2

Nuclear Structure: The Deuteron, Nucleon-Nucleon Scattering, Proton-Proton and Neutron-Neutron Interactions, Properties of Nuclear Forces, The Exchange Force Model, Nuclear Models, Liquid-Drop Model, Shell Model, Collective Model of the Nucleus

UNIT 3

Radioactive Decays: Alpha Decay, The Q-value of alpha decay, Gamow's theory of alpha decay, Beta decay, Fermi theory of beta decay, Parity violation in beta decay, Gamma Decay, Internal conversion, Nuclear Isomers

UNIT 4

Nuclear Reactions: The Optical Model, The Compound Nucleus and Direct Reactions, Resonance Reactions, Heavy-Ion Reactions, Nuclear Fission, Characteristics of Fission, Energy in Fission, Nuclear Fusion, Characteristics of Fusion, Solar Fusion.

UNIT 5

Particle Physics: Particle Interactions and Families, Symmetry and Conservation laws, Standard Model, Quark Dynamics, Grand Unified Theories.

TEXT BOOKS:

1. S. Krane, Introductory Nuclear Physics, 2nd Edition, Wiley India Pvt Ltd, 2013.

REFERENCE BOOKS:

1. V. Devanathan, Nuclear Physics, Narosa Publishing House, 2012.
2. B. Povh, K. Rith, C. Scholz, F. Zetsche, Particles and Nuclei: An Introduction to the Physical Concepts, Springer; 6th Edition, 2008.
3. A. Das, T. Ferbel, Introduction to Nuclear and Particle Physics, World Scientific Publishing Co Pte Ltd, 2nd Edition, 2003.
4. A. Seiden, Particle Physics a comprehensive introduction, Pearson, 1st Edition, 2004.
5. W.E. Burcham and M. Jobes, Nuclear and particle Physics, Prentice Hall, 1994.

25PHY411 (Major 22)	**Condensed Matter Physics**	**3 1 0 4**

Course Objective:

The course provides an understanding of X-ray diffraction and the origin of energy bands in solids. It covers semiconductor physics and provides insights into basic semiconducting devices.

Course Outcomes:

On completion of the course, students will be able to:

CO1: Acquire knowledge of the reciprocal lattice concept and X-ray diffraction methods.

CO2: Understand the origin and calculation of the energy gap in solids.

CO3: Understand the types and electrical properties of semiconductors and devices.

CO4: Describe the optical properties of different solids

UNIT 1:

Wave Diffraction and Reciprocal Lattice: Miller indices and its relationship with Inter planar spacing, Scattered Wave Amplitude - Fourier Analysis - Reciprocal Lattice Vectors - Diffraction Conditions - Laue Equations. Experimental methods – Laue method – Rotating crystal method – Powder or Debye-Scherrer method. Brillouin Zones: Simple Cubic, FCC, and BCC lattices. Fourier Analysis of the Basis: Structure Factor of cubic and hexagonal lattices, Atomic Form Factor.

UNIT 2:

Energy Bands: Origin of Band gap - Nearly free electron model - Bloch Functions - Kronig-Penney model. Methods of Calculation of Energy bands: Reduced zone-periodic zone schemes. Tight Binding method (LCAO), Pseudopotential method.

UNIT 3:

Semiconductors: energy band structure, intrinsic and extrinsic semiconductors, Effective mass, carrier concentration, Hydrogenic model of impurity levels, law of mass action, Compensated doping, Degenerate Semiconductors, Fermi levels of intrinsic and extrinsic semiconductors, Temperature-dependent conductivity and mobility, Direct and indirect gap semiconductors, Hall effect

UNIT 4:

Semiconductor Devices: Built-in-potential - Space Charge region -electric field across junction, Forward and reverse bias - band diagram, minority carrier distribution across the junction in forward and reverse bias - boundary conditions - Basics of MOSFET – Structure of MOSFET, Optoelectronic devices.

UNIT 5:

Optical properties of solids: Kramers-Kronig relations; Sum rules, Dielectric function for ionic lattice, Polaritons, Polarons, Dielectric function for free electron gas; loss spectroscopy. Optical properties of metals- Plasmons, skin effect, and anomalous skin effect. Free carrier absorption in semiconductor and Excitons: Interband transition - direct and indirect transition, Mott-Wannier excitons, Frenkel excitons, Luminescence.

Text Book:

1. Charles Kittel, Introduction to Solid State Physics, Eighth Edition, Wiley, 2016.

Reference Books:

1. Philips Philip, Advanced Solid State Physics, Cambridge University Press; second edition, 2012.
2. Philip Hofmann, Solid State Physics - An Introduction, second edition, Wiley-VCH Verlag GmbH & Co, 2015.
3. N.W. Ashcroft and N.D. Mermin, Solid State Physics, Cengage Learning India, first edition, 2003.
4. Donald Neeman, Semiconductor physics and devices, Basic principles, 3rd Edition, McGraw-Hill International, 2011.
5. S. O. Kasap, Physics of Electronic Materials and Devices, 4th Edition, McGraw-Hill Education, 2018.

25PHY412 (Major 23)	Advanced Experimental Techniques	3 1 0 4

Course Objectives:

This course explores error analysis, Fourier transforms, X-ray diffraction techniques, and various detection methods. It also covers microscopy techniques such as SEM and TEM, along with spectroscopy principles, including IR, EPR, and NMR, emphasizing instrumentation and data analysis.

Course Outcomes:

On completion of the course, students will be able to:

CO1: Apply error analysis and quantification of error propagation in linear/non-linear systems

CO2: Understand and apply Fourier transforms and their relevance in extracting signals from the time domain and displaying in the frequency domain

CO3: Understand the principles of diffraction and various types of spectroscopy techniques.

CO4. Interpret 1D X-ray diffraction data, understand imaging modes in microscopes, and interpretation of signals from various spectroscopic instruments.

UNIT 1:

Error and data analysis: Review of error analysis – estimate confidence intervals – statistical inferences – linear and nonlinear regression analysis including analysis (χ^2 test), correlation analysis (R^2)

UNIT 2:

Review of Fourier Transforms: Time domain and frequency domain spectra, Implementing Fast Fourier Transforms.

UNIT 3:

X-ray diffraction and detectors Production of X-rays, Scattering from an electron, atom and unit cell (calculation of structure factors), Powder X-ray diffraction and determination of crystal structures from diffraction data, particle and photon detectors: GM counter, Scintillation detector, Proportional counter

UNIT 4:

Microscopy: Scanning electron microscopy and transmission electron microscopy – Discussion of electron sources, Secondary and Backscattered electrons, analytical electron microscopy, electron diffraction, amplitude and phase contrast microscopy.

UNIT 5:

Spectroscopy: Review of IR, EPR and NMR spectral lines including selection rules, calculation of *g*-factor, instrumentation for IR, EPR, and NMR

TEXT/REFERENCE BOOKS:

1. Bevington and Robinson, Data Reduction and Error Analysis for the physical sciences, 3rd Ed., McGraw-Hill Education, 2002.
2. John. R Taylor, An introduction to error analysis: The study of uncertainties in physical measurements, 2nd Ed., University Science Books, 1997.

3. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Ed., Wiley, 2015.
4. J. F James, A students guide to Fourier Transforms, 3rd Ed., Cambridge University Press, 2012.
5. S S Kapoor and V S Ramamoorthy, Nuclear Radiation detectors, New Age International, 1993.
6. Ramakanth Hebbar, Basics of X-ray diffraction and its applications, 1st Ed., I. K. International Publishing House, 2011.
7. B E Warren, X-ray diffraction, New edition Ed., Dover Publications Inc. 1990.
8. Ray F Egerton, Physical Principles of Electron Microscopy: An introduction to SEM, TEM and AEM, Springer, 2005.
9. Colin Banwell, Elaine Mccash, Fundamentals of Molecular spectroscopy, McGraw Hill Education, 4th Ed., 1994.

MAJOR SPECIAL COURSES:

25PHY431 (Major 24)	**Compact Stars**	**3 1 0 4**

Pre-requisites

Knowledge of basic and advanced astrophysics.

Course Objectives

The objective of the course is to gain knowledge about low and high energy cold dense matter physics and their application to understand the formation and basic properties of compact stars.

Course Outcomes: After completion this course student able to

CO1: Learn the key ideas and concepts of cold equation of state below neutron dripline.
CO2: Analyze and solve problems related to white dwarf.
CO3: Learn the key ideas and concepts of cold equation of state above neutron dripline.
CO4: Analyze and solve problems related to neutron stars.
CO5: Analyze and solve problems related to black holes.

UNIT 1: Cold Equation of State below Neutron Dripline

Thermodynamic Preliminaries, Kinetic Theory, Equation of State of a Completely Degenerate, Ideal Fermi Gas, Electrostatic Corrections to the Equation of State, Inverse decay: The Ideal, Cold n-p-e Gas, Beta-Equilibrium Between Relativistic Electrons and Nuclei: The Harrison-Wheeler Equation of State.

UNIT 2: White Dwarf

The Onset of Degeneracy, Polytropes, The Chandrasekhar Limit, Improvements to the Chandrasekhar White Dwarf Models, Comparison with Observations: Masses and Radii, Structure of the Surface Layers, Elementary Treatment of White Dwarf Cooling, Crystallization and the Melting Temperature, Heat Capacity of a Coulomb Lattice, Refined Treatment of White Dwarf Cooling, Comparison with Observations.

UNIT 3: Cold Equation of State above Neutron Dripline

The Baym-Bethe-Pethick Equation of State, The Nucleon-Nucleon Interaction, Saturation of Nuclear Forces, Dependence of the NN Potential on the Nucleon Separation, The Yukawa Potential, The Δ-Resonance, Pion Condensation, Ultrahigh Densities, Quark Matter.

UNIT 4: Neutron Stars

Ideal Gas Equation of State in the Nuclear Domain, Observations of Neutron Star Masses,

The Maximum Mass, The Effects of Rotation, Observed Properties of Pulsars, The Dispersion Measure, The Magnetic Dipole Model for Pulsars, Superfluidity in Neutron Stars, Pulsar Glitches and Hadron Superfluidity, Neutrino Reactions in Neutron Stars, Weak Interaction Theory, Free Neutron Decay, The Modified URCA Rate, Other Reaction Rates.

UNIT 5: Black Holes

History of the Black Hole, Schwanschild Black Holes, Test Particle Motion, Massless Particle Orbits in the Schwanschild Geometry, Nonsingularity of the Schwanschild Radius, Kerr Black Holes, The Area Theorem and Black Hole Evaporation.

TEXT BOOK:

1) Stuart L. Shapiro and Saul A. Teukolsky, Black Holes, White Dwarfs, and Neutron Stars, John Wiley & Sons, Inc (1983).

REFERENCE BOOK:

1) Norman K. Glendenning, Compact Stars, Astronomy & Astrophysics Library, 2Ed., (2000).

25PHY432 (Major 24)	**Nanostructures: Theory and Applications**	**3 1 0 4**

Prerequisites

Knowledge of basic quantum mechanics.

Course Objectives

The objective of the course is to learn about nanostructures and apply quantum mechanics to understand the phenomena related to nanostructures.

Course Outcomes: After completion of this course, the student will:

CO1: Learn the key ideas and concepts related to layered nanostructures.
CO2: Learn and apply quantum mechanics to quantized motion and quantum states.
CO3: Learn the basic features of quantum states in atoms and molecules.
CO4: Analyze and solve problems related to quantization in nanostructures.
CO5: Learn about basic features of nanostructures and their applications.

UNIT 1: Layered Nanostructures

The motion of a free electron in vacuum, an electron in a potential well with infinite barriers, an electron in a potential well with finite barriers, Propagation of an electron above the potential well, Tunneling: propagation of an electron in the region of a potential barrier.

UNIT 2: Quantized Motion and Quantum States

Rectangular Potential Well, Spherically symmetric Potential Well, Quantum Harmonic Oscillators, Stationary perturbation theory for a system with non-degenerate states, Stationary perturbation theory for a system with degenerate states, Non-stationary perturbation theory, The Quasi-Classical Approximation.

UNIT 3: Quantum States in Atoms and Molecules

The Hydrogen Atom, The emission spectrum of the hydrogen atom, The spin of an electron, Many-electron atoms, The wave function of a system of identical particles, The Hydrogen Molecule.

UNIT 4: Quantization in Nanostructures

The number and density of quantum states, Dimensional quantization and low-dimensional structures, Quantum states of an electron in low-dimensional structures, The number of states and density of states for nanostructures, Double-quantum-dot structures, A one-dimensional super lattice of quantum dots, A three-dimensional super lattice of quantum dots.

UNIT 5: Nanostructures and their applications

Methods of fabrication of nanostructures, Tools for characterization with nanoscale resolution, selected examples of nanodevices and systems.

Text Book:

1. V. V. Mitin, D. I. Sementsov and N. Z. Vagidov, Quantum Mechanics for Nanostructures, Cambridge University Press (2010).

Reference Book:

1. V. V. Mintin, V. A. Kochelap, M. A. Storscio, Quantum Heterostructures: Microelectronics and Optoelectronics, Cambridge University Press (2000).

25PHY433 (Major 24)	Thermodynamics of Materials	3 1 0 4

Prerequisites: The student is expected to have covered topics in basic solid-state physics/ crystal physics and a basic course in thermodynamics.

Course Outcomes:

CO1. Understand the concept of crystalline defects in solids and their implications in phase diagrams

CO2. Apply the notion of effective charges to write defect chemistry equations

CO3. Understand how to construct binary phase diagrams

CO4. Understand the concept of diffusion in solids and their implications in phase transitions.

UNIT 1: Defect Chemistry

Point and electronic defects; Kröger-Vink notation; Effective charge on a defect; Frenkel and Schottky defects; Defect formation and reaction equations; Extended defects – Line and planar defects; Population and energy of defects: Equilibrium population of vacancies, Schottky and Frenkel defects; Energy of a point defect and a line defect; Non-stoichiometric defects – the phase diagram.

UNIT 2: Thermodynamics of Solid Solutions

Review of basic thermodynamic functions – heat capacities, enthalpy, entropy, chemical potential, activity and activity coefficients; Statistical definition of entropy; Thermodynamics of solutions – entropy, enthalpy and free energy of solution and mixtures; First order and second order phase transitions; Approximations to the free energy function – Ideal solution, Regular solution and Sub-lattice model; the calculation of Phase Diagrams (CALPHAD) technique using the sub-lattice model.

UNIT 3: Binary Phase Diagrams

The Gibbs phase rule; the common tangent rule; the Lever rule; understanding the binary phase diagram; Miscibility gap.

UNIT 4: Diffusion

Basic review of parabolic partial differential equations (PDEs); solution by analytical and numerical methods; Fick's laws; solution of the Fick's diffusion equation; Mechanisms of diffusion; Kirkendall effect.

UNIT 5: Non-classical diffusion

Overview of the types of solid state phase transitions; Failure of the classical Fick's law; Spinodal decomposition; Cahn-Hillard (C-H) equation; Solution of the C-H equation using the semi-implicit Fourier spectral method; Using the C-H equation for understanding microstructural evolution in solids.

Text books/References:

1. "Physical metallurgy principles" by Robert E Reed-Hill and Reza Abbaschian, Chapters 3-5.
2. "Defects in Solids" by Richard J Tilley, Chapters 2-4.
3. "Thermodynamics of materials", by Gaskell.
4. "Thermodynamics of microstructures" by Taiji Nishizawa
5. "Statistical Thermodynamics and model calculations" by Tetsuo Mohri-Chapter 10 of "Alloy Physics".
6. "Mathematics of diffusion" by J. Crank, Oxford University Press

25PHY434 (Major 24)	**Optoelectronics**	**3 1 0 4**

Pre-requisite: Basic Electrodynamics

Course Objectives: The objective of the course is to give students an introduction to optoelectronic fundamentals and devices. This course serves as a perquisite course to prepare students to do research in the semiconductor optics and optoelectronics devices

UNIT 1: Review of Basic Concepts

Electromagnetic waves, Maxwell's and Fresnel equations, Introductory quantum mechanics, Semiconductors, Einstein relations

Growth of semiconductor materials – bulk and epitaxial growth

UNIT 2: Electron–Photon Processes

Review of Semiconductors and Energy bands, p-n junction diodes, Carrier radiative recombination and light-emitting devices, Stimulated processes, Lasing mechanism and modes, Semiconductor laser

UNIT 3: Photon–Electron Processes

p-n junction photodiode, Photodiode materials, Quantum efficiency and responsivity, p-i-n photodiode, Avalanche photodiode, Heterojunction photodiode, Phototransistors, Photoconductive detectors: Gain, Noise in photodetectors, Photo-voltaic devices.

UNIT 4: Photon-Photon Processes

Waveguides, Planar slab waveguide, Eigenvalues for the slab waveguide, Optical mode confinement, Dispersion in waveguides, Coupling of modes between waveguides, Coupling

between optical sources and waveguides, Grating couplers, Coupling coefficient, Propagation optical fibers, Dispersion, Solitons in nonlinear fibers.

UNIT 5: Advanced Optoelectronics

Photonic and optoelectronic integrated circuits, Organic, Molecular and Terahertz optoelectronics, Display technology, Optoelectronic nanomaterials.

Text Books / Reference Books:

1. S. O. Kasap. "Optoelectronics and Photonics", Pearson Prentice Hall, Second Edition, 2012.
2. Pallab Bhattacharya, "Semiconductor Optoelectronic Devices," Second Edition, Prentice-Hall, 2017.
3. John Wilson and John Hawkes, "Optoelectronics", Prentice-Hall Europe, 1998.
4. Govind P. Agrawal, Niloy K. Dutta. "Semiconductor Lasers", Second Edition, Springer-Verlag, 1993.
5. Jasprit Singh, "Electronic and Optoelectronic properties of semiconductor structures", Cambridge University Press, 2003.
6. Mitsuo Fukuda, "Optical Semiconductor Devices", John-Wiley and Sons, 2005.
7. Ben G. Streetman and Sanjay Kumar Banerjee, "Solid State Electronic Devices," Seventh Edition Global Edition, Pearson, 2016.
8. Clifford R. Pollock, "Fundamentals of Optoelectronics", Richard d Irwin, 1995.
9. Emmanuel Rosencher, Borge Vinter, "Optoelectronics", First Edition, Cambridge University Press, 2002.

II. MINOR COURSES:

LAYOUT OF MINOR COURSES IN THE CURRICULUM

Course Code	Course Title	L T P	Cr	
	SEMESTER 1			
Minor1	Matrix Algebra and Calculus	2 1 0	3	
Minor2	Chemistry I - General Chemistry	2 1 0	3	
	SEMESTER 2			
Minor 3	Differential Equations	2 1 0	3	
Minor 4	Chemistry II - Principles of Physical Chemistry	2 1 0	3	
	SEMESTER 3			
Minor 5	Introduction to Scientific Computing Using Python	2 0 1	3	
	SEMESTER 4			
Minor 6	Introduction to Computational methods	2 1 0	3	
Minor 7	Applied Electronics	2 1 0	3	
	SEMESTER 5			
Minor 8	Core Elective I	3 0 0	3	
	Astronomy and Astrophysics			
	Introduction to Radiation Physics			
	Physics of Semiconductors			
	Physics of Nanomaterials			
	SEMESTER 6			
Minor 9	Core Elective II	3 0 0	3	
	Nonlinear Dynamics			
	Advanced Classical Dynamics			
	Electrochemical Energy Storage Systems			
	Sustainable Physics: Principles and Applications			
	SEMESTER 7			
Minor 10	**Core Elective III**	3 0 0	3	
	Special Theory of Relativity			
	Fundamentals of Quantum Computation C			
	Thin Film Technology			
	Advanced Solar Cell Fabrication			
	SEMESTER 8			
Minor 11	**Core Elective IV**	3 0 0	3	
	Introduction to General Theory of Relativity			
	Physics of Radiation Therapy			
	X-Ray C Electron Diffraction Techniques			
	Micro and Nano Magnetism Materials and its Applications			

25MAT107 (Minor 1)	Matrix Algebra and Calculus	2 1 0 3

Course Outcomes:

CO1: To Understand the various methods for solving system of linear equations and apply to some physics problems.

CO2: To understand the eigen values and eigen vectors and apply to some problems.

CO3: To learn the scalar and vector fields, gradient, divergence and curl of vector fields and their physical interpretations

CO4: To learn line integral, surface integral and volume integrals. To understand Greens Theorem, Divergence theorem and Stokes theorem.

Systems of Linear Equations: Linear System of Equations, Gauss Elimination, Consistency of a linear system of equations.

Eigen value problems: Eigen values, Eigen vectors, Properties of Eigen values and Eigen vectors, Cayley-Hamilton theorem, Some Applications of Eigen value Problems, Similarity of Matrices, Diagonalization of a matrix, Quadratic forms and Canonical form of a quadratic form.

Vector differentiation: Limit of a vector function – continuity and derivative of vector function - Geometrical and Physical significance of vector differentiation - Partial derivative of vector function – gradient and directional derivative of scalar point functions – Equations of tangent plane and normal line to a level surface. Divergence and curl of a vector point function – solenoid and irrational functions – physical interpretation of divergence and curl of a vector point function.

Integration of vector functions – Line, surface and volume integrals. Gauss - Divergence Theorem – Green's Theorem – Stoke's Theorem (Statements only). Verification of theorems and simple problems.

TEXT BOOKS

1. 'Advanced Engineering Mathematics', Erwin Kreyszig, John Wiley and Sons, 10th edition, 2023.
2. Vector Calculus with Applications to Physics, Shaw James Byrnie – 2009.
3. Advanced Engineering Mathematics by Dennis G. Zill and Michael R.Cullen, second edition, CBS Publishers, 2012.

25CHY104 (Minor-2)	General Chemistry	2 1 0 3

Course objective: The course is aimed to provide fundamental understanding of chemical bonding, crystal structure, chemistry of acids, bases, nonaqueous solvents and the stoichiometric calculations for chemical analysis

CO	Course Outcomes
CO01	Understand the foundations for atomic structure using classical mechanics and then by quantum mechanics and use them to solve problems related to energy, shapes and electronic configurations of the atomic orbitals.
CO02	Apply various theories on chemical bonding to solve i. stability ii. shapes and iii. the reactivity of molecules
CO03	Understand the structure and bonding in crystals
CO04	Understand the science of acids and bases and reactions in nonaqueous solvents
CO05	Apply the fundamental principles stoichiometric calculations and reactions for chemical analysis

Unit 1: Atomic structure [10 h]

Bohr's model of hydrogen atom, hydrogen spectrum, Bohr-Sommerfeld theory. Planck's quantum theory of radiation, dual character of electrons - de Broglie's equation, Heisenberg's uncertainty principle, photoelectric effect. Schrodinger wave equation, Eigen values, significance of wave function (ψ and ψ^2) and quantum numbers. Shapes of atomic orbitals - s, p, d and f. Aufbau principle, Hund's rule, Pauli's exclusion principle, electronic configuration of elements.

Unit 2: Chemical bonding [12 h]

Ionic bonding, lattice energy. Born-Lande equation and Born-Haber cycle. Covalent bonding, formation of H_2, orbital theory of covalency. Hybridisation – VSEPR theory, sigma and pi bonds, formation of covalent compounds. Properties of covalent compounds. Molecular orbital theory – homo diatomic molecules and hetero di and triatomic molecules. Polar and non-polar covalent bonds, polarization of covalent bond - polarizing power, polarizability of ions and Fajan's rule. Co-ordinate covalent compounds and their characteristics. Metallic bond - free electron, valence bond and band theories.

Unit 3: Structure and Bonding in Solids [10 h]

Crystalline and amorphous solids, indices - Miller indices, space lattice and unit cell, types of crystals - molecular, covalent, metallic and ionic crystals. Close packing of spheres – hexagonal, cubic and body centered cubic packing – density, coordination numbers, tetrahedral and octahedral holes. Body centered and primitive structures. Defects in crystals – stoichiometric, non-stoichiometric, extrinsic and intrinsic defects. Ionic solids - structures of MX, MX_2 and MX_3, Braggs law and X-ray diffraction.

Unit 4: Acids, Bases and Non-aqueous solvents [7 h]

Conjugate acids and bases, hard and soft acids and bases - Pearson's concept, HSAB principle and its application. Non-aqueous solvents - general characteristics of non-aqueous solvent - melting point, boiling point, latent heat of fusion and vaporization, and dielectric constant. Reactions in non-aqueous solvent liquid ammonia.

Unit 5: Chemical Analysis and Stoichiometric Calculation [6 h]

Acid base, redox, precipitation and complexometric titrations. Problems based on stoichiometry. Gravimetry principle and calculations involving estimation of barium, calciumand nickel. Data analysis, significant figures, precision and accuracy. Types of errors, mean and standard deviation.

Recommended Readings

1. Atkins, P. and Overton, T., 2010. Shriver and Atkins' inorganic chemistry. Oxford University Press, USA.
2. Catherine E. H. and Alan G. S. 2012. Inorganic Chemistry (Fourth Edition), Pearson, UK.
3. Marion Clyde Day Jr, Joel Selbin, Harry H Sisler. 2012. Theoretical Inorganic Chemistry. LLC.
4. Vogel, A. I. and Jeffery, G.H. 2009. Vogel's Quantitative Chemical Analysis, 6th Ed. Wiley.

F. A. Cotton and G. Wilkinson. 1987. Advanced Inorganic Chemistry, 5th edition, John Wiley and Sons, New York

25MAT113 (Minor 3)	**Differential Equations**	**2 1 0 3**

Course Outcomes:

CO1: To understand the basic concept of derivatives and its applications in Physics.

CO2: Define first-order ordinary differential equations and demonstrate ability to use techniques to solve them and apply these solutions in engineering contexts.

CO3: Solving the higher order ODE using method of undetermined coefficient and other methods.

Differentiation: Derivatives. Applications of Derivative: Mean Value theory – Concavity and Curve Sketching – Maxima and Minima.

Differential Equations of First Order: Formation of Differential Equations. Solutions of Differential Equations (Variable Separable, Homogeneous Equations and Equations reducible to Homogeneous Form, Linear and Equations reducible to Linear Form, Exact Differential Equations and Equations reducible to Exact form). Differential Equations not of the first degree (solvable for ‘p’, solvable for ‘y’, solvable for ‘x’, Clairaut’s Equation). Applications.

Differential Equations of Higher Order: Homogeneous Linear Differential Equations with Constant Coefficient and Euler- Cauchy Differential Equations, Basis of Solutions and Wronskian. Non-Homogeneous Equations - Method of Undetermined Coefficients and Method of Variation of Parameters.

TEXT BOOKS

1. ‘Advanced Engineering Mathematics’, Erwin Kreyszig, John Wiley and Sons, 10th edition, 2023.
2. Vector Calculus with Applications to Physics, Shaw James Byrnie – 2009.
3. Advanced Engineering Mathematics by Dennis G. Zill and Michael R.Cullen, second edition, CBS Publishers, 2012.

25CHY115 (Minor 4)	Principles of Physical Chemistry	2 1 0 3

Course objectives: This course aims to provide students with a strong foundation in the fundamental concepts of physical chemistry, focusing on gases, thermodynamics, and chemical kinetics. It also aims to develop problem-solving skills through the numerical application of theoretical concepts.

CO01	Develop sound knowledge to effectively solve conceptual and numerical problems, in line with the science of 'gaseous state'
CO02	Demonstrate the capability to analyze and interpret the bulk behavior of systems, based on the principles of classical thermodynamics
CO03	Exhibit the thorough understanding of both theoretical and practical aspects of chemical kinetics

Unit 1: Gaseous state [8 h]

Kinetic theory of gases, ideal gas equation, Maxwell distribution of energy and velocities, collision parameters. Relation between mean free path and coefficient of viscosity. van der Waals equation, other state equations, the law of corresponding states, liquefaction, Andrews curves, and methods for liquefaction, critical parameters, critical phenomena, critical constants, and their determination. Numerical problems.

Unit 2: Thermodynamics – I [10 h]

Thermodynamic processes - reversible and irreversible, isothermal and adiabatic processes. State and path functions. Exact and inexact differentials, the concept of heat and work. The first law of thermodynamics. Relation between Cp and Cv. Calculation of w, q, dE, and dH for expansion of ideal and real gases under isothermal and adiabatic conditions of reversible and irreversible processes. Thermochemistry - Enthalpy change of a reaction and different enthalpy changes - Bond energy and its calculation from thermochemical data. Numerical problems.

Unit 3: Thermodynamics-II [10 h]

The second law of thermodynamics - different statements of the law, Carnot's cycle and efficiency of heat engine, Carnot's theorem. Thermodynamic scale of temperature - the concept of entropy - definition and physical significance of entropy - entropy as a function of P, V, and T. Entropy criterion for spontaneous processes in an isolated system, Gibb's free energy (G) and Helmholtz free energy (A) - Gibb's - Helmholtz equation and its applications. Thermodynamic equation of state – Maxwell's relations. Numerical problems.

Unit 4: Thermodynamics – III [6 h]

Third law of thermodynamics - need for third law, calculation of absolute entropy, unattainability of absolute zero. Fugacity functions, partial molar quantities, thermodynamics of ideal solutions, real solutions. Henry's law, Raoult's law, Gibbs-Duhem equations, and Gibbs-Duhem-Margules equations. Numerical problems.

Unit 5: Chemical Kinetics [8 h]

Molecularity and order of a reaction, rate law expression, and rate constant. First, second, third,

and zero-order reactions, pseudo-first order reactions (pseudo-unimolecular reactions). Complex, parallel, chain, opposing, and consecutive reactions. Equilibrium and steady-state approximations - mechanism of these reactions. Effect of temperature on reaction rates - Arrhenius equation and its derivation, activation energy, characteristics of the activated complex. Collision theory, limitation of collision theory. Numerical problems.

Recommended readings

1. Atkins, P., Atkins, P.W. and de Paula, J., 2006. Atkins' physical chemistry. Oxford university press.
2. Gilbert William Castellan. 1983. Physical Chemistry, Addison Wesley; 3rd revised edition.
3. Ira Levin, 'Physical Chemistry', 6th edition, Tata Mcgraw-Hill Education, 2011.
4. Samuel Glasstone, Textbook of Physical Chemistry, Macmillan; 2nd edition.
5. Keith J Laidler, Chemical Kinetics, Pearson Publications, Third edition, 2003.
6. James E House, Principles of Chemical Kinetics, Second Edition, Academic Press, 2007.
7. Silbey, Alberty and Bawendi, Physical Chemistry, Fourth Edition, John Wiley and Sons.

25CSA205 (Minor 5)	**Introduction to Scientific Computing using Python**	**2 0 1 3**

Prerequisites
The students should have studied any basic computer language as a prerequisite for the course.

Objective of the course
In this course students are introduced to use Python as a tool to solve Physics problems. The emphasis is to learn using a high level programming language without actually going through the logic behind the equations that are to be coded. A minimal understanding of the basic mathematics is assumed. This develops familiarity and equips them to code a large number of physics problems and learn how to obtain results and plots using the software.

At the end of the course students will be able to:
CO1 : Master the fundamentals of writing Python scripts.
CO2 : Use basic mathematical methods in Python to solve physical problems
CO3 : Write Python functions to facilitate code reuse.
CO4 : Discover how to work with lists and sequence data.
CO5 : Use python libraries like NumPy, SciPy etc to mathematically evaluate physical systems

UNIT 1: Introduction to Python Programming

History of Python Programming Language, Thrust areas of Python in physics, Integrated Development Environments, installation and use of python distribution: Anaconda, Spyder, Jupiter notebooks

Fundamental programming with Python : Designing a Program, identifiers, keywords, operators, and expressions. Arithmetic, Logical and Assignment operators, Precedence, Data types: Basic data types: Strings and numbers, displaying an output, type conversion, basic string operations& methods, format specifiers

UNIT 2: Tuples, Lists & Dictionaries

Tuples: immutable sequences, creating tuple, basic tuple operations. **Lists:** mutable sequences, basic list operations, List methods Dictionaries: basic dictionary operations, dictionary method User input variable.

UNIT 3: Control structures

Decision Structures: If ,If ----else, if ….elif…..else, nested if decision flow statements.
Repetition Structures: condition controlled: while loop. Count controlled: for loop, sentinals, continue and break statements, try and except statements

UNIT 4: Functions & Files

Built in function, modules, void function, flow charting, hierarchy charts, Local variables and scope, passing an argument function, value returning functions, Random number generation
Files: introduction to file input and output

UNIT 5: Scientific computing packages

Numpy: -Array object, creating array, matrix, indexing, slicing, resizing, reshaping, arithmetic operations, functions, matrices and vector operations **Matplotlib:** basic plotting, **Scipy:** Linear algebra operations, equation solving

Text Book

1. Mark Lutz, “Learning Python” O'Reilly Media,2013.

Reference Books

1. Robert Johansson, “Numerical Python: Scientific Computing and Data Science Applications with Numpy, SciPy and Matplotlib” Apress, 2019.
2. Rubin H. Landu, Manuel J. Paez, and Cristian C.Bordeianu, “Computational Physics Problem solving with Python” - Third Edition, Wiley VCH, 2015.

25CSA215 (Minor 6)	Introduction to Computational methods	2 1 0 3

Course Objectives: This course delves into a broad array of topics centered on numerical methods and their applications, spanning mathematical modeling, algebraic equation solving, curve fitting, numerical integration, as well as ordinary and partial differential equations.

Course outcomes:

At the end of the that students can expect after completing this course:

CO1: Model real-world problems using mathematical and computational methods, understanding the inherent errors in numerical computations.
CO2: Analyze and solve ordinary and partial differential equations using various numerical techniques.
CO3: Perform curve fitting, interpolation, and regression analyses to interpret and model data effectively.
CO4: Apply learned techniques to a variety of scientific and engineering applications, including computational fluid dynamics, heat conduction, and other physical simulations.

UNIT 1

Modelling, Computers and Error Analysis: Mathematical Modelling, Programming and Software, Approximations and Round off errors, Truncation errors and the Taylor series.

UNIT 2

Algebraic Equations and Curve Fitting: Bracketing Methods, Open Methods, Roots of Polynomials, Gauss Elimination, LU Decomposition and Matrix Inversion, Special Matrices and Gauss-Seidel, Least-Squares Regression, Interpolation, Fourier Approximations

UNIT 3

Numerical Integration and Differentiation: The Trapezoidal Rule, Simpson's Rules, Open Integration Formulas, Multiple Integrals, Gauss Quadrature, Improper Integrals, Richardson Extrapolation, Derivatives of Unequally Spaced Data, Derivatives and Integrals for Data with Errors, Partial Derivatives

UNIT 4

Ordinary Differential Equations: Euler's Method, Runge-Kutta Methods, System of Equations, Stiffness, Multistep Methods, General Methods for Boundary-Value Problem, Eigenvalue Problems

UNIT 5

Partial Differential Equations: The Laplace Equation, Solution Technique, Boundary Conditions, The Control Volume Approach, The Heat Conduction Equation, Explicit Methods, Parabolic Equations in Two Spatial Dimensions

Text Book

1. Steven Chapra, Raymond Canale, Numerical Methods for Engineers, 7th Ed., McGraw-Hill Higher Education, 2015.

Reference Books

1. V. Rajaraman, Computer Oriented Numerical Methods, PHI LEARNING PVT LTD, 2016.

25PHY214 (Minor 7)	**Applied Electronics**	**2 1 0 3**

Prerequisite: Basic of Electronics

Objective of the course: Making the students to understand, analyse and construct Analog and digital circuits for various applications.

Course Outcomes:

At the end of the course students will be able to

CO 1: Analyse second order AC circuits and study its applications

CO 2: Understand the principles of digital logics and circuits.

CO 3: design and use digital circuits for various applications.

UNIT 1

Second order circuits: Source-Free Series *RLC and* Parallel *RLC* Circuit, Step Response of Series *RLC and* Parallel *RLC* Circuits. Sinusoids and Phasors: Phasors, Phasor Relationships for Circuit elements, General second-Order Circuits, Second-Order Op Amp Circuits.

UNIT 2

Introduction to logic circuits - Variables and functions, inversion - Truth tables - Logic gates and Networks - Boolean algebra - Synthesis using gates - Design examples - Optimized implementation of logic functions - Karnaugh map - Strategy for minimization - Minimization of product of sums forms - Incompletely specified functions - Multiple output circuits - Tabular method for minimization.

UNIT 3

Number representation and arithmetic circuits: Addition of unsigned numbers - Signed numbers - Fast adders Combinational circuit building blocks - Multiplexers - Decoders - Encoders - Code converters - Arithmetic comparison circuits.

UNIT 4

Sequential circuit building blocks - Basic latch - Gated SR latch - Gated D latch - Master slave and edge triggered - D flip-flops - T flip-flop - JK flip-flop - Registers - Counters - Reset synchronization - Other types of counters.

UNIT 5

Analog to digital conversion, digital to Analog conversion, microcontrollers, ardunio and raspberry pi based programmable circuits.

Text / Reference books

1. C. K. Alexander and M. N. O. Sadiku, Fundamental of Electrics circuits, 5th Ed, McGraw Hill Education, 2013.
2. Stephen Brown, Zvonko Vranesic, "Fundamentals of Digital logic with Verilog Design", Tata McGraw Hill Publishing Company Limited, Special Indian Edition, 2007.
3. M Morris Mano and Michael D Ciletti, "Digital Design with Introduction to the Verilog HDL", Pearson Education, Fifth Edition, Fifth Edition, 2015.
4. Thomas L. Floyd, Digital Fundamentals, 11th edition, Pearson Education press,2014.

Donal P. Leach, Albert Paul Malvino and Gautam Saha, Digital Principles and their Applications, 8th Ed, McGraw Hill Education, 2015.

25PHY341 (Minor 8)	**Astronomy and Astrophysics**	**2 1 0 3**

Course Outcomes: After completion this course student will be able to

CO1: Recognize scientific and quantitative methods and the differences between these approaches and other methods of inquiry used in astronomy.

CO2: Identify and recognize the differences among competing modern astronomical scientific theories.

CO3: Develop critical/logical thinking, scientific reasoning, and problem solving skills in the area of astronomy.

Unit 1

Astronomy, an Observational Science: Introduction - Indian and Western Astronomy– Aryabhatta - Tycho Brahe's observations of the heavens - The laws of planetary motion - Measuring the astronomical unit - Isaac Newton and his Universal Law of Gravity - Derivation of Kepler's third law, The wave nature of light, Stellar Parallax, The Color index.

Unit 2

The Sun - The formation of the solar system - Overall properties of the Sun - The Sun's total energy output – Blackbody radiation and the sun's surface temperature - The Fraunhofer lines in the solar spectrum and the composition of the sun - Nuclear fusion - The proton–proton cycle - The solar neutrino

problem - The solar atmosphere: photosphere, chromosphere and corona - Coronium - The solar wind - The sunspot cycle.

Unit 3

The Planets - Planetary orbits - Orbital inclination - Secondary atmospheres- The evolution of the earth's atmosphere. The Properties of Stars: Stellar luminosity - Stellar distances - The hydrogen spectrum - Spectral types - Spectroscopic parallax - The Hertzsprung–Russell Diagram - The main sequence - The giant region - The white dwarf region – The stellar mass – luminosity relationship - Stellar lifetimes - Stellar Evolution.

Unit 4

Basic equations of stellar structure, Constructing stellar models, Stellar quantities, Stellar observational data, HR Diagram star clusters, Main nuclear reactions in stellar interior, Formation of protostar, Pre-main sequence star – Hayashi line, Interstellar Medium (ISM)- HI region, HII region, Intercloud Medium, Giant Molecular cloud, Interstellar dust – Interstellar extinction, Interstellar redding.

Unit 5

Supernovae- type I and type II, Degeneracy pressure of a Fermi gas, White Dwarf and Chandrasekhar mass limit, Neutron stars, Pulsars, Black holes, Event Horizon and Schwarzchild radius.

Text Book and References:

1. *Ian Morison, "Introduction to Astronomy and Cosmology", John Wiley & Sons Ltd, 2008.*
2. *D. C. Clarke and A.E. Roy "Astronomy: Principles and Practice", 4th Edition (Paperback), Institute of Physics Publishing 2003.*
3. B. W. Corroll and D. A. Ostlie "An Introduction to Modern Astrophysics", 2nd Edition, Combridge University Press 2017.
4. Eric Chaisson and Steve McMilan "Astronomy, A Beginner's Guide to Universe", 8th Edition, Pearson 2017.

25PHY342 (Minor 8)	**Introduction to Radiation Physics**	**2 1 0 3**

Course Outcomes: After completion of this course students will be able to

CO1: Learn about the dosimetry quantities and concepts on which radiation dosimetry is based

CO2: Explain radiation-generating equipment like linear accelerators, particle accelerators, and X-ray generators

CO3: Comprehend the interaction of photons and charged particles with matter

CO4: Apply the working principle of radiation detectors in the measurement of radiation doses.

CO5: Understand the working principle of scintillators and neutron detectors.

Unit 1

Basic Concepts of Radiation and Dosimetry Units: Radiation & need for its measurements, physical features of radiations, conventional sources of radiation, tissue equivalent materials, radiation dose, Definition of dose quantities:- Fluence, kerma, exposure, absorbed dose, Dose equivalent, Quality factor Q, effective dose equivalent, determination of dose equivalent, Radiation quality.

Unit 2

Radiation generating equipment: Considerations in designing high-energy beams, Betatrons. The Linear Accelerator (LINAC), Medical LINACs, Isotope machines, Typical Cobalt – 60 units, The Cyclotron, Particles of Radiotherapy, Production of X – rays: The X-ray tube and Simplified Circuit, Anode and Cathode Structures, X-ray Spectra, Characteristic radiation, White Radiation or Bremsstrahlung radiation, Quality of X-rays.

Unit 3

Interaction of gamma-rays- Compton effect, photoelectric, pair production, electrons, heavy charged particles, Passage of heavy charged particles through matter - Energy loss per collision – Range-energy relation - Bragg curve - Specific ionization - stopping Power - Bethe Bloch formula - Interaction of neutrons with matter - scattering - capture - neutron-induced nuclear reactions**.**

Unit 4

General properties of radiation detectors, energy resolution, detection efficiency, and dead time. Gas-filled detectors, Ionization chambers, Multiwire proportional chambers, Drift chambers, Proportional counters, space charge effects, energy resolution, time characteristics of signal pulse, position-sensitive proportional counters, and G-M Counters

Unit 5

Scintillators - Organic and inorganic scintillators and their characteristics, light detection and scintillator mounting, photomultiplier tubes. Neutron detectors - nuclear track emulsion for fast neutrons - Solid state nuclear track (SSNTD) detectors – Calorimeters- dose measurement through temperature.

Text Book and References:

1. H. E. Johns and J. R. Cunningham, “The Physics of Radiology”, 4th Edition, C C Thomas publisher, 1966.
2. Frank H. Attix, “Introduction to radiological Physics and Radiation Dosimetry” Wiley-VCH publishing, 2004.
3. Glenn F. Knoll, “Radiation Detection and Measurement”, 4th Edition, Wiley Publishing, 2010.
4. S. Tavernier, “Radiation detectors for Medical Application”, (Springer) 2006.

25PHY343 (Minor 8)	Physics of Semiconductors	2 1 0 3

Course Outcomes:

CO01 Understand crystal structure, symmetry elements, and defects in solids.

CO02 Differentiate between metals, semiconductors, and insulators through band theory of solids after learning classical and classical and quantum free electron theories.

CO03 Acquire knowledge on different types of semiconductors, determination of carrier concentrations, carrier transport phenomena, carrier generation and recombination mechanisms.

CO04 Understand the theory and operations of semiconductor devices such as p-n junction diode, BJT, field effect transistors.

CO05 Understand the theory and operations of various semiconductor optoelectronic devices.

UNIT 1: Crystal Structure of Solids

Unit cell, Bravais lattices, Crystal systems, Crystal planes and Miller indices, Symmetry elements, Defects and imperfections – Point defects, Line defects, Surface defects and Volume defects.

UNIT 2: Classical and Quantum Theories of Solids

Classical free electron theory assumptions, Drift velocity, Mobility and Conductivity, Drawbacks. Quantum free electron theory: Fermi energy, Density of States. Band theory of solids: Origin of energy bands, Effective mass, Distinction between metals, insulators and semiconductors.

UNIT 3: Carrier Transport Phenomena

Intrinsic and extrinsic semiconductors, Band structure of semiconductors, Carrier concentration in intrinsic and extrinsic semiconductors, Electrical conductivity and Conduction mechanism in semiconductors, Fermi level in intrinsic and extrinsic semiconductors and its dependence on temperature and carrier concentration, Carrier generation - Recombination, Mobility, Drift and diffusion current, Hall effect.

UNIT 4: Theory of p-n junction Diode and Transistors

p-n junction under thermal equilibrium, Forward bias, Reverse bias, Carrier density, Current, Electric field, Barrier potential, V-I characteristics, Junction capacitance and voltage breakdown. Bipolar junction transistor: p-n-p and n-p-n transistors: principle and modes of operation, current relations, V-I characteristics. Fundamentals of MOSFET, JFET, and Heterojunctions – quantum wells.

UNIT 5: Optical Devices

Optical absorption in a semiconductor, electron-hole generation, Solar cells: p-n junction, conversion efficiency, Heterojunction solar cells, Photo detectors: Photo conductors, Photodiode, p-i-n diode, Light emitting diode (LED): Generation of light, Internal and external quantum efficiency, Modern Semiconducting Devices: CCD-Introduction to nano devices, Fundamentals of tunneling devices, Design considerations, physics of tunneling devices.

TEXTBOOKS:

1. C. Kittel, “Introduction to Solid State Physics”, Wiley, Eighth Edition, 2012.
2. D.A. Neamen, “Semiconductor Physics and Devices”, TMH, Fourth Edition, 2021.

REFERENCES:

1. S.M. Sze, “Physics of Semiconductor Devices”, Wiley, Third Edition. 2015.
2. P. Bhattacharya, “Semiconductor Optoelectronic Devices”, Prentice Hall, 1996.
3. M.K. Achuthan, K.N. Bhat, “Fundamentals of Semiconductor Devices”, TMH, 2007.
4. J. Allison, “Electronic Engineering Materials and Devices”, TMH, 1990.

25PHY344 (Minor 8)	**Physics of Nanomaterials**	**2 1 0 3**

Course Objectives: To make the students to understand about physics of nanostructured materials, synthesis of nanomaterials, structure-property correlation in nanomaterials, application of nanomaterials in diversified fields along with device fabrication using various nanostructures.

Course Outcomes:

A student completing this course will:

CO1: Understand and appreciate the unique properties of nanomaterials

CO2: Understand the concept of confinement and its consequences

CO3: Become familiar with tools for characterizing nanomaterials

CO4: Become familiar with various nano devices and their principles of operation.

UNIT 1: Basics of Nanomaterials

Introduction to nanomaterials, Comparison of bulk and nanomaterials: Change in band gap, Novel properties of nanomaterial. Classification of nanostructured materials, Synthesis of nanomaterials: Classification and fabrication methods - Top down and bottom-up methods.

UNIT 2: Concept of Quantum Confinement and Phonon Confinement

Basic concepts - Excitons, Effective mass, Free electron theory and its features, Band structure of solids. Bulk to nano transition - Density of states, Quantum confinement effect - weak and strong confinement regime. Electron confinement in infinitely deep square well, Confinement in two and three dimension. Blue shift of band gap, Effective mass approximation. Vibrational properties of Solids - Phonon Confinement effect and presence of surface modes.

UNIT 3: Tools for Characterization

Structural: X-ray Diffraction, Surface Analysis: Transmission Electron Microscope, Scanning Tunneling Microscope, Atomic Force Microscope, Optical studies: UV - Visible absorption, Photoluminescence, Raman spectroscopy.

UNIT 4: Nanostructured Materials

Carbon nanotubes: Structure, electrical, vibration and mechanical properties, Applications of carbon nanotubes - Field emission and shielding, Computers, Fuel cells, Chemical sensors,Catalysis, Mechanical reinforcement. Quantum dots and Magnetic nanomaterials – Applications.

UNIT 5: Nanoelectronics and Nanodevices

Impact of nanotechnology on conventional electronics, Nanoelectromechanical systems (NEMSs): Fabrication (Lithography) and applications, Nanodevices: Resonant tunneling diode, Quantum cascade lasers, Single electron transistors: Operating principles and applications.

TEXT BOOKS:

1. Robert W. Kelsall, Ian W. Hamley and Mark Geoghegan, "Nanoscale Science and Technology", John Wiley and Sons Ltd., 2004.
2. W.R. Fahrner (Ed.), Nanotechnology and Nanoelectronics, Springer, 2006.

REFERENCE BOOKS:

1. Charles P. Poole, Jr. Frank J. Owens, "Introduction to nanotechnology", First Edition, Wiley-Interscience, 2003.
2. T. Pradeep, "Nano: The essentials: Understanding nanoscience and nanotechnology", First Edition, McGraw Hill Education, 2017.

25PHY351 (Minor 9)	**Nonlinear Dynamics**	**2 1 0 3**

Course Outcomes:

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

CO1: Identify fixed points in various dynamical systems and classify them based on their types and predict the behavior of the system.

CO2: Analyze the various types of bifurcations in one dimension (saddle node, transcritical, and pitchfork) and in two dimensions.

CO3: Gain an understanding of the properties of the most important strange attractors and chaotic dynamics.

CO4: Identify integrable systems, Hirota's bilinearization method apply it to obtain one soliton solutions of a given nonlinear partial differential equation.

Unit 1

Introduction, Phase Space, and Phase Portraits:Linear systems and their classification; Existence and uniqueness of solutions; Fixed points and linearization; Stability of equilibria; Pendulum and Duffing oscillator, Lindstedt's method; Conservative and reversible systems.

Unit 2

Limit Cycles:The van der Pol oscillator, Method of Averaging; Relaxation oscillators; Weakly

nonlinear oscillators; Forced Duffing oscillator, Method of Multiple Scales; Forced van der Pol oscillator, Entrainment; Mathieu's equation, Floquet Theory, Harmonic Balance.

Unit 3

Bifurcations:Saddle-node, trans critical, and pitchfork bifurcations; Center manifold theory; Hopf bifurcation; Global bifurcations; and Poincaré maps.

Unit 4

Chaotic Dynamics: Lorentz equations; Lorentz map; Logistics map; Lyapunov Exponents; fractal sets and their dimensions; box, pointwise and correlation dimensions; strange attractors; and forced two-well oscillator.

Unit 5

Integrable Systems and Solitons: Linear and nonlinear dispersive systems – Cnoidal and solitary waves - The Scott Russel phenomenon and derivation of Korteweg-de Vries (KdV) equation – Explicit soliton

solutions: one-, two- and N-soliton solutions of KdV equation – Hirota's bilinear method

Text Book and References:

1. J.C. Sprott, "Chaos and Time-Series Analysis", Oxford University Press, 2003.
2. G.L. Baker and J.P. Gollub, "Chaotic Dynamics", 2nd edition, Cambridge University Press, New York, 1996.
3. Edward Ott, "Chaos in Dynamical Systems", Cambridge University Press, 1993.
4. K.T. Alligood, T.D. Sauer, and J.A. Yorke, "CHAOS - An Introduction to Dynamical Systems", Springer, 1996.
5. D. Kaplan and L. Glass, "Understanding nonlinear dynamics", Springer-Verlag, New York, 1995.
6. J. M. T. Thompson and H.B. Stewart, "Nonlinear dynamics and chaos", John Wiley and Sons, New York, 1986.

25PHY352 (Minor 9)	**Advanced Classical Dynamics**	**2 1 0 3**

Course Outcomes:

CO01 Using Newton's laws of motion to solve advanced problemsinvolving the dynamic motion of classical mechanical systems.

CO02 Familiarity with different coordinate systems, concept of generalised coordinates, constraints and principle of virtual work.

CO03 Representing the equations of motion for mechanical systems usingLagrangian formulation of mechanics. Familiarity with Hamiltonian, Virial theorem, conserved quantities, symmetry etc.

CO04 Application of Lagrangian dynamics in Central force problem, Kepler's problem, Orbits, Scattering, Rotational kinematical and dynamical aspects.

Unit 1

Introduction to Lagrangian dynamics

Survey of principles, mechanics of particles, mechanics of system of particles,constraints, D'Alembert's principle and Lagrange's equation, simple applications ofthe Lagrangian formulation, variational principles and Lagrange's equations,Hamilton's principles, derivation of Lagrange's equations from Hamilton's principle,conservation theorems and symmetry properties.

Unit 2

Central field problem

Two body central force problem, reduction to the equivalent one body problem,Kepler problem, inverse square law of force, motion in time in Kepler's problem,scattering in central force field, transformation of the scattering to laboratorysystem, Rutherford scattering, the three body problem.Rotational kinematics and dynamicsKinematics of rigid body motion, orthogonal transformation, Euler's theorem on themotion of a rigid body.

Unit 3

Angular momentum and kinetic energy of motion about a point, Euler equations of motion, force free motion of rigid body.Practical rigid body problems Heavy symmetrical spinning top, satellite dynamics, torque-free motion, stability of torque-free motion - dual-spin spacecraft, satellite maneouvering and attitude control- coning maneuver - Yo-yo despin mechanism - gyroscopic attitude control, gravitygradientstabilization.

TEXTBOOKS:

1. H. Goldstein, Classical Mechanics, Narosa Publishing House, New Delhi, 1980, (Second Edition)

2. H. Goldstein, Charles Poole, John Safko, Classical Mechanics, Pearson education, 2002

(Third Edition)

3. Howard D. Curtis, Orbital Mechanics for Engineering Students, Elsevier, pp.475 - 543

4. Anderson John D, Modern Compressible flow, McGraw Hill.

REFERENCE BOOKS:

1. D. A. Walls, Lagrangian Mechanics, Schaum Series, McGrawHill, 1967.

2. J. B. Marion and S. T. Thornton, Classical dynamics of particles and systems, Ft. Worth,

TX: Saunders, 1995.

25PHY353 (Minor 9)	**Electrochemical Energy storage systems**	**2 1 0 3**

Course Outcomes:

CO01 Understanding the Basics of Electrochemistry, Energy Power relation and cell components involved in the battery fabrication

CO02 To apply the knowledge of basic electrochemistry and to fabricate the primary energy storage devices.

CO03 To apply the knowledge of basic electrochemistry and to fabricate the Secondary Batteries- Lead Acid and Li-ion Batteries (Construction, working and application)

CO04 To apply the knowledge of basic electrochemistry and understanding of various types of fuel cells (Construction, working, and application

CO05 To apply the knowledge of basic electrochemistry and understanding various types of Electrochemical supercapacitors (Construction, working, and application)

UNIT 1: Basic Principles

Review of Faradays laws, thermodynamics of electrochemical cells and kinetics of electrochemical reactions. Performance evaluation of energy storage devices - cell voltage – capacity - specific and volumetric energy and power densities, Peukert curves, Ragone plot, discharge profiles. Factors affecting the performance. Design and classification of electrochemical storage devices, importance of nanotechnology. Battery components – current collector, separator, electrolyte and active materials.

UNIT 2: Primary Batteries

The chemistry, fabrication and performance aspects, packing classification and rating of the following batteries - zinc-carbon - Leclanche type, zinc alkaline - duracell, zinc/air, zinc-silver oxide batteries, lithium primary cells - liquid cathode - solid cathode and polymer electrolyte types.

UNIT 3: Secondary Batteries

Fabrication, performance characteristics, electrode and electrolyte materials of the following batteries: Lead acid and VRLA, nickel-cadmium, nickel-zinc, nickel-metal hydride batteries, silver peroxide, lithium-ion batteries, lithium polymer cells. Advanced Batteries for electric vehicles, specifications - sodium-beta and redox batteries.

UNIT 4: Reserve Batteries and Fuel Cells

Reserve batteries - water activated, electrolyte activated and thermally activated batteries - remote activation - pyrotechnic materials. Fuel Cells-Principle, chemistry and functioning - carbon, hydrogen-oxygen, proton exchange membrane (PEM), direct methanol (DMFC), molten carbonate electrolyte (MCFC) fuel cells, solid oxide fuel cells and outline of biochemical fuel cells. Fuel cell stack technology.

UNIT 5: Supercapacitors

Types - double layer, hybrid and pseudo capacitors, symmetric and asymmetric capacitors. Mechanism of energy storage, materials for supercapacitors, carbon materials-activated carbon, carbide-derived carbon, CNT, graphene, mesoporous carbon, metal oxides, metal sulphides, conducting polymers. Effect of ratio of ion and molecule sizes and pore sizes. Electrolytes- aqueous, organic and ionic liquid. Determination of capacitor performance-cyclic voltammetry, galvanostatic charge-discharge, impedance spectroscopy. Flexible and wearable supercapacitors.

Recommended Readings

1. Beard, K.W., 2019. Linden's handbook of batteries. McGraw-Hill Education.

2. Bagotsky, V.S., Skundin, A.M. and Volfkovich, Y.M., 2015. Electrochemical power sources: batteries, fuel cells, and supercapacitors. John Wiley & Sons.

3. Allen, J. and Bard, R.L., 2000. Faulkner. Electrochemical Methods: Fundamentals and Applications, John Wiley and Sons. Inc. New York.

4. Conway, B.E., 2013. Electrochemical supercapacitors: scientific fundamentals and technological applications. Springer Science & Business Media

25PHY354 (Minor 9)	Sustainable Physics: Principles and Applications	2 1 0 3

Course outcomes

By completing this course, students will:

CO1: Develop a Strong Understanding of Sustainability Concepts in Physics: Students will be able to explain how physics contributes to solving sustainability challenges, including energy efficiency, material innovation, and environmental preservation.

CO2: Design and Evaluate Renewable Energy and Sustainable Systems: Students will have the skills to design, assess, and propose renewable energy solutions and sustainable technologies based on physical principles.

CO3: Apply Circular Economy and Resource Efficiency in Materials Science: Students will be able to incorporate circular economy principles into material science practices, promoting the reuse, recycling, and responsible management of resources in industrial applications.

Syllabus

Unit 1: Introduction to Sustainable Physics and Environmental Challenges (12 hours)

This unit introduces the concepts of sustainability and their relevance to physics, with a focus on environmental challenges and the physical principles underlying sustainable development.

- Sustainability in Physics:
  Definition and core principles of sustainability. The physics of energy consumption and resource use.

  Introduction to Sustainable Development Goals (SDGs) and their intersection with physics.

- Environmental Challenges and Resource Management:
  The physics behind climate change and global energy consumption patterns. Carbon capture and energy-efficiency technologies. Physical principles underlying the greenhouse effect, atmospheric energy balance, and planetary energy systems. Basics of Life Cycle Assessment (LCA) and its application to materials.

Unit 2: Energy Harvesting, Renewable Energy, and Storage Technologies (14 hours)

This unit explores renewable energy sources, energy-efficient materials, and technologies for sustainable energy production and storage.

- Energy Harvesting and Renewable Technologies:
  The physics of solar energy: Principles of photovoltaics, advances in solar cell technology, and materials for enhancing efficiency. Wind and hydropower: Conversion of mechanical energy into electricity; efficiency and optimization of turbines. Piezoelectric and thermoelectric materials: Converting mechanical and thermal energy into electrical energy for renewable energy harvesting.

- Energy Storage and Efficiency:
  Battery technologies: Physics of conventional and emerging energy storage solutions, including lithium-ion and sodium-ion batteries. Supercapacitors: Material innovations and physics principles for energy storage. Thermoelectric materials: Physics of converting waste heat into usable energy. Energy-efficient electronics and the role of materials science in reducing power consumption.

- Sustainable Transportation:
  Physics of electric vehicles (EVs), fuel cells, and hydrogen energy. Advances in low-energy transportation systems and sustainable infrastructure.

Unit 3: Sustainable Materials and Circular Economy in Physics (14 hours)

This unit focuses on sustainable materials, their applications, and how material science can support the circular economy and resource efficiency.

- Green and Sustainable Materials:
  Green Chemistry and its applications in material science. Development of biopolymers and bio-based composites as alternatives to traditional plastics and synthetics. Nanomaterials (e.g., graphene, MXenes) for energy storage, water purification, and other sustainable technologies. Low-energy material processing: Sol-gel methods, hydrothermal synthesis, and other energy-efficient techniques.

- Circular Economy and Resource Management:
  Recycling technologies: Physics of recycling processes and resource recovery. Upcycling and downcycling: Transforming waste materials into high-value products using physical principles. Physics of waste reduction in material design and the role of smart materials in extending product life cycles. E-waste management: Sustainable approaches to electronics recycling and resource efficiency.

Textbooks and Books:

1. "Physics for Future Presidents: The Science Behind the Headlines" by Richard A. Muller.
2. "Principles of Sustainable Energy Systems" by Frank Kreith and Susan Krumdieck
3. "Sustainable Materials: With Both Eyes Open" by Julian M. Allwood and Jonathan M. Cullen
4. "Introduction to Renewable Energy" by Vaughn C. Nelson
5. "Sustainable Energy – Without the Hot Air" by David J.C. MacKay

25PHY441 (Minor 10)	**Special Theory of Relativity**	**2 1 0 3**

Course Outcomes:

CO01 Demonstrate an understanding of the basic necessity and principles of the special theory of relativity in four dimensional Minkowski space-time.
CO02 Apply tensor notation in relativity theory and perform basic calculations in relativistic kinematics and dynamics
CO03 Understanding of covariant formulation of classical theories like electromagnetism & fluid dynamics

UNIT 1

Classical Mechanics and Relativity: Galilean Relativity, Newtonian Mechanics, Electrodynamics and Galilean Relativity, Ether, Michelson–Morley experiment, Attempts by Lorentz & Poincare.

UNIT 2

Special Theory of Relativity: Einstein's postulates, Lorentz's transformation, Length contraction, Time dilation. Relativistic Kinematics, Doppler shift, Minkowski Diagrams, Boosts and Minkowski space.

UNIT 3

Four dimensional Space-Time geometry: Space-time continuum, Lorentz transformations as coordinate transformations, tensors, contravariant and covariant objects, four vectors.

Relativistic Dynamics: Four velocity, Four momentum, Four acceleration, Relativistic Collisions, Conservation of four-momentum, Equivalence of Mass and Energy. Central force problem in relativity.

UNIT 4

Electromagnetic Theory in covariant form: Maxwell's equations in covariant form, Four dimensional vector potential, Energy-Momentum Tensor and Conservation Laws, Lagrangian formulation of Electrodynamics, Radiation.

UNIT 5

Covariant formulation Fluid Dynamics: Perfect fluids, Pressure and proper density, Energy-Momentum tensor, Relativistic Euler equations, Equation of state, Speed of sound.

The Lorenz & Poincare groups: The Lorentz and Poincare algebras and their representations.

The Principle of Equivalence and preamble to General Theory of Relativity.

Text Books:

1. N. M. J. Woodhouse, Special Theory of Relativity, Springer, 2003.
2. Steven Weinberg, Gravitation and Cosmology: Principles and Applications of the General Theory of Reactivity, Wiley India, 2008.

Reference Books:

1. Landau & Lifshitz, Classical Field Theory, University Science Books, 1E, 2004.
2. Ashok Das, Lectures on Electromagnetism, Hindustan Book Agency – World Scientific, 2013.
3. A. Einstein, Relativity: The Special and the General Theory.

25PHY442 (Minor 10)	**Fundamentals of Quantum Computation & Information**	**2 1 0 3**

Course Outcomes

At the end of the course students will be able to

CO1: Understand the logic mathematical tools behind the quantum computations.

CO2: Acquire knowledge in developing quantum circuits

CO3: Understand the logic in physical realization of quantum computers

Unit 1

Fundamental concepts: Quantum bits, Quantum computations- single and multiple qubit gates, quantum circuits, Bell states, basics of quantum teleportation. Quantum Algorithms- Classical computations on a quantum computer, Quantum parallelism, Deutsch's and Deutsch- Jozsa algorithm, experimental quantum information processing.

Unit 2

The postulates of quantum mechanics: State space, Evolution, Quantum measurements, Distinguishing quantum states, Projective measurements, POVM measurements, Phase, Composite systems.

superdense coding, The density operator, The Schmidt decomposition and purifications, EPR and the Bell inequality.

Unit 3

Quantum circuits: Quantum algorithms, Single qubit operations. Controlled operations, Measurement, Universal quantum gates, Two-level unitary gates are universal, Single qubit and CNOT gates are universal, A discrete set of universal operations, Quantum computational complexity, Simulation of quantum systems.

Unit 4

The quantum Fourier transform and its applications: Phase estimation, order-finding and factoring, General applications.

Unit 5

Quantum computers: physical realization: Guiding principles, Conditions for quantum computation, Harmonic oscillator quantum computer, Optical photon quantum computer, Optical cavity quantum electrodynamics, Other implementation schemes.

Text Book and References:

1. Michael A. Nielsen & Isaac L. Chuang, "Quantum Computation and Quantum Information" 10th Anniversary Edition, Cambridge University Press, 2010.
2. Mikio Nakahara and Tetsuo Ohmi, "Quantum Computing (From Linear algebra to Physical Realization)", CRC Press, Taylor &Francies Group, 2008.

25PHY443 (Minor 10)	Thin Film Technology	2 1 0 3

Course Outcomes

At the end of the course students will be able to

CO1. To understand the principle, differences and similarities, advantages, and disadvantages of different thin film deposition Techniques.

CO2. To understand and evaluate and use models for understanding nucleation and growth of thin films.

CO3. To understand about different instrumentation techniques and to analyze thin film properties to apply for various applications.

CO4. To improve problems solving skills related to evaluation of different properties of thin films.

UNIT 1: Preparation Methods

Physical methods: Thermal evaporation, Cathodic sputtering,

Molecular beam epitaxy and Laser ablation methods.

Chemical methods: Electrolytic deposition, Chemical vapor deposition.

UNIT 2: Thickness Measurement and Characterization

Understand and analyze the characteristics of thin films using different instrumentation techniques.Electrical, Mechanical, Optical, Microbalance, Quartz crystal methods.Analytical techniques of characterization: X-ray diffraction, Electron microscopy, High and low energy electron diffraction, Auger emission spectroscopy.

UNIT 3: Growth and Structure of Films General Features, Nucleation theories, Effect of electron bombardment on film structure, Post-nucleation growth, Epitaxial film growth, Structural defects.

UNIT 4: Properties of Thin Films

Mechanical properties: Elastic and Plastic behavior. Optical properties: Reflectance and transmittance spectra, Absorbing films, Optical constants of film material, Multilayer films, Anisotropic and isotropic films.

Electrical properties: Conductivity in metal, Semiconductor and Insulating films, Discontinuous films, Superconducting films.

UNIT 5: Magnetic Properties of Thin Films and Thin Film Devices Molecular field theory, Spin wave theory, Anisotropy in magnetic thin films, Domains in thin films, Applications of magnetic thin films. Thin film devices: Fabrication and applications.

TEXT BOOKS:

1. K.L. Chopra, “Thin Film Phenomena”, First Edition, McGraw-Hill, 1969.

2. George Hass, “Physics of Thin Films”, Volumes 1, Academic Press Inc., 1963.

REFERENCE BOOKS:

1. K. L. Chopra and S. R. Das, “Thin Film Solar Cells”, Springer, 1983.

2. L. I. Maissel and Glang, “Handbook of Thin Film Technology”, McGraw Hill Higher Education, 1970.

3. J. C. Anderson, “The Use of Thin Films in Physical Investigation”, Academic Press Inc., 1966.

4. J. J. Coutts, “Active and Passive Thin Film Devices”, Academic Press Inc., 1978.

5. R.W. Berry, P.M. Hall and M.T. Harris, “Thin Film Technology”, Van Nostrand, 1968.

25PHY444 (Minor 10)	Advanced Solar Cell Fabrications	2 1 0 3

Course Outcomes

At the end of the course students will be able to

CO1 Different methods of solar energy harvesting like solar thermal power and solar PV.

CO2: Working principle of solar PV, physics behind photocurrent and photovoltage generation in the solar cell.

CO3: Fabrication of different types of solar cell and methods to enhance solar cell efficiency.

CO4: Recent trends and current research focus on solar cell fabrication.

CO5: Hands-on Experience on Fabrication of solar cell, characterization of solar cell.

UNIT 1

The Solar Resource and types of solar energy converters, Requirements of an ideal photoconverter, Principles of a solar cell design, material and design issues; Revisions of Semiconductor Physics, Physics of semiconductor Junctions; p-n junction under dark and under illumination, effect on junction characteristics, Other device structures. Photovoltaic cell and power generation, Characteristic of the Photovoltaic Cell.

UNIT 2

Silicon Solar cell, Mono -crystalline and poly–crystalline cells, Metallurgical Grade Si, Electronic Grade Si, wafer production, Mono–crystalline Si Ingots, Poly–crystalline Si Ingots, Si–wafers, Si–sheets, Solar grade Silicon, Si usage in solar PV, Commercial Si solar cells, process flow of commercial Si cell technology, Process in solar cell technologies, Sawing and surface texturing, diffusion process, thin film layers, Metal contact..

UNIT 3

Centre of Mass, Conservation of linear momentum, collisions, and systems with variable mass. Torque, Angular momentum, Moment of Inertia, Conservation of Angular momentum, Kinetic Energy of Rotation.

UNIT 4

2nd generation solar cell, Thin film solar cell, Advantage of thin film, Thin film deposition techniques, Evaporation, Sputtering, LPCVD and APCVD, Plasma Enhanced, Hot Wire CVD, closed space sublimation, Ion Assisted Deposition, Substrate and Super -state configuration, Thin film module manufacturing, Thin film and Amorphous Si Solar cell, Cadmium Telluride Solar Cell, CIGS solar Cell, CZTS solar cell, New materials for thin film solar cell.

Optics in solar energy conversion: antireflection coatings, concentration of light: Light confinement, photon recycling, multiple exciton generation.

UNIT 5:

Hand on experience on solar cell fabrication, DSSC fabrication, Perovskite solar cell fabrication, Thin film solar cell fabrication.

Suggested Reading

1. Physics of Solar cells-Jenny Nelson, Imperial College Press (2006)

2. Crystalline Silicon Solar Cells, by A. Goetzberger, J. Knobloc h, and B. Voss (Wiley, 1998)

3. Third Generation Photovoltaics: Advanced Solar Energy Conversion, by M. A. Green (Springer, 2006)

4. Semiconductor Materials for Solar Photovoltaic Cells; Paranthaman, M. P. (et al.) (Eds.) (2016)

25PHY451 (Minor 11)	**Introduction to General Theory of Relativity**	**2 1 0 3**

Course Outcome

CO01 Physics of semiconductors Electrochemical Energy storage systems

CO02 Apply tensor calculus to study Special theory of relativity in Minkowski flat space-time and covariant formulation of electrodynamics

CO03 Understand the Principle of Equivalence & geometric description of gravity with study of Einstein's field equation and its Newtonian limit

CO04 Study of Schwarzschild metric to describe the static spherically symmetric gravitational fields.

UNIT 1

Tensor Calculus and Differential Geometry: Riemannian space, Curvilinear coordinates, Tensors, Affine connection, Covariant derivative, Geodesics, Riemann-Christoffel curvature tensor, Bianchi identities, Ricci Tensor, Curvature Scalar.

UNIT 2

Special Theory of Relativity and Introduction to Gravity: Minkowski spacetime, Special Theory of Relativity, Relativistic Dynamics. The principle of equivalence, Principle of General covariance, General Theory of Relativity – historical developments.

UNIT 3

Einstein Field Equations: Gravity and Geometry, Energy-momentum tensor, Curvature tensors, Bianchi identities, Einsten tensor, Field equation, Weak Gravitational Field.

UNIT 4

Schwartzchild Solution: Centrally symmetric Gravitational Field, Static spherically symmetric space-time, Schwartzchild Solutions

Black Holes: Relativistic Stellar star structure, Gravitational Collapse, Black Holes

Text Books:

1. Steven Weinberg, Gravitation and Cosmology: Principles and Applications of the General Theory of Relativity, Wiley India, 2008.
2. Øyvind Grøn, Sigbjorn Hervik, Einstein's general theory of relativity: with modern applications in cosmology, 2002.
3. Ashok Das, Lectures on Gravitation, World Scientific, 2013.

Reference Books:

1. Landau & Lifshitz, Classical Field Theory, University Science Books, 1E, 2004.
2. C. W. Misner, K. S. Thorne and J. A. Wheeler, Gravitation, Princeton Univ Press
A. Einstein, Relativity: The Special and the General Theory

25PHY452 (Minor 11)	**Physics of Radiation Therapy**	**2 1 0 3**

Course Outcomes: After completion of this course students will be able to

CO1: Understand the radiation interaction and radiation transport mechanisms in a classical and relativistic manner

CO2: Identify the biological effects of both ionizing and non-ionizing radiation and the harmful effects of radiation.

CO3: Learn about the cellular response to dose and the mechanism of cell survival using target theory

CO4: Comprehend the physical principles underlying diagnostic imaging technologies

CO5: Understand the physical principles of radiotherapy technologies, radiology, and nuclear medicine

Unit 1
Radiation transport - Basic concepts of radiation transport, Transport equation, Ficks's law and diffusion equation, Boundary conditions, Analytical solution to diffusion equation. Energy-dependent transport and diffusion equation, slowing theory, resonance absorption.
Unit 2
Radiation biophysics - Basic aspects of cell biology and physiology. Mechanism of direct and indirect action of radiation at cellular level. Nature of radiation damage at molecular, subcellular and cellular level. Radiation effects on human beings – deterministic and stochastic effects, parental radiation effects, radiobiological basis of risk evaluation and evolution of radiation protection standards. Dose limits.
Unit 3
Induction of chromosomal aberrations and its application in biological dosimetry of absorbed radiation. Cell killing and induction of mutations. Target theory of cell inactivation and theoretical models for cell survival response. Cellular response-dose, dose rate, dose fractionation, LET, hyperthermia oxygen, sensitizers, protectors, cell cycle stage, cellular repair processes.
Unit 4
Diagnostic methods - Diagnostic radiology and modern trends in imaging techniques-Physical principles of x-ray diagnosis, Positron Emission Tomography (PET), CT Scanning.
Unit 5
Radiation therapy - Benign and malignant tumours, Tissue tolerance dose and tumour lethal dose, Fractionation, Palliative and Curative therapy, Spectral distribution of X-rays dose measurement, Backscatter and central axis depth doses, Isodose curves, Wedge filters, Shielding blocks and compensators. Megavoltage X-ray therapy, Electron contamination, particulate beam therapy, neutron capture therapy, Heavy ion therapy and proton beam therapy

Textbook and References:

1. E. J. Hall and A. J. Giaccia, “Radiobiology for the Radiologist”, 7th Ed. Lippincottt Williams & Wilkins, 2011.
2. H. E. Johns and J. R. Cunningham, “The Physics of Radiology”, 4th Edition, C C Thomas publisher, 1966.
3. Faiz M. Khan, “The Physics of Radiation therapy”, LIppincott Williams & Wikins, Philadelphia, 3rd edition, 2003.
4. J. T. Bushberg, J. A. Seibert, E. M. Leidholdt Jr. and J. M. Boone, “The essential Physics of Medical Imaging”, Lippincott, Williams & Wilkins, Philadelphia, 2012.

25PHY453 (Minor 11)	**X-Ray and Electron Diffraction Techniques**	**2 1 0 3**

Course Outcomes:

CO1: Understand fundamental concepts of X-ray diffraction

CO2: Apply diffraction techniques to study materials

CO3: Understand electron diffraction and the instrumentation of the TEM

CO4: Understand how to index 2D electron diffraction patterns.

UNIT 1: Properties of X-rays and Description of Crystals

Production and detection of X-rays, Directions and intensities of diffracted beams, Detectors and measuring intensities of X-rays, Methods of X-ray diffraction, Penetration of X-rays, Grain size, Particle size and Crystal perfection and Orientation.

UNIT 2: X-ray Analysis

Determination of phase diagrams, Order-disorder phase transitions, Chemical analysis by diffraction: Hanawalt method, Direct comparison and Internal standard methods, Chemical analysis by Fluorescence and Absorption.

UNIT 3: Precise Lattice Parameter Measurements

Rietveld refinement method, General methods of precise lattice parameter measurement: Least Squares method, Cohen’s method, Calibration method, Hugo Rietveld’s method of full pattern refinement, Introduction and practice of refinement using the Full Proof software (open source).

UNIT 4: Transmission Electron Microscopy

Comparison of scattering by electrons and X-rays, Elastic and inelastic electron scattering, Basic instrumentation and imaging modes in TEM, Obtaining and indexing parallel beam electron diffraction patterns, Kikuchi lines and use of Convergent Beam Electron Diffraction (CBED) techniques.

UNIT 5: Phase Contrast Imaging and HR-TEM

Different contrast mechanisms in the TEM: Amplitude, Mass-thickness, Z-contrast, STEM diffraction contrast, Analysing defects: Two beam condition, Weak beam dark field imaging, Thickness and bending effects, Planar defects, Strain field imaging, High resolution TEM.

Reference Books:

1. B. D. Cullity and S. R. Stock, “Elements of X-ray Diffraction”, Third Edition, Pearson Education India, 2014.

2. Vitalij K. Pecharsky, Peter Y. Zavalij, "Fundamentals of Powder Diffraction and Structural Characterization of Materials", Second Edition, Springer, Boston, MA, 2005.

3. David B. Williams and C. Barry Carter, Transmission Electron Microscopy – A Textbook for Materials Science, Second Edition, Springer, 2011.

25PHY454 (Minor 11)	**Micro and Nanomagnetism Materials and its Applications**	**2 1 0 3**

Course Outcomes

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

1. CO1: Understand and explain the concepts of magnetism at the electron level.
2. CO2: Differentiate between ferromagnetism, antiferromagnetism, and other forms of magnetic order.
3. CO3: Explain the principles of micro and nano magnetism, including domain theory and hysteresis.
4. CO4: Identify and classify different types of magnetic materials.
5. CO5: Understand the fundamentals of spintronics and magnetic recording technologies.

Unit 1: Magnetism of Electrons (11 hours)

- Historical Overview: A brief history of magnetism.
- Magnetism Fundamentals: Magnetism and hysteresis, and their applications.
- Magnetostatics: The magnetic dipole moment, magnetic fields, Maxwell's equations, and magnetic field calculations.
- Electronic Magnetism: Orbital and spin moments, magnetic field effects, and the theory of electronic magnetism.
- Magnetism in Solids: Magnetism of electrons in solids, paramagnetism, ions in solids, and crystal-field interactions.

Unit 2: Ferromagnetism, Antiferromagnetism, and Other Magnetic Orders (9 hours)

- Ferromagnetism: Mean field theory, exchange interactions, band magnetism, collective excitations, and anisotropy.
- Antiferromagnetism: Molecular field theory, ferrimagnets, frustration, and amorphous magnets.
- Magnetic Models: Spin glasses and other magnetic models.

Unit 3: Micro and Nanomagnetism, Domains, and Hysteresis (11 hours)

- Micromagnetics: Micromagnetic energy, domain theory, reversal, pinning, and nucleation.

- Nanoscale Magnetism: Characteristic length scales, thin films, thin-film heterostructures, wires and needles, small particles, and bulk nanostructures.
- Magnetic Resonance: Electron paramagnetic resonance (EPR), ferromagnetic resonance (FMR), nuclear magnetic resonance (NMR), and other methods.
- Experimental Methods: Materials growth techniques, magnetic field generation, atomic-scale magnetism, domain-scale measurements, bulk magnetization measurements, and numerical methods.

Unit 4: Magnetic Materials (8 hours)

- Introduction to Magnetic Materials: Iron group metals and alloys, rare-earth metals, intermetallic compounds, interstitial compounds, and oxides with ferromagnetic and antiferromagnetic interactions.
- Applications: Soft magnetic materials, low-frequency and high-frequency applications, magnetic circuits, permanent magnet materials, and magnetic microsystems.

Unit 5: Spintronics and Magnetic Recording (6 hours)

- Spin Electronics: Spin-polarized currents, materials for spin electronics, magnetic sensors, and magnetic memory.
- Magnetic Recording: Techniques and materials used in magnetic recording.
- Special Topics: Magnetic liquids, magneto-electrochemistry, magnetic levitation, magnetism in biology and medicine, and planetary and cosmic magnetism.

Textbooks

1. Magnetism and Magnetic Materials by J. M. D. Coey, Cambridge University Press.
2. Textbook of Magnetism by R. K. Verma, DPH.
3. Magnetism Fundamentals edited by Etienne Du Trémolet de Lacheisserie, Damien Gignoux, Michel Schlenker, Springer.
4. Magnetism: From Fundamentals to Nanoscale Dynamics by Joachim Stöhr and Hans Christoph Siegmann, Springer.
5. Introduction to Magnetism and Magnetic Materials, Second Edition by David C. Jiles, Taylor and Francis.
6. The Quantum Theory of Magnetism by Norberto Majlis, World Scientific Publishing Co. Pte. Ltd.

III. SKILL ENHANCEMENT COURSES (SEC)

LAYOUT OF SEC COURSES IN THE CURRICULUM

Course Code	Course Title	L T P	Cr
SEMESTER 1			
SEC 1	Chemistry Lab	0 0 2	1
SEC 2	Computer Aided Drafting	1 0 2	1
SEMESTER 2			
SEC 3	Physics Lab I – Mechanics, Electricity C Magnetism	0 0 2	1
SEMESTER 3			
SEC 4	Physics Lab II - Electronics	0 0 2	1
SEC 5	Programming Lab 1		
SEMESTER 4			
SEC 6	Physics Lab III-Modern Physics lab	0 0 3	1
SEC 7	Research Internship	0 0 2	2
SEMESTER 5			
SEC 8	Physics Lab IV – Solid State C Thermal lab	0 0 2	1
SEMESTER 6			
SEC 9	Physics Lab V-Optics	0 0 3	1
SEMESTER 8			
SEC 10	Dissertation		15
SEC 11	Minor Project		7

25CHY184 (SEC1)	Chemistry Lab	0 0 2 1

Course Objective:

The primary objective of the (Physical) Chemistry Laboratory course is to provide students with hands-on experience in experimental techniques that illustrate and reinforce the principles of physical chemistry. This includes developing proficiency in data collection, analysis and interpretation.

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

CO1: Apply fundamental chemical principles to solve problems, interpret data, and explain outcomes.**CO2:** Use a variety of laboratory techniques to safely conduct chemical experiments and procedures.

CO 3: Develop and utilize effective computer, written, and oral communication skills in a scientific setting.

CO 4: Demonstrate readiness for a career or advanced degree in chemistry or a chemistry-related field.

List of experiments:

1. Conduct metric estimation of weak and strong acids in a mixture

2. Determination of the rate constant of acid catalyzed hydrolysis of ethyl acetate

3. Polari metric determination of the rate of inversion of sugar

4. Spectrophotometric estimation of iron in a water sample

5. Determination of calorific value of fuels by bomb calorimetry

6. Construction of isotherms for acetic acid adsorption on activated charcoal

7. Determination of critical solution temperature for phenol water system and effect of ionic electrolytes

8. Determination of molecular weight by Rast's method-colligative properties

9. Determination of partition coefficient of iodine in CCl4-water mixture

10. Determination of molecular weight of coordination complex by partition coefficient method.

11. Determination of average molecular weight of a polymer by viscosity measurements

12. Effect of current density on the thickness of anodized aluminum films

13. pH metric estimation of strong acids

TEXT / REFERENCE BOOKS

1. Das. R.C. and Behara. B., 1983. 'Experiments in Physical Chemistry', Tata McGraw-Hill.

2. Findly. A., 1972.' Practical Physical Chemistry', 9th edition, Wiley.

3. Yadav, J.B.2010. 'Advanced Practical Physical Chemistry', Krishna Prakashan Media, 29th Ed

25CSA102(SEC2)	COMPUTER AIDED DRAFTING	1 0 2 1

Course Objectives: Familiarize with the Computer Aided Drafting packages.Introduce standards and codes in engineering drawings. Provide hands on training to make the students proficient with 2D drafting of simple machine elements and assemblies.

Course Outcomes: At the end of the course the student will be able to

CO1: Apply standard drawing codes and practices to produce engineering drawings

CO2: Construct 2D geometry with proper dimensioning using Computer Aided drafting software

CO3: Create 2D representations of 3D objects using CAD software

CO4: Develop isometric drawings using orthographic views

UNIT 1: Drawing Standards - Introduction to CAD software – CAD user interface – Data input modes - Coordinate systems - Units and precision – Setting Limits and display units – Drawing templates - Features of GUI. Sketching basic geometric entities. Sketching simple geometric entities: points, lines, circles, arcs, ellipse, rectangle, polygons, polylines, splines – Use of object snaps - Practice exercises using simple geometric entities.

UNIT 2: Modifying drawings: Move, copy, rotate and offset drawings; Mirroring, Scaling, Trim, extend, erase, explode - Fillet and chamfering – Rectangular, Polar and Path array - Drawing exercise: Sketching and modifying 2D drawings.

UNIT 3: Drawing properties: Line type, Line weight, Object properties – Hatch and gradient – Working with Layers - Dimensioning and annotations – Adding tolerance to dimensions – Working with text and tables – Sketching with blocks and groups - Use of attributes – Working with external references – Layout, printing and publishing drawings - Exercise involving sketching 2D orthographic views of 3D geometries with dimensions and tolerances. Introduction to 3D - Isometric drafting - Conversion of orthographic projections of simple components into isometric views. Creating 3D components and assembly.

Project: Students have to complete a project involving creating orthographic/ 3D views of the simple machine elements / assemblies such as centrifugal pumps, hydraulic cylinders, gear boxes etc. with dimensions following standard drawing practices using CAD software.

Text / Reference Books:

1. James D Bethune, “Engineering Graphics with AutoCAD 2017”, Pearson Education, 2018.
2. Gopalakrishna, K.R., and Sudheer Gopalakrishna “Computer Aided Engineering Drawing”, Subhas Publications, 2015. AUTO-CAD manual (In-House)

25PHY183 (SEC3)	Physics Lab I – Mechanics, Electricity & Magnetism	0 0 2 1

Course Objective :

This course aims to provide hands-on experience in fundamental physics experiments, helping students understand and verify theoretical principles through practical applications. The experiments enhance analytical skills, measurement techniques, and data interpretation related to mechanics, elasticity, fluid dynamics, acoustics, electromagnetism, and material properties.

Course Outcomes:

At the end of the course students will be able to

CO 1: Develop a strong conceptual understanding of physical laws through experimental verification.

CO 2: Enhance students' ability to perform precise measurements and analyze experimental uncertainties.

CO 3: Familiarize students with different experimental techniques and instruments used in physics.

Co 4: Acquire problem-solving skills and critical thinking by interpreting experimental results.

List of Experiments

1. Determination of acceleration due to gravity using bar pendulum.
2. Determination of Young's Modulus of a given bar by Uniform bending method.
3. Determination of Rigidity modulus of the given wire using Torsional pendulum.
4. Determination of Coefficient of viscosity of a given liquid by Poiseulle's method.
5. Studying the liquid flow through series and parallel combinations of capillaries.
6. Melde's String-Verification of laws of vibration.
7. Studies on different exciting modes of sonometer wire.
8. Determination of spring constant of the given spring.
9. Determination of velocity of sound in air using Kundt's tube apparatus.
10. Determination of surface tension of the given liquid.
11. Study of collision parameters in two dimension.
12. Studying magnetic field along the axis of the coil-verification of superposition principle of magnetic field.
13. Mapping of electric field.
14. Study of Mutual inductance
15. Deducing the magnetic properties of a sample from its Hysteresis curve

25PHY281 (SEC4)	**Physics Lab II – Electronics**	0 0 2 1

Course Objective :

This course aims to provide students with practical exposure to fundamental electronic circuits and digital logic design, enabling them to analyze and implement various electronic components and systems. Through hands-on experiments, students will gain expertise in circuit design, signal processing, and digital system functionality, preparing them for real-world applications in electronics.

Course Outcomes:

At the end of the course students will be able

CO 1: To understand and analyze the characteristics and applications of diodes, operational amplifiers, and logic circuits.

CO 2: To design, implement, and test analog and digital circuits, including rectifiers, amplifiers, multivibrators, and counters.

CO 3: To enhance problem-solving skills by verifying theoretical principles through experimental validation and circuit simulations.

CO 4: To develop proficiency in using electronic instruments for measuring and troubleshooting various electronic components and systems.

List of Experiments

1. Diode rectifier –full wave bridge rectifier

2. Diode Characteristics: Si, Ge, Zener diodes and voltage regulation using Zener diode (Source and load regulation).

3. Construction of Dual supply with 12 V - IC regulator

4. Design and performance study of Op-Amp based active filters (Low pass, high pass, band pass, band rejection) and frequency response amplifiers

5. Basic Opp –amp circuits- Inverting and non-inverting amplifier, Summing and difference amplifier

6. Multivibrators: Astable, Monostable and Bistable- Using 555 -Timers

7. Combination of gate universal- NAND and NOR as universal building blocks and verification of De Morgan's theorem

8. Flip flops: D, RS, JK and Master slave

9. Half adder, Full adder and Subtractor

10. Counters and Registers- 4 bits.

11. Encoders and Decoders 4 bits

12. Response and characteristic of RC, LC and RLC and resonance circuits

25CSA285 (SEC5)	Programming Lab I	0 0 2 1

Course Objective :

This course aims to equip students with computational and numerical analysis techniques to solve mathematical and physical problems using programming tools like Python. By applying these methods, students will develop skills in data visualization, curve fitting, differential equations, and solving physical system models through simulations

Course outcomes:

At the end of the laboratory course, students will be able

CO 1: To develop computational skills for solving mathematical and physical equations using numerical techniques.

CO 2: To analyze experimental data using curve fitting, least squares methods, and goodness-of-fit measures.

CO 3: To apply numerical methods to solve linear and differential equations for real-world physics applications.

CO 4: To enhance problem-solving abilities through simulations of physical phenomena such as electric circuits, mechanical systems, and thermodynamics

List of Experiments

1. 2D and 3D plotting of functions (Scilab, Python)
2. Curve fitting
3. Least square fit Goodness of fit& standard constant
4. Solution of Linear system of equations: Gauss elimination
5. Solution of Linear system of equations: Gauss Seidal method
6. Solution of ODE First Order Differential equation:
7. Solution of ODE second order Differential equation
1. Ohms law to calculate R,
2. Hooke's law to calculate spring constant
3. Solution of mesh equations of electric circuits
4. Solution of coupled spring mass systems
5. Radioactive decay
6. Current in RC, LC circuits with DC source
7. Newtons law of cooling
8. Classical equations of motion
9. Current in RC, LC circuits with DC source
10. Newtons law of cooling
11. Classical equations of motion
12. Harmonic oscillator •

13. Damped Harmonic oscillator- Overdamped- Critical damped
14. Forced Harmonic oscillator

Text Books:

1. A Survey of Computational Physics- Introductory Computational Science" Rubin H. Landau, Manuel José Páez, Cristian C. Bordeianu, 2008, Princeton university press.

25PHY282(SEC6)	**Physics Lab III – Modern Physics Lab**	0 0 2 1

Course Objective:

This course aims to provide students with hands-on experience in fundamental quantum physics and modern physics experiments, enabling them to explore the principles governing atomic and subatomic particles.

Course outcomes:

At the end of the laboratory course, students will be able

CO 1: To experimentally verify fundamental concepts of quantum mechanics, atomic physics, and solid-state physics.

CO 2: To determine essential physical constants such as Planck's constant, Rydberg's constant, and the charge-to-mass ratio of an electron.

CO 3: To analyze the behavior of electrons and photons through experiments like the photoelectric effect, Franck-Hertz experiment, and Millikan's oil drop method.

CON4: To explore the properties of materials, including semiconductor energy gaps and ferromagnetic Curie temperatures, using experimental techniques

List of Experiments

1. Study of black body spectra

2. Determination of Planck's constant and De Broglie wavelength of Electrons using photo electric experiments.

3. Determination of Rydberg's constant from hydrogen spectrum

4. Determination of charge to mass ratio of electron – Thomson's method

5. Verification of Bohr's theory - Franck – Hertz Experiment.

6. Determination of charge of electron by Millikan's oil drop method.

7. Electron Spin Resonance- Determination of 'g' factor of an electron

8. Determination of Ferro magnetic Curie temperature of a given sample

9. Studying the Energy gap of semiconductors

25PHY290(SEC7)	**Research Internship**	0 0 2 2

Course Objective:

The requirement of this course is that the student engages in a professional activity/work experience/cooperative educational activity with supervision from a faculty member.

The student is expected to get a formal induction in real world situations and gain important experience in on-site experiential learning. This can be achieved by associating with a lab inside Amrita or outside (such as research labs/organizations/local companies) and similar entities. The student may do this even during the summer vacation.

A report will be submitted along with a presentation which will be used to evaluate the students performance.

25PHY383(SEC8)	**Physics Lab IV – Solid state and Thermal Lab**	0 0 2 1

Course Objective:

This course provides students with practical knowledge of thermal physics such as heat transfer.

Course Outcomes:

At the end of the laboratory course, students will be able

CO 1: To understand and experimentally verify principles of heat transfer, thermal conductivity, and Joule's law of heating.

CO 2: To explore electrical properties such as specific resistance and the Hall effect in materials.

CO3 : To analyze optical and spectroscopic phenomena, including the Zeeman effect and Fabry-Perot interferometry.

CO 4: To develop precision measurement techniques using instruments like thermocouples, potentiometers, and Carey-Foster bridges.

List of Experiments

1. Verification of Joule's Law of Heating.

2. Determination of specific heat capacity of a liquid using Spherical calorimeter

3. Determination of Thermal conductivity of good conductor by Forbe's method

4. Determination of Thermal conductivity of a bad conductor by Lee's disc method

5. Study of variation of total thermal radiation with temperature.

6. Calibration of thermocouple using potentiometer

7. Determination of specific resistance of a wire by Carey-Foster bridge method

8. Zeeman effect experiment

9. Analysis of spectral transitions from the Arc spectrum of different metals

10. Experiment on Fabry Perot Interferometer

11. Mass susceptibility of paramagnetic Liquid substance by Quinkes's method

12. Hall Effect experiment

25PHY384(SEC9)	**Physics Lab V – Optics**	0 0 2 1

Course Objectives

The course objective is to familiarize the students with traditional optical experiments as well as the modern optical instruments and methods. To impart the knowledge on calibrating the optical measuring equipment and identify sources of error and uncertainty in practical work. To develop the presentation skills of the students in demonstrating experimental results in the form of a scientific report, both written and oral.

Course Outcomes

Upon completion of this course, students will be able to

CO1. Understand the physical principles underlying geometrical optics, assembling the optical systems and determination of refractive index of different media

CO2. Perform the formulations and analysis of the interference and diffractions patterns

CO3. Acquire knowledge on analyzing polarizations and fiber optic transmissions

List of Experiments

1. Determination of focal length of combination of lenses and nodal distance using nodal slide assembly.
2. Studying the resolving power of a telescope.
3. Studying the dispersive power of prism.
4. Newton's ring experiment.
5. Studying the Interference fringes in Wedge shaped films.
6. Determination of wavelength of spectral lines using diffraction grating.
7. Verification of Law of Malus - Polarization.
8. Determination of refractive index of the liquids using Snell's law.
9. Diffraction at single, double, and multiple slits using laser - studying the intensity distribution.
10. Diffraction at circular aperture using laser and estimation of size of particles.

11. Determination of numerical aperture of optical fiber and losses of light in fibre due to Bending and beam profile analysis of Laser.
12. Constructing Michelson interferometer and use it to determine the wavelength of laser and refractive index of given glass plate.

25PHY499 (SEC 10)	**Dissertation (For B.Sc. Honours with Research)**	**15**

Course Objectives:

The student is expected to associate with a faculty and identify a research gap, frame a proper research problem based on discussions with expert faculty, plan a scientific solution method and conclude with clear inferences and results. There shall be two mid-term reviews and one final review to evaluate the student's clarity and approach. A project report has to be submitted which will also be considered for the evaluation component.

Evaluations will be based on the midterm reviews, quality of work done and novelty of approach/solution methodology.

25PHY498 (SEC 11)	**Minor Project (For B.Sc. Honours)**	**7**

Course Objectives:

The student is expected to associate with a faculty and identify a tangible research problem and plan and execute the solution methodology. There shall be one mid-term review during which the student will present a seminar on his/her proposed research problem. There shall be a final review to assess the overall completion of the project work.

IV. MULTI DISCIPLINARY COURSES (MDC)

LAYOUT OF MDC COURSES IN THE CURRICULUM

Course Code	Course Title	L T P	Cr
	SEMESTER 1		
MDC 1	Open Elective I	3 0 0	3
	SEMESTER 2		
MDC 2	Open Elective II	3 0 0	3
	SEMESTER 3		
MDC 3	Professional Elective - Machine Learning	3 0 0	3

List of Open Electives (MDC 1 and MDC 2) including both Humanities, Engineering and Management electives:

Open Electives from Engg and Management (Common to B.Tech electives also)			
Course Code	**Course Title**	**L-T-P**	**Cr**
23MNG331	Financial Management	3 0 0	3
23MNG332	Supply Chain Management	3 0 0	3
23MNG333	Marketing Management	3 0 0	3
23MNG334	Project Management	3 0 0	3
23MNG335	Enterprise Management	3 0 0	3
23MNG336	Operations Research	3 0 0	3
23MEE321	Industrial Engineering	3 0 0	3
23MEE324	Lean Manufacturing	3 0 0	3
23MEE323	Total Quality Management	3 0 0	3
23CSE322	Financial Engineering	3 0 0	3
24OEL231	Introduction to Accounting	2 1 0	3
24OEL232	Business Studies	2 1 0	3
24OEL233	Personal Financial Management	2 1 0	3
24OEL234	Working Capital Management	2 1 0	3
24OEL235	Non-Profit Organization	3 0 0	3
24OEL236	Digital Banking	3 0 0	3
24OEL237	Basics of Company accounts	3 0 0	3
24OEL238	Money market and Capital market	3 0 0	3
24OEL239	Macroeconomics	3 0 0	3
24OEL240	Microeconomics	3 0 0	3
24OEL241	Retail Banking	3 0 0	3
24OEL242	Business management	3 0 0	3
24OEL243	Introduction to travel and tourism	3 0 0	3
24OEL244	Basics of Insurance Management	3 0 0	3
24OEL245	Introduction to costing	2 1 0	3
24OEL246	Advertising	3 0 0	3
24OEL247	Green Marketing	3 0 0	3

24OEL248	Modern Banking	3 0 0	3
24OEL249	Project Management	3 0 0	3
24OEL250	Indian Financial System	3 0 0	3
24OEL251	B2B Marketing	3 0 0	3
24OEL252	Business Ethics	3 0 0	3
24OEL253	Sales and Distribution Management	3 0 0	3
24OEL254	Basics of Human ResourceManagement	3 0 0	3
24OEL255	Basics of Management	3 0 0	3
24OEL256	Introduction to EntrepreneurshipDevelopment	3 0 0	3
24OEL257	Understanding Travel and Tourism	3 0 0	3
24OEL258	Supply Chain Management	3 0 0	3
24OEL259	Introduction to Marketing	3 0 0	3
24OEL260	Film Appreciation	0 1 2	3
24OEL261	Introduction to Media Studies	3 0 0	3
24OEL262	Introduction to Psychology	3 0 0	3
24OEL263	Introduction to Gender Studies	3 0 0	3
24OEL264	Constitution and Media Ethics	3 0 0	3
24OEL265	Introduction to Calligraphy	3 0 0	3
24OEL266	Introduction to Branding	3 0 0	3
24OEL267	Introduction to Indian Sculptures	3 0 0	3
24OEL268	Introduction to figure drawing	0 1 2	3
24OEL269	Introduction to product sketching	0 1 2	3
24OEL270	Basics of Water Colour painting.	0 1 2	3
24OEL271	Basics of Landscape painting in water Colour	0 1 2	3
24OEL272	Basics of Oil painting	0 1 2	3
24OEL273	Anchoring and Programme Casting	0 1 2	3
24OEL274	Basics of Photography	0 1 2	3
24OEL275	Basics of Videography	0 1 2	3
24OEL276	Introduction to Fashion Photography	0 1 2	3
24OEL277	Introduction to Advertising	3 0 0	3
24OEL278	Film Theory	3 0 0	3
24OEL279	Event Management	3 0 0	3
24OEL280	Documenting Social Issues	0 1 2	3
24OEL281	Communication Strategies for Event Management	2 1 0	3
24OEL282	Effective Leadership through Non-Violence in Communication	3 0 0	3
24OEL283	Basics of Psychology and Personality Development	3 0 0	3
24OEL284	Introduction to Sci-Fi Studies	3 0 0	3
24OEL285	Campus Novels	3 0 0	3
24OEL286	Technical Communication	3 0 0	3
24OEL287	English for Academic Writing	3 0 0	3
24OEL288	English for Informal Communication	2 0 1	3
24OEL289	Orientation in Creative Writing	2 0 1	3
24OEL290	English for Competitive Exams and Interviews	3 0 0	3
24OEL291	Introduction to Comic Studies	3 0 0	3
24OEL292	Introduction to Food Studies	3 0 0	3
24OEL293	Film and Literature	3 0 0	3
24OEL294	Computer Aided Language Learning	3 0 0	3
24OEL295	Theatre and Communication	3 0 0	3
24OEL296	Women's Writing in India	3 0 0	3

FREE ELECTIVES OFFERED UNDER MANAGEMENT STREAMCOMMON TO ALL PROGRAMS

23MNG331	FINANCIAL MANAGEMENT	L-T-P-C: 3-0-0-3

Course Objectives

- Understand the overview of financial management
- Inculcate methods and concepts on valuation
- Familiarize with working capital management, financial analysis and planning

Course Outcomes

CO1: Understand and apply time value concept of money and use this for investment criteria decisions.
CO2: Evaluate the risk and return for various alternatives of investment.
CO3: Apply the capital budgeting techniques and evaluate the investment decisions.
CO4: Understand working capital management, cash and liquidity management and financial statements**. CO/PO**

Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3					1	1		3	3	1			
CO2	3	3					2	1		3	3	1			
CO3	3	2					1	1		3	3	1			
CO4	3	2			1		2	1	2	3	3	1			

SyllabusUnit

1
Introduction: Financial Management an overview – Financial Decisions in a firm – Goal of FM – Function of the financial system.

Unit 2
Fundamental Valuation Concepts:Time value of money – Risk and Return. Capital Budgeting: Techniques of capital budgeting investment criteria– NPV – Benefit Cost Ratio – IRR – Payback Period – ARR – Investment appraisal inPractice – Estimation of Project cost flows.

Unit 3
Working Capital Management: Current Assets – Financing Ruling – Profit Criterion. Cash and Liquidity Management. Working Capital Financing.

Financial Analysis and Planning**:** financial instruments, sources of long-term, intermediate term and short term finance. Analyzing Financial Performance – Break – even analysis and Leverages – Financial Planning and Budgeting.

Mergers and Takeovers-International trade.

TEXT BOOKS

1. *Chandra, P., 'Financial Management: Theory and Practice', 9e, TMH, 2017.*
2. *Denzil Watson & Antony Head, 'Corporate Finance- Principles and Practice', 2e, Pearson Education Asia, 2016.*
3. *R L Varshney& K L. Maheshwari, 'Managerial Economics', S Chand & Sons, 22e, 2014.*

REFERENCE BOOKS

1. *Stephen Blyth, 'An Introduction to Corporate Finance ',McGraw Hill Book Company, 2014.*
2. *Eugene F. Brigham & Louis C.Gapenski, 'Financial Management – Theory and Practice',14e, 2015.*

Evaluation Pattern

Assessment	Internal	End Semester
Periodical 1	15	
Periodical 2	15	
*Continuous Assessment (CA)	20	
End Semester		50

*CA – Can be Quizzes, Assignments, Projects, and Reports

23MNG332	SUPPLY CHAIN MANAGEMENT	L-T-P-C: 3-0-0-3

Course Objectives

- Understand the complexity and key issues in supply chain management.
- Describe logistics networks, distribution planning, routing design and scheduling models.
- Familiarize dynamics of supply chain and the role of information in supply chain.
- Understand the issues related to strategic alliances, global supply chain management, procurement and outsourcing strategies.

Course Outcomes

CO1: Analyze the complexity and key issues in supply chain management
CO2: Evaluate single and multiple facility location problems, logistics network configuration, vehicle routing and scheduling models
CO3: Analyze inventory management models and dynamics of the supply chain
CO4: Develop the appropriate supply chain through distribution requirement planning and strategic alliances
CO5: Identify the issues in global supply chain management, procurement and outsourcing strategies

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1									1	3		
CO2	2	2	3	1						1	1	2	2		
CO3	3	3	3	3	2				3	1	1	3	2		
CO4	2	2	1	1						1	1	2	2		
CO5	3	3	3	1					3	1	1	3	2		

SyllabusUnit

1
Introduction: Introduction to SCM-the complexity and key issues in SCM – Location strategy – facility locationdecisions – single facility and multiple location models.
Logistics: Logistics Network Configuration – data collection-model and data validation- solution techniques-network configuration DSS – Transport strategy – Service choices: single service and inter modal services – vehicle routingand scheduling models – traveling salesman problems – exact and heuristic methods.

Unit 2
Inventory: Inventory Management and risk pooling-managing inventory in the SC. Value of Information-bullwhipeffect-lead time reduction.
Supply Chain Integration: Supply chain integration-distributed strategies-push versus pull systems. Distribution Requirements Planning – DRP and demand forecasting, DRP and master production scheduling. DRP techniques –time-phased order point – managing variations in DRP – safety stock determination-Strategic alliances-third partylogistics-distribution integration.

Unit 3
Issues in SCM**:** Procurement and outsourcing strategies – framework of e-procurement. International issues in SCM-regional differences in logistics. Coordinated product and supply chain design-customer value and SCM.

TEXT BOOK
Simchi-Levi,D.,Kaminsky,P.,Simchi-Levi,E., Shankar,R., 'Designing and Managing the Supply Chain: Concepts, Strategies, and Cases', Tata McGraw Hill, 2008.

REFERENCE BOOKS

1. *Christopher, M., 'Logistics and Supply Chain Management: Strtegies for reducing Cost and Improving Service', PH, 1999.*
2. *Ballou, M., 'Business logistics / Supply chain management', Pearson Education, 2003.*
3. *Vollmann, T.E., 'Manufacturing Planning and Control for Supply Chain Management', 5e, McGraw Hill, 2005.*

Evaluation Pattern

Assessment	Internal	End Semester
Periodical 1	15	
Periodical 2	15	
*Continuous Assessment (CA)	20	
End Semester		50

*CA – Can be Quizzes, Assignments, Projects, and Reports

23MNG333	MARKETING MANAGEMENT	L-T-P-C: 3-0-0-3

Course Objective

To educate the students to apply concepts and techniques in marketing so that they become acquainted with the duties of a marketing manager with an emphasis to make the students exposed to the development, evaluation, and implementation of marketing management in a variety of business environments.

Course Outcomes

On successful completion of the Course students will be able to:

CO1: Illustrate key marketing concepts, theories and techniques for analysing a variety of marketing situations
CO2: Identify and demonstrate the dynamic nature of the environment in which marketing decisions are taken and appreciate the implication for marketing strategy determination and implementation
CO3: Develop the ability to carry out a research project that explores marketing planning and strategies for a specific marketing situation
CO4: Understand the need and importance of sales promotions and make use of advertising
CO5: Manage a new product development process from concept to commercialization.
CO6: Illustrate the importance of modern trends in retailing and marketing logistics

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1			3	1								1			
CO2		1	3	3		2	1			2	2	2			
CO3	1	1	1	3	2	2	2		2	2	2	3			
CO4			2	2		2	1	1		3	3	3			
CO5	1	1	3	2		1	1			1	2	3			
CO6	1	1	3	2		1	1			1	2	3			

Syllabus Unit

1
Marketing Process: Definition, Marketing process, dynamics, needs, wants and demands, value and satisfaction, marketing concepts, environment, mix. Philosophies, selling versus marketing, organizations, industrial versus consumer marketing, consumer goods, industrial goods, product hierarchy.

Buying Behaviour and Market Segmentation: Major factors influencing buying behaviour, buying decision process, businessbuyingbehaviour. Segmenting consumer and business markets, market targeting.

UNIT 2
Product Pricing and Marketing Research: Objectives, pricing, decisions and pricing methods, pricing management. Introduction, uses, process of marketing research.

UNIT 3
Developing New Products - Challenges in new-product Development - Effective organizational arrangements - Managing the development Process: ideas - Concept to strategy - Development to commercialization – The consumer- adoption process. Advertising Sales Promotion and Distribution: Characteristics, impact, goals, types, and sales promotions- point of

purchase- unique selling proposition. Characteristics, wholesaling, retailing, channel design, logistics, and moderntrends in retailing.

TEXT BOOKS

1. *Kolter, P.,'Marketing Management', Pearson Education 2001.*
2. *Ramasamy and Namakumari, 'Marketing Environment: Planning, implementation and control the Indian context', 1990.*

REFERENCE BOOKS

1. *Paul, G.E. and Tull, D., 'Research for marketing decisions', Prentice Hall of India, 1975.*
2. *Tull, D.S. and Hawkins, 'Marketing Research', Prentice Hall of Inida-1997.*
3. *Kotler, P. and Armstrong, G., 'Principles of Marketing' Prentice Hall of India, 2000.*
4. *Skinner, S.J., 'Marketing', All India Publishers and Distributes Ltd. 1998.*
5. *Govindarajan, M., 'Industrial marketing management', Vikas Publishing Pvt. Ltd, 2003.*

Evaluation Pattern

Assessment	Internal	End Semester
Periodical 1	15	
Periodical 2	15	
*Continuous Assessment (CA)	20	
End Semester		50

*CA – Can be Quizzes, Assignments, Projects, and Reports

23MNG334	PROJECT MANAGEMENT	L-T-P-C: 3-0-0-3

Course Objectives

- To discuss the project life cycle and build a successful project from pre-implementation to completion.
- To introduce different project management tools and techniques

Course Outcomes

CO1: Appraise the selection and initiation of individual projects and its portfolios in an enterprise.
CO2: Analyze the project planning activities that will predict project costs, time schedule, and quality.
CO3: Develop processes for successful resource allocation, communication, and risk management.
CO4: Evaluate effective project execution and control techniques that results in successful project completion

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	2	1				2		3	1	2	3	2
CO2	2	3	3	2	2				3		3	2	2	3	3
CO3	1	2	3	2	2				2		3	2	1	2	3
CO4	1	1	2		1				2		3	1	1	1	2

SyllabusUnit

1
Overview of Project Management: Verities of project, Project Features, Project Life Cycle – S-Curve, J-C **Project Selection:** Project Identification and Screening – New ideas, Vision, Long-term objectives, SWOT Analysis (Strength, Weakness, Opportunities, Threats).
Project Appraisal – Market Appraisal, Technical Appraisal, Economic Appraisal, Ecological Appraisal, and Financial Appraisal – Payback, Net Present Value (NPV), Internal Rate of Returns (IRR).
Project Selection – Decision Matrix, Technique for Order Preference using Similarity to Ideal Solution (TOPSIS), Simple Additive Weighting (SAW).

Unit 2
Project Presentation: WBS, Project Network – Activity on Arrow (A-O-A), Activity on Node (A-O-N).**Project Scheduling:** Gant Chart, Critical Path Method (CPM), Project Evaluation & Review Technique (PERT).**(6hrs)**
Linear time cost trade-offs in project - Direct cost, indirect cost, Project crashingResource Consideration - Profiling, Allocation, Levelling.
Introduction to project management software: Primavera/ Microsoft project

Unit 3
Project Execution: Monitoring control cycle, Earned Value Analysis (EVA), Project Control – Physical control, Human control, financial control.
Organizational and Behavioral Issues: Organizational Structure, Selection-Project Manager, Leadership Motivation, Communication, Risk Management.
Project Termination: Extinction, Addition, Integration, Starvation.

TEXT BOOKS

1. *Jack R. Meredith and Samuel J. Mantel, Jr. - 'Project Management- A Managerial Approach' Eighth Edition - John Wiley & Sons Inc - 2012.*
2. *Arun Kanda – 'Project Management-A Life Cycle Approach' PHI Learning Private Limited - 2011*

REFERENCE BOOKS

1. *'A Guide to Project Management Body of Knowledge' PMBOK GUIDE, Sixth edition, Project management Institute – 2017*
2. *Ted Klastrorin - 'Project Management, Tools, and Trade-Offs' - John Wiley – 2011*

Evaluation Pattern

Assessment	Internal	End Semester
Periodical 1	15	
Periodical 2	15	
*Continuous Assessment (CA)	20	
End Semester		50

*CA – Can be Quizzes, Assignments, Projects, and Reports

23MNG335	ENTERPRISE MANAGEMENT	L-T-P-C: 3-0-0-3

Course Objectives

- To impart knowledge on the fundamentals of costing, pricing methods and strategies.
- To give an overview of production operations planning.
- To summarize various quantitative methods of plant location, layout and lean manufacturing.
- To familiarize the concepts of e-commerce, e-purchasing, MRP and ERP in business

Course Outcomes

At the end of the course, the student will be able to:

CO1: Understand the concepts of cost and pricing of goods and appraise project proposals
CO2: Design and analyze manufacturing and service processes and to measure the work performed.
CO3: Understand and analyze the key issues of supply chain Management
CO4: Understand the application of lean manufacturing tools and six sigma concepts
CO5: Select appropriate plant location and their layout methods
CO6: Create capacity plan, aggregate plan, schedule, ERP & MRP systems

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	1							2	2			
CO2	2	1								1		2	1		1
CO3	2	1										2	1		1
CO4	2	1	1	1						1		2	1		1
CO5	2	1		1								2			
CO6	2	2	1	1							1	2	1		1

Syllabus Unit

1
Engineering Economics: cost concepts - types of costs - cost functions. Cost controls: reduction – tools & applications.Pricing policies – methods – problems.Process design and improvement – process capacity – process layout – process reengineering – job design. Work standards – work measurement – work sampling – problems.

Unit 2
Supply Chain Management – Basic Concepts, SC dynamics, push-pull boundary, integrated supply chain, logistics, customer relationship, supplier relationship – selection, rating and development, procurement, SC metrics and performance measurement - problems. Lean Manufacturing – concepts, wastes – tools viz., pull system, standardized work, takt time, kanban system, JIT, kaizen, SMED, 5S, value stream mapping, benefits of lean and implementation issues. Introduction to Six Sigma. Plant Location – globalization, factors affecting location decisions, facility location- Break-even method, rectilinear, factor-rating and centre of gravity – problems. Plant Layout – types, process layout,product layout, Systematic layout planning (SLP), Line Balancing problems. Capacity Planning – Aggregate Planning
– importance, planning process, methods – problems.

Unit 3
Role of IT in business performance improvement – e-commerce – e-purchasing –Master Production Schedule, inventory lot sizing strategies, MRP basics – MRP explosion, Available to Promise(ATP) inventory – MRP calculations – MRP II – Scheduling – Gantt chart – Introduction to ERP – ERP software – ERP modules – ERP implementation.
TEXT BOOKS

1. *L J Krajewski, L.P.RitzmanMalhotra.M and Samir K. Srivastava, 'Operations Management: Processes and Value chains, 11e, Pearson, 2015.*
2. *R L Varshney& K L. Maheshwari, 'Managerial Economics', S Chand & Sons, 22e, 2014.*

REFERENCE BOOKS

1. *Richard B. Chase, Ravi Shankar, F. Robert Jacobs, 'Operations and Supply Chain Management' McGraw Hill Education (India) Private Limited.14e, 2017.*
2. *E S Buffa and R K Sariss, 'Modern Production/Operations Management', Wiley India Private Limited, 8e, 2007.*
3. *Harrison.B, Smith.C., and Davis.B.,, 'Introductory Economics', 2e Pr Macmillan, 2013.*

Evaluation Pattern

Assessment	Internal	End Semester
Periodical 1	15	
Periodical 2	15	
*Continuous Assessment (CA)	20	
End Semester		50

*CA – Can be Quizzes, Assignments, Projects, and Reports.

23MNG336	OPERATIONS RESEARCH	L-T-P-C: 3-0-0-3

Course Objectives

Familiarizing the students with quantitative tools and techniques, which are frequently applied in operational decisions

Course Outcomes

CO1: Formulate operations research models to optimize resources.
CO2: Solve transportation and assignment problems using suitable techniques.
CO3: Apply appropriate technique to analyze a project with an objective to optimize resources.
CO4: Solve operational problems using decision theory approaches.
CO5: Select suitable inventory model for effective utilisation of resources.
CO6: Solve Operations Research problems using software package

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2		2						2	2	2		
CO2	3	2	2		2						2	2	2		
CO3	3	2	2		2						2	2	2		
CO4	3	2	2		2						2	2	2		
CO5	3	2	2		2						2	2	2		
CO6	3	2	2		2						2	2	2		

SyllabusUnit1
Linear Programming: Formulations - graphical solutions - Simplex Method - Duality, Dual simplex method.
Transportation model: Assignment model – Travelling Salesman Problem.

Unit 2
Decision Theory: Decision Trees. Game theory - 2 person zero sum; mixed strategies; 2 x n and m x 2 games. Network Models- Project Networks- CPM / PERT- Project Scheduling – crashing networks and cost considerations-Resource leveling and smoothing - shortest route problem, minimal spanning tree problem, maximal flow problem.

Unit 3
Sequencing model – 2 machines 'n' jobs, 'm' machines 'n' jobs – n jobs 2 machines.
Inventory models: deterministic & probabilistic models. Quantity discounts. Selective Inventory Management Queuing models: Poisson arrival and exponential service times. Single server, multi-server. Queues -infinite and finite capacity queues.
Simulation –Monte Carlo simulation: simple problems

Lab session: Practicing case problems with excel solver/MatLab/LINGO package

TEXT BOOK
Hillier, F .S. and Lieberman, G .J, 'Operations Research', 9e, McGraw Hill, 2010

REFERENCE BOOKS

1. *Taha,H.A., 'Operations Research: an Introduction', 8e, Prentice HalI, New Delhi, 2008.*
2. *Ravindran, A., Phillips, D.J., and Solberg, J.J., 'Operations Research- Principles and Practice', John Wiley & Sons, 2005.*
3. *Wagner, H.M., 'Principles of Operations Research', Prentice Hall, New Delhi, 1998.*
4. *Hardley, G.,'Linear Programming', Narosa Book Distributors Private Ltd 2002.*

Evaluation Pattern

Assessment	Internal	End Semester
Periodical 1	10	
Periodical 2	10	
*Continuous Assessment (Theory) (CAT)	15	

*Continuous Assessment(Lab) (CAL)	30	
End Semester		35

*CA – Can be Quizzes, Assignments, Projects, and Reports

23MEE321	INDUSTRIAL ENGINEERING	L-T-P-C: 3-0-0-3

Course Objectives

- To inculcate the concepts of work study and its application to industrial practice
- Impart skills to design, develop, implement, and improve manufacturing/service systems

Course Outcomes

At the end of the course, the student will be able to

CO1: Create value to organizations through the analysis, evaluation, and improvement of work systems using work study and method study
CO2: Develop work systems through motion economy principles
CO3: Apply work measurement techniques to improve productivity, fix wages and incentives
CO4: Apply systematic layout planning techniques and work station design principles based on ergonomics and material handling.

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1						1		3	2		
CO2	2	1	2	1	1					1		3	2		
CO3	1	2		1	1						1	3	2		
CO4	2	2		1	2						2	3	2		

SyllabusUnit

1
Work System: Elements of work, maintenance of machines, interaction, effect of working conditions and environment, physical and mental fatigue.
Productivity: Productivity, factors affecting production, Measurement of productivity.
Work Study: Definition and scope of work study; Areas of application of work study in industry; Human aspects ofwork study.
Method Study: Information collection, recording techniques, and processing aids; critical examination; development, installation and maintenance of improved methods.

Unit 2
Motion Economy and Analysis: Principles of motion economy; Motion analysis; Micromotion and Memomotion study; Therbligs and SIMO charts; Normal work area and design of work places; Basic parameters and principles ofwork design.
Work Measurement: Work measurement techniques; Calculation of standard time, work sampling and predetermined Motion time systems.
Wages and Incentive Schemes: Introduction, wage payment of direct and indirect labour, wage payment plans and incentives, various incentive plans, incentives for indirect labour

Unit 3
Plant Layout: Concept of plant layout, types of layout; factors affecting plant layout.
Ergonomics: Ergonomic Design of equipment and work place. work station design, factors considered in designing awork station, ergonomic design standards - Study of development of stress in human body and their consequences. Case Studies.Production planning and scheduling.
Material Handling: Introduction and functions of material handling equipment, selection of material handling equipment for different requirements, safety requirements.

Recent advances in Industrial Engineering.

TEXT BOOKS

1. *Barnes, R, "Motion and Time Study" - Design and Measurement of Work . NY: John Wiley and Sons, 8th Edition, 1985.*
2. *"Introduction to Work Study", 4ed, International Labor Office, Geneva, 2006.*

REFERENCE BOOKS

1. *Martand T. Telsang, 'Industrial Engineering and Production Management' S Chand; 2nd Rev Edn 2006.*
2. *Mahajan M., "Industrial Engineering and Production Management" Dhanpat rai and Sons Publishers, 2005.*

Evaluation Pattern

Assessment	Internal	End Semester
Periodical 1	15	
Periodical 2	15	
*Continues Assessment (CA)	20	
End Semester		50

*CA – Can be Quizzes, Assignments, Projects, and Reports

23MEE323	TOTAL QUALITY MANAGEMENT	L-T-P-C: 3-0-0-3

Course Objective

To impart knowledge on quality management principles, tools, techniques and quality standards for real lifeapplications

Course Outcomes

CO1: Evaluate the principles of quality management and to explain how these principles can be applied within quality management systems.
CO2: Evaluate the performance measures using various quality and management tools
CO3: Apply the Quality Function Deployment, Taguchi principles, Total Productive Maintenance and Failure Mode and Effect Analysis concepts to solve industrial problems.
CO4: Practice the various quality system in industry.

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2										2	2		
CO2	1	2										2	2		
CO3	2	2	2									2	2		
CO4	2	2	2	2								2	2		

Syllabus Unit

1
Definition of quality - dimensions of quality. Quality planning - quality costs. Total Quality Management: historical review and principles –leadership - quality council - quality statements - strategic planning - Deming philosophy.Barriers to TQM implementation

Unit 2
Customer satisfaction – Customer retention - Employee involvement - Performance appraisal - Continuous process improvement - Supplier partnership - Performance measures. Seven tools of quality.Statistical fundamentals - Control Charts for variables and attributes - Process capability - Concept of six sigma - New seven management tools
- Benchmarking**.**

Unit 3
Quality function deployment (QFD) - Taguchi quality loss function - Total Productive Maintenance (TPM) - FMEA.Need for quality systems - ISO 9000:2000 – Elements of quality systems (such as ISO 9000:2000). Implementation of quality system – documentation - quality auditing - QS 9000-ISO 14000

TEXT BOOK
Besterfiled D. H. - 'Total Quality Management' - Pearson Education Asia – 2015-4th Edition

REFERENCE BOOKS
1. *Evans J. R, and Lidsay W. M. - 'The Management and Control of Quality' - Southwestern (Thomson Learning) - 2002 - 5th Edition*
2. *Feigenbaum A. V. - 'Total Quality Management - Vol I &II ' – McGraw Hill - 1991*

Evaluation Pattern

Assessment	Internal	End Semester
Periodical 1	15	
Periodical 2	15	
*Continuous Assessment (CA)	20	
End Semester		50

*CA – Can be Quizzes, Assignments, Projects, and Reports

23MEE324	LEAN MANUFACTURING	L-T-P-C: 3-0-0-3

Course Objectives

- Understand Lean manufacturing principles and tools
- Inculcate the concepts of value stream mapping
- Familiarize lean implementation practices

Course Outcomes

CO1: Identify key requirements and concepts in lean manufacturing.
CO2: Initiate a continuous improvement change program in a manufacturing organization **CO3:** Analyze and improve a manufacturing system by applying lean manufacturing tools **CO4:** Build value stream map for improving the productivity
CO5: Improve productivity through lean practices

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2											2	2		
CO2	2	2	2	1					2	1		1	2		1
CO3	2	2	2	2	1				2	1		1	2	1	2
CO4	2	2	2	1	1	1	1			1		2	2	1	1
CO5	2	2	2	1	1	1	1			1		2	2	1	1

SyllabusUnit

1
Introduction to Lean and Factory Simulation: History of Lean and comparison to other methods - The 7 Wastes, their causes and the effects - An overview of Lean Principles / concepts / tools - Stockless Production.
The Tools of Lean Manufacturing: Continuous Flow – Continuous Flow Manufacturing and Standard Work Flow –5S and Pull Systems (Kanban and ConWIP systems) – Error Proofing and Set-up Reduction – Total Productive Maintenance (TPM) – Kaizen Event examples. Toyota production systems.
Ford production systems – FPS gear model

Unit 2
Value Stream Mapping – Current state: Preparation for building a Current State Value Stream Map – Building a Current State Map (principles, concepts, loops, and methodology) – Application to the factory Simulation scenario.

Unit 3
Value Stream Mapping – Future State: Key issues in building the Future State Map – Process tips in building the map and analysis of the customer loop, supplier loop, manufacturing loop and information loop – Example of completedFuture State Maps – Application to factory simulation
Implementation of lean practices - Best Practices in Lean Manufacturing.

TEXT BOOKS

1. *Womack, J.P., Jones, D.T., and Roos, D., 'The Machine that Changed the World', Simon & Schuster, New York, 2007.*
2. *Liker, J.K., 'Becoming Lean', Industrial Engineering and Management Press, 1997.*

REFERENCES BOOKS

1. *Womack, J.P. and Jones, D.T., 'Lean thinking', Simon & Schuster, USA, 2003.*
2. *Rother, M. and Shook, J., 'Learning to see', The Lean Enterprise Institute, Brookline, USA, 2003.*

Evaluation Pattern

Assessment	Internal	End Semester
Periodical 1	15	
Periodical 2	15	
*Continuous Assessment (CA)	20	
End Semester		50

*CA – Can be Quizzes, Assignments, Projects, and Reports

23CSE322	FINANCIAL ENGINEERING	L-T-P-C: 3-0-0-3

Pre-Requisite(s): 19MAT112 Linear Algebra, 19MAT205 Probability and Random Processes

Course Objectives

- This course serves as an introduction to financial engineering including cash flows, financial decision making etc
- It gives a thorough yet highly accessible mathematical coverage of standard and recent topics of introductory investments: fixed-income securities, modern portfolio theory, optimal portfolio growth and valuation of multi-period risky investments.

Course Outcomes

CO1: Apply basic concepts to understand and evaluate cash flows
CO2: Evaluate and arrive at a financial investment decision employing the underlying knowledge of stocks and derivatives
CO3: Analyse and design Portfolio selection methods
CO4: Understand capital market theory for stock performance evaluation

CO-PO Mapping

PO/ PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1			2								3	2
CO2	2	3	1										3	2
CO3	1	3			2								3	2
CO4	2	1											3	2

Syllabus Unit

1
Cash Flows and Fixed income securities: Investments and markets - Principal and interest - Present and future valuesof streams - IRR. Fixed income securities - Market value for future cash - Bond value - Bond details – Yields – Convexity – Duration - Immunization. Bond portfolio management - Level of market interest rates, Term structureof interest-rate theories.

Unit 2
Stocks and Derivatives: Common stock valuation - Present value of cash dividends - Earnings approach - Value versus price - Efficient markets theory - Technical analysis. Analysis of financial statements. Derivatives - futures and options - Black Scholes formula - Utility functions - Applications in financial decision making.

Unit 3
Portfolio analysis and capital market theory: Covariance of returns – Correlation - Portfolio return - Portfolio standard deviation - Two asset case - Efficient frontier - Optimum portfolio. Capital market theory - Capital market line - Sample diversifications to reduce risk - Characteristic line - Capital asset pricing model. Arbitrage price theory - Stock performance evaluation.

TEXT BOOK(S)

1. *David Luenberger, Investment Science. Second Edition, Oxford University Press; 2013*
2. *Jack Clark Francis, Richard W. Taylor. Investments, Schaum's Outlines, Tata McGraw Hill ;2006.*

REFERENCE(S)

1. Lyuu YD. Financial Engineering and Computation. Cambridge University Press; 2004.
2. Perry H. Beaumont. Financial Engineering Principles. John Wiley and Sons Inc, New Jersey; 2004.

Evaluation Pattern

Assessment	Internal	External
Periodical 1 (P1)	15	
Periodical 2 (P2)	15	
*Continuous Assessment (CA)	20	
End Semester		50

*CA – Can be Quizzes, Assignment, Projects, and Reports.

OPEN ELECTIVES

24OEL231 INTRODUCTION TO ACCOUNTING 2 1 0 3

Course Objective:

To help the students to understand the accounting principles and practices, including the types of accounting, basic accounting concepts, rules of debit and credit, ledger management, and preparation of financial statements for sole proprietorship.

Course Outcomes:

The student will able:

CO1: To understand the basic accounting terms such as entity, transaction, capital, liabilities, assets, etc.

CO2: To apply the accounting concept like money measurement, revenue recognition, matching, and full disclosure in accounting practices.

CO3: To analyze how transactions are recorded and classified based on their nature.

CO4: To evaluate the effectiveness of ledger maintenance and trial balance preparation in ensuring the integrity of financial data.

CO5: To apply accounting principles to prepare trading account, profit and loss account, and balance sheet.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	0	0	0	1	0	0	0	0	0	1	1	0	1	0	0
CO2	1	1	1	1	0	0	0	0	0	1	1	0	1	0	0
CO3	1	1	1	1	0	0	0	0	0	1	2	0	1	1	1
CO4	2	2	2	1	0	0	0	0	0	1	2	1	1	1	1
CO5	2	2	2	1	0	0	0	0	0	1	2	1	1	1	1

Unit 1

Accounting – meaning –definition – objectives –advantages – limitations - Types of accounting- Financial accounting - Management accounting - Cost accounting - Book keeping – sources of information – difference between book keeping and accounting – Basic Accounting Terms- Entity, Business Transaction, Capital, Drawings. Liabilities, Assets, Expenditure, Expense, Revenue, Income, Profit, Gain, Loss, Purchase, Sales, Goods, Stock, Debtor, Creditor, Voucher, Discount.

Unit 2

Basic accounting concept: Business Entity, Money Measurement, Going Concern, Accounting Period, Cost Concept, Dual Aspect, Revenue Recognition, Matching, Full Disclosure, Consistency, Conservatism, Materiality and Objectivity - Basis of Accounting: cash basis and accrual basis – GAAP – Accounting standards - Goods and Services Tax (GST): Characteristics and Advantages.

Unit 3

Rules of Debit and Credit - Classification of Accounts - Personal Accounts – real accounts – nominal accounts - Recording of Transactions: Books of Original Entry- Journal – Journalizing.

Unit 4

Ledger – meaning – posting from journal -Balancing of accounts - Trial balance: meaning, objectives and preparation.

Unit 5

Financial Statements of Sole Proprietorship – meaning – objectives – Trading account – profit and loss account – balance sheet- Adjustments: Closing stock- prepaid expenses- outstanding expenses (Simple problems)

Textbooks:

1. T.S. Grewal, S.C Gupta – Introduction to Financial Accounting – S. Chand
2. SN Maheswari, SK Maheswari – An Introduction to Accountancy – Vikas Publishing House

References:

1. R. Narayanaswamy - Financial Accounting - Prentice Hall of India
2. Wayne Lavel - Accounting for Non-Accountants: The Fast and Easy Way to Learn the Basics– Sourcebooks Publication

24OEL232 BUSINESS STUDIES 2 1 0 3

Course Objective:

To understand the interrelationship between business and its environment, understand the roles and impacts of various business sectors in India, and apply principles of e-commerce and business ethics to promote responsible and sustainable business practices.

Course Outcomes:

The student will able:

CO1: To understand the meaning, definition, significance, functions, and objectives of business.

CO2: To explain the concepts of liberalization, privatization, globalization, disinvestment, and outsourcing.

CO3: To explain the types of e-commerce (B2C, B2B, C2C, C2B, B2E, B2G, P2P) and the difference between e-commerce and e-business.

CO4: To analyse the social responsibility of business, including its objectives and principles.

CO5: To describe the concept and elements of business ethics in the context of social responsibility.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	1	0	0	1	1	0	0	0	0	1	1	0	1	1	0
CO2	1	0	0	1	1	0	0	0	0	1	0	1	1	0	0
CO3	1	0	0	1	0	0	0	0	0	1	1	0	1	1	0

CO4	1	0	0	1	0	0	0	0	1	1	1	0	1	1	0
CO5	1	0	0	1	1	0	0	0	1	1	1	1	1	1	0

Unit 1

Business and Environment Business- Functions - Scope - Significance of business - Objectives of business - Business and development - Forms of business organisations- Stakeholders of business - Business Environment – Definition – Features- Importance - Components of business environment.

Unit 2

Business in India- Role of public, private, co-operative sectors - Liberalisation, Privatisation and Globalization – Disinvestment – Outsourcing –Recent economic initiatives - Niti Ayog - Make in India initiative.

Unit 3

E Commerce – Meaning- Functions - Operation of E-commerce - Types of E-Commerce -B2C-B2B-C2C- C2B- B2E- B2G- P2P- E-Commerce and E-Business – M-Commerce – Meaning – Advantages-Challenges - Net banking, Digital wallet, e-cheque, e-cash – Payment gateway.

Unit 4

Business Ethics – Importance - Principles of business ethics - Factors Influencing Business Ethics - Arguments in favour and against business ethics - Social responsibility of business – objectives and principles - Arguments in favour and against social responsibility.

Unit 5

Social Responsibility of Business - Responsibility towards owners, investors, consumers, employees, government and community - Role of business in environment protection - Business Ethics - Concept and Elements.

Textbooks:

1. Keith Davis and William C. Frederick - Business and Society: Management, Public Policy, Ethics – McGraw Hill
2. Peter F. Drucker - Management Tasks Responsibilities Practices - Routledge
3. Peter F Drucker - The Practice of Management – Harper Business Publication

References:

1. CB Gupta - Business Environment – Sultan Chand and Sons
2. Francis, Ronald & Mishra, Muktha, Business Ethics - An Indian Perspective - McGraw Hill
3. Sharma, J.P. - Corporate Governance, Business Ethics, and CSR - Ane Books
4. Ghosh, B.N. - Business Ethics and Corporate Governance - McGraw Hill

24OEL233 PERSONAL FINANCIAL MANAGEMENT 2 1 0 3

Course Objective:

The objective of the course is to familiarize the students with basic concepts of personal financial management and its avenues.

Course Outcomes:

The student will able:

CO1: To understand the basic concepts of Personal financial management.

CO2: To identify the significance of investment planning.

CO3: To describe the role of personal financial security and their options.
CO4: To ascertain the relevance of insurance policies in personal finance.
CO5: To understand the tax management mechanisms.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	1	1					1			1	1			1	1
CO2	1	1					1			2	2			1	1
CO3	1	1								2	2			1	1
CO4	1	1								1	2			2	2
CO5	1	1								1	1			1	1

Unit 1

Introduction to personal finance - concepts – savings, investment, borrowings, inflation, time value of money – active and passive income – personal financial planning – steps – SMART financial goals – importance of personal budget

Unit 2

Investment planning – importance and objectives of investment - savings, current, fixed and recurring; investment avenues offered by securities market - primary market and secondary market – risks involved in securities market – mutual funds.

Unit 3

Personal Financial security: National Pension scheme – investment options under NPS – Retirement planning – role of retirement planning in personal financial management – sources of retirement income - estate planning - gratuity plans from the government -Provident Fund.

Unit 4

Management of Insurance - Benefits of Life Insurance, evaluating need for Life Insurance, Determining the Right Amount of Life Insurance. Choosing the Right Life Insurance Policy – Term Life Insurance, Whole Life Insurance, Universal Life Insurance, Variable Life Insurance, Group Life Insurance, Other Special Purpose Life Policies. Buying Life Insurance – Compare Costs and Features.

Unit 5

Tax Management - Personal Tax Planning –Fundamental Objectives of Tax Planning, Tax Structure in India for Individuals, Common Tax Planning Strategies.

Textbooks:

1. Randall S. Billingsley, Lawrence J. Gitman, and Michael D. Joehnk - Personal Financial Planning - Cengage Learning.
2. Susan M. Tillery, and Thomas N. Tillery - Essentials of Personal Financial Planning - Association of International Certified Professional Accountants (AICPA).

References:

1. Introduction to Financial Planning – Indian Institute of Banking & Finance
2. Sinha, Madhu - Financial Planning: A Ready Reckoner - McGraw Hill

24OEL234 WORKING CAPITAL MANAGEMENT 2 1 0 3

Course Objective:

To help the students to understand the concept of working capital management, components, and significance. They will acquire the knowledge and skills necessary to analyze and manage working capital

effectively, assess working capital requirements, evaluate sources of working capital, implement cash management strategies, and optimize receivable and inventory management processes using various tools and techniques.

Course Outcomes:

The student will able to:

CO1: Understand the importance of working capital management in maintaining liquidity and financial stability in a business.

CO2: Recall the types of working capital and their definitions.

CO3: To understand the different sources of working capital to assess their suitability for specific business situations.

CO4: Analyze cash management strategies and their impact on business operations.

CO5: Explain the importance of efficient collections from receivables and effective inventory management.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	1	0	0	1	0	0	0	0	0	1	1	0	1	0	0
CO2	1	1	1	1	0	0	0	0	0	1	1	0	1	0	0
CO3	2	0	0	1	0	0	0	0	0	1	1	0	1	0	0
CO4	2	1	1	1	0	0	0	0	0	1	1	0	1	1	1
CO5	1	1	1	1	0	0	0	0	0	1	1	0	1	1	1

Unit 1

Introduction Working Capital Meaning –definition - Concept of Working Capital - Balance Sheet Concept - Operating Cycle Concept - Importance of - components of working capital - Factors Influencing working capital requirements - working capital life cycle - Role of finance manager in working capital.

Unit2

Types of Working Capital - Gross Working Capital - Net Working Capital - Operating Cycle: Meaning of Operating Cycle, Significance of Operating Cycle - Cash Cycle: Meaning of Cash Cycle, Significance of Cash Cycle - Estimation of Working Capital Requirements - Determinants of Working Capital - Computation of Working Capital (Simple problems).

Unit 3

Sources of Working Capital - Commercial Banks: Forms of Bank Finance - Commercial Papers (CPs): Features - Factoring - Trade Credit: Advantages of Trade Credit - Accrued Expenses: Importance of Accrued Expenses - Deferred Income.

Unit 4

Cash Management – meaning – importance - Cash vs. Cash Flow - Motives for Holding Cash and Marketable Securities - Factors Determining the Optimum Cash Balance

Unit 5

Receivable Management - Dimensions of Receivable Management- Collections from Receivables – Inventory Management - Tools and Techniques of Inventory Management - ABC Approach- Value-volume Analysis – Classification: HML Classification, XYZ Classification, VED Classification, FSN Classification, SDF and GOLF Classifications, SOS Classification.

Textbook:

1. Hrishikes Battacharya - Working Capital Management Strategies and Techniques - Prentice Hall of India

References:

1. Chitnis, K.M - Working Capital Management of Large Industrial Units - Dastane Ramachandra and company
2. Joshi R.N - Cash Management - New Age International Publishers

24OEL235 NON-PROFIT ORGANIZATION 3 0 0 3

Course Objective:

To provide students with a comprehensive understanding of non-governmental organizations (NGOs), covering their foundational concepts, legal frameworks, operational challenges, and strategic management.

Course Outcomes:

Students will be able to:

CO1: Understand the various types of non-profit organisations and their specific functions and the challenges faced by NGO management in India.

CO2: Understand the legal and operational differences between Trusts and Societies and implement the registration procedures for setting up NGOs as Trusts or Societies.

CO3: Assess the effectiveness of NGO interventions in addressing issues like poverty, child labour, education, and tribal welfare.

CO4: Apply strategic planning tools, such as SWOT analysis, and analyse the management processes.

CO5: Investigate the effectiveness of SHGs in empowering women.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	1	0	0	1	0	0	0	0	0	1	0	1	0	0	1
CO2	1	1	0	1	1	0	0	0	0	1	0	1	0	1	1
CO3	1	1	0	1	2	1	0	0	0	0	0	1	1	1	1
CO4	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1
CO5	1	1	0	1	1	1	0	0	0	0	0	1	1	1	1

Unit 1

NGOs – An Introduction, Concepts and Functions - evolution in India -types of non-profit organisations - Issues in NGO Management - challenges of NGO Management.

Unit 2

Legal procedures for establishment of NGOs – Trust and Society and their differences - Formation of Trust and Society - Registration procedure for NGO - Corporate Social Responsibility and Social Marketing.

Unit 3

Development issues - Development indicators -Poverty and Development - Child labour - Education and Tribal welfare.

Unit 4

Strategy and planning for NGOs – Elements of Strategy - SWOT analysis - Process of Management: Planning - Organization - Delegation - Co-ordination - Core Competency and Capacity Building.

Unit 5

NGOs and changing trends of development – State - market and third sector - Self Help Group (SHG) and Empowerment of Women - Role of NGOs in Civil Society.

Textbook:

1. JM Ovasdi- Management of Non-Governmental Organizations towards a Developed Civil Society

References:

1. Peter F Drucker - Managing the Non-profit organizations: Principles and Practices - Harper Collins publishers.
2. Michael, J Worth- Non-profit Management: Principles and Practices - Sage publications.

24OEL236 DIGITAL BANKING 3 0 0 3

Course Objective:

This course explores the evolution of digital banking, its key technologies, challenges, and opportunities. Participants will gain insights into digital banking innovations and best practices, preparing them to navigate the rapidly changing financial services industry.

Course Outcomes:

The students will be able to:

CO1: Understand the evolution and importance of digital banking in the financial sector.

CO2: Recall and describe the key features of various digital products in the banking industry.

CO3: Understand the key technologies underpinning digital banking, including Block chain, Artificial Intelligence and Machine Learning.

CO4: Understand the various applications of AI technologies in different areas of banking, such as customer service, risk management, and fraud detection.

CO5: Identify digital banking security, compliance, and risk management practices.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	1	0	0	0	0	0	1	0	0	1	1	0	2	1	0
CO2	1	0	0	0	0	0	0	0	0	1	1	0	2	1	0
CO3	1	0	0	1	0	0	0	0	0	1	1	0	2	1	1
CO4	1	0	0	1	0	0	0	0	0	1	1	0	2	1	1
CO5	1	0	0	1	0	0	1	1	0	1	1	1	2	1	1

Unit 1

Introduction to Digital Banking: Definition – History – Significance- Comparison of traditional banking vs. digital banking- Channels of Digital Banking- Digital Banking Platforms and services.

Unit 2

Digital Banking Products: Online Banking: Meaning, Services- Benefits- Disadvantages- Mobile banking Apps - Digital Wallets- Personal Financial Management Tools- Digital loans and credit products - Robo Advisory Services – Electronic Fund Transfer.

Unit 3

New developments in digital banking: Fin techs- Business ecosystems- Block chain -Crypto Currencies-

Peer Financing - Cloud Banking - Artificial Intelligence - Machine Learning- Internet of things (IoT).

Unit 4

Artificial Intelligence in Banking: Applications of AI in Banking – Need of AI in Banking- Importance of AI in banking – AI in customer service- AI in risk Management- AI in Fraud detection- Future of AI in Banking.

Unit 5

Digital Banking Securities and Risk Management: Emerging trends and challenges in cyber security - Importance of cyber security in banking - Cyber security threats faced by banks - Risk management strategies for mitigating cyber risks- Regulatory compliance and data protection laws.

References:

1. Lohana Sarika R. - Digital Banking and Cyber Security - New Century Publications
2. Singh Jaspal - Digital Payments in India: Background, Trends and Opportunities - New Century Publications

24OEL237 BASICS OF COMPANY ACCOUNTS 3 0 0 3

Course Objectives:

This course equips students with the knowledge to analyze corporate capital structures, prepare financial statements, and understand profit distribution. It explores valuation methods and dives into consolidated financial statements for holding companies, particularly focusing on those with one subsidiary company according to Accounting Standard 21 (AS 21).

Course Outcomes:

The students will be able to:

CO1: Understand capital structures and transactions for shares and debentures.

CO2: Gain knowledge about Preparing financial statements & analysing profit distribution for corporations.

CO3: Analyze methods for valuing intangible assets and company ownership.

CO4: Acquire knowledge to Prepare consolidated financial statements for holding companies (AS 21).

CO5: Understand consolidation for holding companies with one subsidiary company (AS 21)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	1	1	0	1	0	0	0	0	0	1	1	1	1	1	0
CO2	1	1	0	1	0	0	0	0	0	1	1	1	1	0	0
CO3	1	1	0	1	0	0	0	0	0	1	1	1	1	0	0
CO4	1	1	0	1	0	0	0	0	0	1	1	0	1	0	0
CO5	1	1	0	1	0	0	0	0	0	1	1	1	1	1	0

Unit 1

Accounting for Share Capital and Debentures, Issue, forfeiture and reissue of forfeited shares: concept & process of book building; Issue of rights and bonus shares; Buy back of shares; Redemption of preference shares; Issue and Redemption of Debentures

Unit 2

Final Accounts Preparation of profit and loss account and balance sheet of corporate entities, excluding calculation of managerial remuneration, Disposal of company profits

Unit 3

Valuation of Goodwill and Valuation of Shares Concepts and calculation: simple problem only

Unit 4

Amalgamation of Companies Concepts and accounting treatment as per Accounting Standard: 14 (ICAI) (excluding inter-company holdings). Internal reconstruction: concepts and accounting treatment excluding scheme of reconstruction. (Simple Problem only)

Unit 5

Accounts of Holding Companies/Parent Companies - Preparation of the consolidated balance sheet with one subsidiary company. Relevant provisions of Accounting Standard: 21 (ICAI). (simple problems only).

Notes:

a) The relevant Indian Accounting Standards in line with the IFRS for all the above topics should be covered.

b) Any revision of relevant Indian Accounting Standard would become applicable immediately.

Textbooks:

1. Shukla and Grewal - Advanced Accounts Vol 2 - S. Chand
2. Jain and Narang - Advanced Accounts Vol 2 - Kalyani Publishers
3. Sr. K. Paul - Accountancy Vol 2 - New Central Book Agency

Reference:

1. Jawahar La - Accounting Theory and Practice - Himalaya Publishing
2. Dr. L. S. Porwal - Accounting Theory - McGraw Hill
3. Robert Anthony, D.F. Hawkins & K. A. Merchant - Accounting Text and Cases - McGraw Hill)
4. Dr. S. N. Maheshwari - Corporate Accounting - Vikas Publishing House
5. Dr. Ashok Sehgal, Dr. Deepak Sehgal - Advanced Accounting - Taxmann

24OEL238 MONEY MARKET AND CAPITAL MARKET 3 0 03

Course Objective:

To provide a wide range of investment opportunities to individuals and institutional investors. It plays a crucial role in financing domestic and international trade.

Course Outcomes:

The students will be able to:

CO1: To provide an understanding of the fundamentals of money markets and capital markets.

CO2: To familiarize students with the key participants, instruments, and operations in money and capital markets.

CO3: To explore the role of regulatory bodies and institutions in overseeing money and capital markets.

CO4: To analyze the relationship between money market and capital market in the overall financial system.

CO5: To develop critical thinking and analytical skills related to financial market activities.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	3	2	1	0	2	1	0	1	2	1	0	1	2	1	0
CO2	2	3	2	1	0	2	1	0	1	2	1	0	1	2	1
CO3	1	2	3	2	1	0	2	1	0	1	2	1	0	1	2
CO4	0	1	2	3	2	1	0	2	1	0	1	2	1	0	1

CO5	2	1	0	1	2	3	2	1	0	2	1	0	2	1	0

Unit 1

Introduction to Financial Markets - Financial market, Overview of financial market, Distinction between money market and capital market, importance of financial markets in the economy.

Unit 2

Money Market Instruments and Operations – Meaning and definition of money market, Money market instruments- Treasury bills, commercial papers, certificates of deposit, repurchase agreements (Repos), money market mutual funds, role of central banks in money market operations.

Unit 3

Capital Market Instruments and Institutions - capital market, meaning and definition, capital market instruments- stocks (Equities), bonds (Fixed Income Securities),mutual funds, hedge funds, investment banks and brokerage firms, securities and Exchange Board of India (SEBI) regulations.

Unit 4

Regulatory Environment and Risk Management - role of regulatory bodies in financial markets, market risk, credit risk, and liquidity risk, risk management practices in money and capital markets, Basel norms and capital adequacy requirements

Unit 5

Market Analysis and Investment Strategies - fundamental analysis, technical analysis, efficient market hypothesis, investment strategies: value investing, growth investing, etc., portfolio management and diversification.

Text books:

1) Pandey, I. M. - Financial management - Vikas Publishing House
2) Kothari, C. R. - Research methodology: Methods and techniques - New Age International

References:

1) Mishkin, F. S., & Eakins, S. G. - Financial markets and institutions. Pearson Education
2) Fabozzi, F. J., Modigliani, F., & Jones, F. J. - Foundations of financial markets and institutions - Pearson Education
3) Bodie, Z., Alex Kane, Alan J Marcus – Investments – McGraw Hill
4) Jeff Madura, - Financial Markets and Institutions - Cengage Learning
5) John C Hull, Sankarshan Basu - Options, Futures, and other Derivatives - Pearson

24OEL239 MACRO ECONOMICS 3 0 0 3

Course Objective:

This course is designed to make the students aware of the theoretical aspects of macroeconomics and provides foundation of some advanced issues and policies. It attempts to discuss the functional relationships between economic aggregates and helps to understand the overall structure of the economy in a theoretical perspective.

Course Outcomes:

The students will be able to:

CO1: To identify the macro economic problems and analyse the various features of macroeconomic

identities, per capita income, circular flow of income etc.

CO2: To analyse the basic concepts of national income measurements, welfare concepts, and consumer price index.

CO3: To learn the major perspectives on what determines performance of the overall economy and analyse the components of aggregate demand.

CO4: To familiarize the concepts of excess demand how it measures to control excess and deficient demand.

CO5: To analyze the meaning and objectives of government budget and suggest relevant policies to save the economy when deficit budget situation.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	1	0	0	1	2	0	1	2	0	0	0	0	0	1	0
CO2	2	1	1	0	1	0	1	0	1	0	0	1	0	0	0
CO3	0	1	0	1	1	0	1	0	0	0	0	0	0	1	0
CO4	2	1	2	1	1	0	0	0	0	1	0	1	0	0	1
CO5	1	2	2	1	1	0	0	0	0	0	1	1	0	0	1

Unit 1

Macro Economics emergence – meaning and scope – different sectors of the economy - Micro and Macro Economics – some basic concepts of Macro Economics – Stock – Flow – some Macro Economics identities – GDP, GNP, NDP, NNP, Per capita Income, Personal Income, Personal Disposable Income – Circular Flow of Income.

Unit 2

National Income – Methods for Measuring National Income – product method, income method and expenditure method – precautions of national income calculation - GDP and welfare – nominal GDP and real GDP - Concepts and their relationships – GDP deflator – Consumer Price Index.

Unit 3

Meaning and Components of Aggregate Demand – aggregate demand in a two-sector model – aggregate supply – components of aggregate supply – consumption function – types of propensities to consume – average propensity to consume and marginal propensity to consume – saving function – types of propensities to save – average propensity to save and marginal propensity to save – investment function induced investment and autonomous investment.

Unit 4

Excess demand – reasons for excess demand – impact of excess demand – deficient demand – reasons for deficient demand – impact of deficient demand – measures to control excess and deficient demand – measures to correct excess demand and deficient demand.

Unit 5

Meaning of government budget – objectives of government budget – components of budget – budget receipts – revenue receipts and capital receipts – budget expenditure – revenue and capital expenditure – balanced, surplus and deficit budget – measures of government budget.

Textbooks:

1. N. Gregory Mankiw – Principles of Macroeconomics – Cengage Learning
2. Richard T. Froyen – Macroeconomics: Theories and Policies - Pearson Education.
3. Eugene Diulio – Schaum's Outline of Macroeconomics - McGraw Hill

References:

1. Shapiro, Edward - Macroeconomic Analysis - Galgotia Publications
2. Sampat Mukherjee - Analytical Macroeconomics: From Keynes to Mankiw - New Central Book Agency
3. Andrew B. Abel – Macroeconomics - Pearson

24OEL240 MICRO ECONOMICS 3 0 0 3

Course Objective:

To analyse the market mechanisms that establish relative prices among goods and services and allocate limited resources among alternative uses, various microeconomic concepts, demand and supply, utility analysis, and production function.

Course Outcomes:

The students will be able to:

CO1: To identify the various features and problems of capitalist, socialist and mixed economies

CO2: To analyse the basic economic problems and its application in the society.

CO3: To discuss the economic data using changes in supply and its implications in the market equilibrium condition.

CO4: To familiarize the concepts of consumer behaviour, utility and indifference curve analysis.

CO5: To analyze short run and long run production function and to predict least cost production combination in the economy.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	0	1	1	0	1	1	0	0	0	0	0	0	0	2	0
CO2	1	3	2	0	0	0	0	1	0	0	0	0	0	1	0
CO3	1	2	1	1	0	0	0	0	0	0	0	1	0	1	0
CO4	0	1	1	0	1	0	0	1	1	0	0	1	0	0	1
CO5	1	2	1	1	1	0	0	0	0	0	0	0	0	0	0

Unit 1

Introduction to Micro Economics – origin – meaning - positive and normative economics – basic economic problems – capitalist economy – socialist economy and mixed economy.

Unit 2

Demand and Supply Analysis - Demand Determinants – individual and market demand – individual and market schedules – changes and shifts in demand – Market demand - Elasticity – types and degrees of price elasticity – determinants – Income elasticity of demand.

Unit 3

Supply – supply schedule and supply curve – changes and shifts in supply - elasticity of supply - Revenues – total, average and marginal - market equilibrium and impact of changes in demand and supply

Unit 4

Theory of Consumer Behaviour - Consumer preference and choice - utility – total and marginal utility – cardinal and ordinal utility. Analysis of consumer behaviour - law of diminishing marginal

utility – law of equi-marginal utility – consumer equilibrium under cardinal utility. Ordinal utility analysis – indifference curve analysis – properties.

Unit 5

Production – production function – total, marginal and average product – short run analysis of production function and long run analysis of production function – returns to a factor - law of variable proportions – three stages. Isoquants – properties – Iso cost line – returns to scale - economies and diseconomies of scale – internal and external economies.

Textbooks

1. A. Koutsoyiannis - Modern Micro Economics - Palgrave McMillan
2. Dominick Salvatore - Micro Economics: Theory and Application - Oxford University Press

References:

1. Robert S. Pindyck, et al. - Micro Economics - Pearson Education
2. G.S. Maddala and Ellen Miller - Micro Economics: Theory and Applications - McGraw Hill

24OEL241 RETAIL BANKING 3 0 0 3

Course Objective:

The course offers a comprehensive understanding of retail banking operations, products, and strategies. Students will explore the key principles of retail banking, including customer relationship management, product development, risk management, and regulatory compliance,

Course Outcomes:

The students will be able to:

CO1- Understand the role and significance of retail banking in the financial services industry.

CO2- Understand the various retail banking products and services offered to individual consumers and small businesses.

CO3- Identify the role of effective customer relationship management strategies in retail banking and assess the impact of these strategies on enhancing customer satisfaction.

CO4- Explain the various digital banking technologies and their impact on retail banking operations

CO5- Understand the various types of risks in retail banking and assess the effectiveness of different risk assessment methods and mitigation strategies

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	1	0	0	1	0	0	0	0	0	1	1	0	1	1	1
CO2	1	0	0	1	0	0	0	0	0	1	1	0	1	1	1
CO3	1	0	0	2	1	0	0	1	0	1	1	0	1	1	1
CO4	1	0	0	1	0	0	0	0	0	1	2	1	1	1	1
CO5	1	0	1	1	0	0	0	0	0	1	1	0	1	1	1

Unit 1

Introduction to Retail Banking: Evolution – Characteristics - Advantages – Significance - Challenges - Distinction between Retail and Corporate/Wholesale Banking- Role of retail banks in the economy. **Unit 2**

Retail banking Products and Services: Overview of retail banking products: Deposits – Loans- Credit

cards- Wealth management services - Lending products - Merchant services - Cash management solutions - Introduction to cross-selling and up selling strategies - Trends and innovations in retail banking products and services.

Unit 3

Customer Relationship Management in Retail Banking: Introduction - Need and Importance of Customer Relationship Management - Implementation Process of Customer Relationship Management in Banks - Benefits of Customer Relationship Management - Impact of Customer Relationship Management on Customer Satisfaction.

Unit 4

Digital Transformation in Retail Banking: Overview of digital banking technologies - Impact of digital transformation on retail banking operations - Fintech and Retail Banking - Opportunities and challenges of fintech integration in retail banking- Data Analytics and Artificial Intelligence in Retail Banking- Applications of artificial intelligence in retail banking.

Unit 5

Risk management in retail banking: Types of risks in retail banking: credit risk- operational risk and compliance risk - Risk assessment Methods - Risk mitigation strategies - Role of technology in managing risks in retail banking.

References:

1. Keith Pond - Retail banking – Gosbrook Professional Publishing
2. Scott, C. E - Changing face of retail banking – Oxford University Press.

24OEL242 BUSINESS MANAGEMENT 3 0 0 3

Course Objective:

To provide foundational understanding of the functional domains within Management.

Course Outcomes

The students will be able to:

CO1: Understand the concept of management and understand the significance of business management in various contexts.

CO2: Understand the features and significance of planning in organizational settings and identify the benefits and limitations of Management by Objectives.

CO3: Understand the significance of organizing in achieving organizational goalsand explain the process of organizing in various organizational contexts.

CO4: Explain the role of staffing process in identifying and acquiring human resources.

CO5: Identify the strategies for effective directing and Evaluate the significance of controlling in organizational management.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	1	0	0	1	1	0	0	0	0	1	2	0	1	1	1
CO2	1	0	0	1	1	0	0	0	0	1	2	0	1	2	1

CO3	1	0	0	1	1	0	0	0	0	1	2	0	1	2	1
CO4	1	0	0	1	1	0	0	0	0	1	2	0	1	2	1
CO5	1	0	0	1	1	0	0	0	0	1	2	0	1	2	1

Unit 1

Introduction to business management: Meaning - Definition- Features – Significance – Functions - Nature: As an Art, As a Science, And as a Profession - Levels of Management - Managerial Skills- Administration vs. Management.

Unit 2

Planning: Meaning – Definition – Features – Significance – Process - Management By Objectives: Meaning, Process, Benefits, Limitations.

Unit 3

Organizing – Meaning – Definition – Features – Significance – Process - Types of organization: Formal and Informal - Authority and Responsibility.

Unit 4

Staffing: Meaning – Definition – Features – Significance – Process - Difference between Training and Development

Unit 5

Directing and Controlling: Directing: Meaning, Definition, Features, Significance, Principles - Key Elements of Directing: Supervision, Motivation, Leadership, Communication – Controlling – Meaning – Definition – Features – Significance – Process - Resistance to control .

Textbooks:

1. L. M Prasad - Principles and Practices of Management – Sultan Chand and Sons
2. Koontz, Weihrich - Essentials of Management – McGraw Hill

References:

1. Brian Henry, Richard Daft – Management - Cengage Learning
2. Stephen P. Robins and Marry Coulter – Management - Pearson

24OEL243 INTRODUCTION TO TRAVEL AND TOURISM 3 0 0 3

Course objective:

Help the students gain a comprehensive understanding of tourism, interpret and evaluate tourism as a phenomenon and business system.

Course Outcomes:

The students will be able to:

CO1: Involve interest in students with basic concepts and contents of tourism.

CO2: Demonstrate an understanding of the impact of tourism at individual, local, national, regional and global levels

CO3: Familiarization with global tourism destinations, make tour plan and itineraries

CO4: Provide knowledge to students in concise and understandable format so that students could learn and apply these concepts in their career.

CO5: Develop transferrable skills among the students for managing various operations efficiently so that they could be ready to join the tourism industry.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	1	0	0	1	1	0	0	0	0	1	1	0	1	1	0
CO2	1	1	0	1	1	0	0	0	0	1	1	1	1	0	0
CO3	1	1	0	1	0	0	0	0	0	1	1	0	1	0	0
CO4	1	0	0	1	0	0	0	0	0	1	1	0	1	0	0
CO5	1	1	0	1	1	0	0	0	0	1	1	1	1	1	0

Unit 1

Travel and Tourism through the ages: Early Travels - 'Renaissance' and 'Age of Grand Tours'- Emergence of Modern Tourism, Factors affecting growth of Tourism.

Unit 2

Significance of Tourism: Definitions and Concepts – Tourism Systems, Visitor-Traveler, Excursionist – Definition and differentiation. Nature, Characteristics and Components of Tourism Industry – 5 A's – Introduction, Attraction, Accessibility, Accommodation, Amenities, Activities. Motivations and deterrents for travel.

Unit 3

Types and Forms of Tourism- Inbound, Outbound Inter–Regional , Intra–Regional Tourism- Domestic - International Tourism - Adventure- Health – Business – Conferences – Conventions – Sports – Religious - Senior Tourism - Special Interest Tourism Like Culture Or Nature Oriented - Ethnic

Unit 4

Functions of A Travel Agent - Travel Information and Counselling - Itinerary Preparation- Reservation - Ticketing- Preparation and Marketing of Travel Tour Packages - Handling Corporate Clients - Sources of Income of a Travel Agent - Popular Abbreviations Used in Travel Business - Difference Between a Travel Agent and a Tour Operator.

Unit 5

Role of Government- Role of Ministry of Tourism In Developing And Promoting Tourism In India- Role of Central And State Government In Promoting Tourism- Study of Tourism Organizations- Origin. Location- Institutional Set Up and Functions of WTO, IATA, PATA, ASTA, UFTAA, IATO, TAAI and ICAO.

Textbooks:

1. Pran Seth - Successful Tourism Management - Sterling Publishers
2. A.K Bhatia - Tourism Development: Principles and Practices - Sterling Publishers
3. K.K. Kamra, M. Chand - Basics of Tourism: Theory Operation and Practice – Kanishka Publishers

References:

1. Dr. Shubhada Marathe - Tourism Management – Himalaya Publishing House
2. Jag Mohan Negi: International Tourism and Travel: Concepts and Principles – S. Chand

24OEL244 BASICS OF INSURANCE MANAGEMENT 3 0 0 3

Course Objective:

To enable students to understand the various terms and concepts related to insurance management

Course Outcomes:

Student will be able:

CO1: To understand the various principles of insurance

CO2: To get an idea of various types of insurance products

CO3: To identify the role of insurance in economic development

C04: To explore the future potential of the insurance industry **C05:**

To recognize and accommodate business insurance

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	P014	PO15
CO1	1	0	0	1	1	1	1	0	0	1	1	0	0	0	0
CO2	1	0	0	1	1	0	0	0	0	1	1	0	1	0	0
C03	1	0	0	1	1	0	0	1	0	1	1	0	0	1	1
C04	2	0	1	1	1	0	1	1	1	1	2	2	3	1	1
C05	3	1	2	1	1	2	1	1	2	2	3	0	2	0	3

Unit 1

Insurance: Meaning, definition, nature, functions, types, classification on the basis of nature, business and risk Insurance principles: principles, general or essential principles of insurance contract, specific and miscellaneous principles.

Unit 2

Insurance products: Introduction, term life insurance, whole life insurance, endowment type plans, combination of whole life insurance and endowment type plans, children's assurance plans, annuities and pension plans.

Unit 3

Insurance and economic development: Introduction, role of insurance in economic development.

Unit 4

Growth of life insurance appraisal of insurance sector growth, product diversification by LIC, growth of general insurance after nationalization, issues and problems, future potential in future.

Unit 5

Business insurance: Insurance business in pre and post nationalization, weakness, liberalization, Functions of IRDA, Regulatory investment of funds, Accounting and actuarial standards, features of the revised guidelines, Actuaries Act 2006, International association of insurance supervisors, impact of liberalization, present scenario.

References:

1) Karam Pal, Bodla, M C Garg - Insurance Management, Principles and Practices - Deep and Deep Publications
2) Neelam Gulati - Principles of Insurance Management - Excel Books

24OEL245 INTRODUCTION TO COSTING 2 1 0 3

Course objective:

This course aims to provide students with a comprehensive understanding of cost accounting and different elements of cost and their respective management and accounting procedures.

Course Outcomes:

Student will be able to:

CO1: Assess the advantages and disadvantages of cost accounting and distinguish between costing, cost

accounting, and financial accounting.

CO2: Understand the procedures for centralized purchasingand determine appropriate stock levels and EOQ for effective inventory management.

CO3: Understand the different methods of wage payment

CO4: Analyse the classification, allocation, apportionment, and absorption of overheads

CO5: Prepare detailed cost sheets and understand the expenses typically excluded from cost sheets.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	1	0	0	1	0	0	0	0	0	1	1	0	0	0	0
CO2	2	2	2	1	0	0	0	0	0	1	1	0	0	0	0
CO3	1	1	1	1	0	0	0	0	0	1	1	0	1	0	0
CO4	1	0	0	1	0	0	0	0	0	1	1	0	0	0	0
CO5	2	2	2	1	0	0	0	0	0	1	2	1	1	0	0

Unit 1

Costing – meaning – objectives – cost - costing and cost accounting - advantages and disadvantages - cost accounting and financial accounting - cost accounting and management accounting.

Unit 2

Elements of cost - Materials - purchase procedure - centralized purchasing - decentralised purchasing - stock levels: minimum level - maximum level - Re-order Level - Average stock level - Danger level – EOQ. (simple problems)

Unit 3

Labour - Time keeping and time booking - methods of wage payment: time rate and piece rate system - over time - idle time. (Theory only)

Unit 4

Overheads - meaning and classification – allocation - apportionment and re-apportionment of overheads - Absorption of overheads - concept of over and under absorption of overheads. (Theory only)

Unit 5

Cost sheet – cost unit - preparation of cost sheet - unit costing - estimated cost sheet - expenses excluded from cost sheet.

Textbooks:

1) K. M. Vineeth, K.R. Shabu – Cost Accounting - Kalyani Publishers
2) S.P. Jain and K.L. Narang - Cost Accounting - Kalyani Publishers

Reference Books:

1) S.P. Iyangar - Cost Accounting Principles - Sultan Chand and Sons
2) Khanna Ahuja and Pandey –Practical Costing - S. Chand and Co.

B. S. Raman – Cost Accounting - United Publishers

24OEL246 ADVERTISING 3 0 0 3

Course Objective:

It provides how to explore markets, introduce salesmanship, advertising, and brand building,

Course Outcomes:

The student will be able:

CO1: To learn and explore the advertising methodologies and integrated marketing methods **CO2:** To understand the features of advertising and the role of advertising in the marketing mix **CO3**: To analyze the classification of advertising

CO4: To understand the types of media in advertising

CO5: To study the economic aspects of advertising

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO 1	2	3	3	3	3	1	2	1	3	3	3	3	2	3	3
CO 2	3	2	2	3	3	1	2	2	2	2	3	1	1	2	3
CO 3	3	1	1	2	2	1	2	1	3	2	3	2	2	2	3
CO 4	1	2	2	3	3	1	3	2	3	2	3	3	2	3	3
CO 5	3	3	2	2	2	1	2	2	3	2	3	2	2	2	3

Unit 1

Introduction to Advertising- Introduction to Integrated Marketing Communications – Publicity – Public Relations – Salesmanship – Sponsorship - Advertising – Sales promotion.

Unit 2

Advertising Features, Active participants, Role of Advertising in Marketing Mix, Communication and society- Advertising and brand building

Unit 3

Classification of Advertising on the basis – Area, Audience, Advertisers, Media, Objectives – Social Advertising, Political Advertising, Advocacy Advertising, Retail Advertising, Financial advertising, Corporate Image Advertising, Primary and Selective Advertising- Media in Advertising.

Unit 4

Comparative analysis of Media options for advertising – Television (cable / satellite / DD), Radio (special reference to FM), Internet, Print, Film (Product Placement) and Outdoor advertising. Emerging Media Options -New Options of Transit Advertising - Marketing ThroughSocial sites - Advertising through cell phones

Unit 5

Economic aspects of advertising - impact on production – distribution and consumer cost - advertising and competition – waste in advertising. Social aspects of advertising - advertising and culture (values, festivals, customs), standard of living, ethics in advertising.

References:

1. S.L.Gupta, V.V. Ratna - Advertising and sales promotion management - Sultan Chand & Sons
2. George E Belch, Keyoor Purani, Micheal A Belch - Advertising and Promotion – McGraw Hill
3. Chunawalla S. A. - Advertising and sales promotion management - Himalaya Publishing House.

24OEL247 GREEN MARKETING 3 0 0 3

Course Objective:

To understand and apply green marketing principles and strategies to enhance sustainability, address environmental challenges, and foster ethical business practices in both Indian and global contexts.

Course Outcomes:

The student will be able:

CO1: To Identify and describe the types of green marketing and reasons for adopting green marketing.

CO2: To explain the concept and guiding principles of sustainability in green marketing.

CO3: To identify key terms such as green spinning, green selling, and green harvesting. **CO4:** To evaluate the effectiveness of different stakeholders in promoting green marketing.

CO5: To assess the impact of governance on green marketing strategies.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	1	0	0	1	1	0	0	0	1	1	1	0	1	1	0
CO2	1	1	0	1	1	0	0	0	1	1	2	1	1	0	0
CO3	1	1	0	1	0	0	0	0	1	1	1	0	1	0	0
CO4	1	0	0	1	0	0	0	0	1	1	1	0	1	0	0
CO5	1	1	0	1	1	0	0	1	1	1	1	1	1	1	0

Unit 1

Green marketing - Meaning - Definition - Evolution of green marketing - Assumptions of green marketing – Types - Importance of Green Marketing -Reasons for adopting green marketing -benefits of green marketing - Green Marketing Mix.

Unit 2

Green Marketing Mix (GMM) and Sustainability - Meaning - concept of GMM – Strategies – Challenges - The concept of Sustainability and Green Marketing/Consumers and pioneering efforts in India - Guiding principles of Sustainability and Green Marketing/ Consumers - Common assumptions and myths of green marketing - Method of bringing sustainability in green marketing in India.

Unit 3

Green Spinning – Green Selling – Green Harvesting – Enviropreneur Marketing - Compliance Marketing – Green Washing – Climate Performance Leadership Index Promotional Channels of Green Marketing.

Unit 4

Functional Groups in Green Marketing - Functions within the market - Role of Wholesalers and Retailers- Role of banking institutions- funders and donors. Difference between general marketing and green marketing.

Unit 5

Governance and Legal Institutions - Role of governance in sustaining green marketing -Implications of governance - Impact of emerging green technologies for the manufacturing Sector.

Textbooks:

1. Amitabha Ghose - Green Marketing Strategies –ICFAI University Press
2. Tanushree Purohit, A.K Das Mohapatra - Green Marketing in the Indian Retail Sector - Lambert Academic Publishing
3. Robert Dahlstrom - Green Marketing Management - Pearson
4. Robert Dahlstrom- Green Marketing, Theory, Practice and Strategies - Pearson
5. Monica Loss - Green Marketing Strategies and Consumer Behavior

References:

1. Esakki and Thangasamy - Green Marketing and Environmental Responsibility in Modern Corporations - IGI Global
2. Jacquelyn A. Ottman - Green Marketing: Challenges and Opportunities for the New Marketing Age - NTC Business Books
3. Jacquelyn A. Ottman - The New Rules of Green Marketing - Berrett-Koehler Publishers

24OEL248 MODERN BANKING 3 0 0 3

Course Objective:

The objective of the course is to make the students aware about the principles and practices of banking and its recent trends.

Course Outcomes:

The student will be able:

CO1: To understand the basic concepts and evolution of banking sector.

CO2: To acquire knowledge on management and regulations of banks.

CO3: To identify the important documents about opening and maintenance of accounts.

CO4: To understand the role of IT in banks.

CO5: To summarise the trends that revolutionized the banking field.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	1	2	0	0	0	0	1	0	0	1	1	0	0	1	1
CO2	1	1	0	0	0	0	0	0	0	2	2	0	0	1	1
CO3	1	2	0	0	0	0	0	0	0	2	2	0	0	1	1
CO4	1	1	0	0	0	0	0	0	0	1	2	0	1	2	2
CO5	1	1	0	0	0	0	0	0	0	1	1	0	1	1	1

Unit 1

Introduction – Evolution of banking – meaning and definition of banks – functions- the importance of nationalization of commercial banks – classification of banks - Branch banking and Unit Banking; Investment banking and Mixed Banking; Universal Banking and virtual banking; Mobile Banking and Tele-Banking; Public Sector and Private Sector Banks.

Unit 2

Management and Regulation of banks – Management of account - Types of accounts; NPA; Pass Book; Cheque; Features, Crossing, Endorsements - Reserve Bank India-Evolution; RBI Act – 1935- main features; regulatory methods; Bank Ombudsman-Function and role.

Unit 3

Banking documents - Promissory Note - Bill of exchange – Cheque - Pay in slip - Withdrawal form - Account opening and Nomination form KYC - Deposit form and Deposit Receipts - Loan application form - ATM Card Application form

Unit 4

IT in banking - E-banking – Meaning and Definition; Services Provided; Types of E-banking; Banking Services through Internet. Retail Banking; Difference between Core banking and Retail banking; Advantages and disadvantages of retail banking; Services Offered in Retail Banks; Types of Internet Banking Risk.

Unit 5

Banking sector reforms - Small Finance Banks - Payment Banks – Financial Inclusion –Modes of cashless payments – Internet, mobile, mobile vallet, UPI, IMPS, USSD, AEPS, Debit cards, credit cards, prepaid cards, online payments.

Textbooks:

1. Nirmala K Prasad – Banking Theory Law and Practice– Himalaya Publishing
2. KC Sharma - Modern Banking in India – Deep and Deep Publication
3. Srivastava - Banking Theory and Practice – Himalaya Publishing
4. Mahmood Shah &Steve Clarke - E-Banking Management: Issues, Solutions, and Strategies - Information Science Reference (an imprint of IGI Global)

Reference Books:

1) Natarajan, Gordon - Banking Theory and Practice – Himalaya Publishing
2) Shekar, Shekar - Banking theory and practice - Vikas Publishing House

24OEL249 PROJECT MANAGEMENT 3 0 0 3

Course Objective:

Equips students with a versatile skill set that is applicable across industries, preparing them for roles in project management, business consulting, operations management, and various other areas of business

Course Outcomes:

The student will be able to:

C01. Understand the different concepts of a project and its importance.

C02. Describe the project appraisal and evaluation techniques.

C03. Analyze the stages of project financing to comprehend its underlying principles and operational mechanics

C04. Applyprinciples of project cost estimation and assessing the associated documentation charges to evaluate their impact on project planning and budgeting.

C05. Analyzethe procedures of project implementation to comprehend the underlying principles and strategies for effective execution.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	0	0	0	1	0	0	0	1	0	1	2	1	0	1	1
CO2	1	0	0	1	1	0	0	1	0	1	1	1	2	1	1
CO3	0	0	0	1	0	0	0	1	0	1	1	0	1	1	1
CO4	0	0	0	1	0	0	0	1	0	1	1	0	0	1	1
CO5	1	2	0	2	2	0	0	1	0	1	2	1	1	2	2

Unit 1

Project management – meaning- definition- Characteristics – importance of project management – types of projects – project life cycle and its stages.

Unit 2

Project appraisal – market feasibility, technical feasibility, financial feasibility – feasibility report – financial appraisal of a project – evaluation techniques of a project – traditional and modern.

Unit 3

Project financing – importance of project financing – key features – stages of project financing – pre financing, financing, post financing.

Unit 4

Project cost estimation – Preliminary expenses – fixed assets cost acquisition – technical cost – acquisition of patents and licenses – project documentation charges – preparation of project report. **UNIT 5**

Project implementation and control – project implementation procedures – working and design of project systems – work breakdown structure – project execution, project control, performance control, schedule control and cost control.

Textbooks:

1. Project Management – Shaveta Chugh, Kirandeep Kaur – Kalyani Publishers.
2. Project Management – Dr. D.C Agarwal, Dr. Amit Gupta – Thakur Publications.

References:

3. Clifford F Gray, Erik W Larson, "Project Management-The Managerial Process" Mcgraw-Hill
4. Vasanth Desai, Project Management, Himalaya Publishing House

24OEL250 INDIAN FINANCIAL SYSTEM 3 0 0 3

Course Objective:

To analyze the structure and functioning of the Indian financial system, including its components, regulatory framework, and recent developments, and evaluate the roles and impacts of primary and secondary markets.

Course Outcomes:

The student will be able:

CO1: To identify the components of the Indian financial system and explain the role and functions of financial institutions and markets.

CO2: To explain the methods of the new issue, such as IPO, FPO, public issue, bonus issue, and rights issue.

CO3: To analyze the different types of speculators and their strategies in the stock market.

CO4: To illustrate the structure and management of mutual funds in India.

CO5: To explain the different types of derivatives: forwards, futures, options, and swaps.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	1	0	0	1	0	0	0	0	0	1	1	0	1	1	0
CO2	1	1	0	1	0	0	0	0	0	1	2	1	1	0	0
CO3	1	0	0	1	0	0	0	0	0	1	1	0	1	0	0
CO4	1	0	0	1	0	0	0	0	0	1	1	0	1	0	0
CO5	1	1	0	1	0	0	0	0	0	1	1	1	1	1	0

Unit 1

The Indian Financial System-Components - Role and Functions-Interactions among the Components-Recent Developments in the Indian Financial System- Financial Markets-Classification- Capital Market and Money Market - - SEBI- -Objectives- functions.

Unit 2

Primary Market- Functions of New Issue Market - Methods of New Issue - IPO - FPO - Public Issue - Bonus Issue- Right Issue- - ESOP - Intermediaries in the New Issue Market- -Innovative Financial Instruments.

Unit 3

Secondary Market- Role and Functions of Stock Exchanges - Stock Exchanges in India - Online Trading Depositories - Stock Market Indices - Type of Speculators - SEBI regulations- Foreign Institutional Investors in Securities market- Foreign Portfolio Investment- Private Equity.

Unit 4

Mutual Funds -Meaning- Objectives- Advantages - Classification of Mutual Funds–Exchange Traded Fund- Constitution and Management of Mutual Funds in India – Advantages and limitations of Mutual Funds.

Unit 5

Derivatives - Features of Derivatives -Types of Derivatives– Forwards – Futures -Options-Swaps.

References:

1. Khan, M.Y. - Indian Financial System - McGraw Hill
2. Singh, Preethi - Dynamics of Indian Financial System - Ane Books
3. Guruswami, S - Capital Markets, McGraw Hill
4. Avadhani, V. A. - Investment and Securities Market in India - Himalaya Publishing House.

24OEL251 B2B MARKETING 3 0 0 3

Course Objective:

To provide students with essential knowledge and skills to succeed in the complex and dynamic world of business-to-business transactions.

Course Outcomes:

The student will be able:

C01: To Analyze the concept and environmental factors influencing B2B marketing to evaluatetheir impact on business strategies and decision-making.

C02: To Evaluate organizational buying processes and behaviors within the B2B context, discerning their implications for marketing strategies and relationship management.

C03: To Apply critical analysis to assess the efficacy of marketing strategies and market channels, incorporating evidence-based reasoning to enhance decision-making processes and achieve desired business outcomes.

C04: To Analyze the concepts of Segmentation, Targeting, and Positioning (STP) in marketing, applying critical thinking to assess their relevance and effectiveness in crafting market strategies to meet specific business objectives.

C05: To Evaluate the principles and practices of business marketing communication and digital marketing, synthesizing theoretical knowledge with practical applications to develop comprehensive strategies for effective communication and engagement with target audiences."

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	0	0	0	1	1	0	1	1	0	1	2	0	0	2	2
CO2	0	1	0	1	2	0	1	1	0	1	2	0	1	2	2
CO3	0	0	0	1	1	0	1	1	0	1	2	0	1	2	2
CO4	0	0	0	1	1	0	1	1	0	1	2	0	1	2	2
CO5	1	1	0	2	2	0	2	1	0	1	2	0	2	2	2

Unit 1

Introduction to B2B Marketing – meaning – definition – creation of B2B Marketing strategy – characteristics – business marketing and customers – Environment of business marketing – role of B2B Marketing – commercial enterprises and commercial and institutional customers.

Unit 2

Organisational buying – behaviour of the buyer – stages of organisational buying - Organizational and

business markets - Government as a customer - Commercial enterprises - Commercial and institutional customers.

Unit 3

Marketing strategy – strategy management process – managing products and services for business markets – management of business market channels - The Growth-Share Matrix, Multifactor Portfolio Matrix, The Balanced Scorecard.

Unit 4

Market segmentation – bases of segmentation – selection of target segments and positioning – B2B pricing strategies – advertising – Competitive bidding – CRM.

Unit 5

Business marketing communication – importance – marketing channels – trade fairs – exhibitions – business meets – B2B logistics – benefits – digital marketing – evolution - importance – types.

Textbooks:

1. Marketing Management – C.N Sontakki, Neeti Gupta, Anuj Gupta – Kalyani Publishers.
2. Nitin Kamat, Chinmay Nitin Kamat- Digital Marketing –Nirali Prakashan

References:

1. Michael D. Hutt, Dheeraj Sharma, Thomas W. Speh - B2B Marketing: A South Asian Perspective - Cengage
2. Sharad Sarin - Business Marketing: Concepts and Cases - McGraw Hill

24OEL252 BUSINESS ETHICS 3 0 0 3

Course Objective:

To understand ethical principles and theories to make informed and ethical decisions, promoting a culture of integrity, environmental sustainability, and gender equality in both Indian and global organizational contexts.

Course Outcomes:

The student will be able:

CO1: To compare and contrast the role of ethics in business from Indian and global perspectives.

CO2: To identify and describe the principles of consequential and non-consequential theories.

CO3: To explain the need to protect the natural environment and conserve natural resources.

CO4: To describe the importance of gender equality and the ethical considerations in addressing workplace discrimination.

CO5: To develop a code of ethics for an organization and demonstrate the application of value- based leadership.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	1	0	0	1	1	0	0	1	0	1	1	0	1	1	0
CO2	1	1	0	1	1	0	0	1	0	1	2	1	1	0	0
CO3	1	1	0	1	0	0	0	1	1	1	1	0	1	0	0
CO4	1	0	0	1	0	0	0	1	0	1	1	0	1	0	0
CO5	1	1	0	1	1	0	0	1	0	1	1	1	1	1	0

Unit 1

Ethics- meaning – definition - Business Ethics: Meaning - Definition - importance – nature- advantages – elements of business ethics - the purpose of ethics and morals for organizational interests – Cultural and Human values in management – Indian and Global perspective.

Unit 2

Consequential and non-consequential theories – meaning – Principles - Ethical dilemma – Ethical decision making.

Unit 3

Environment Issues - Protecting the Natural Environment - Prevention of Pollution and Depletion of Natural Resources - Conservation of Natural Resources – meaning – definition - need.

Unit 4

Workplace Ethics – meaning – definition- personal and professional ethics in the organization – discrimination: meaning, employer liability for harassment - gender equality - Importance of Gender Equality

Unit 5

Organisation Ethics Development System – Organisational Culture and values- meaning- definition – Code of Ethics: meaning, definition – Value-based Leadership and its effectiveness - Benefits of Value-Based Leadership.

Textbooks:

1. Armstrong, David - Managing by Storying Around
2. Arnold, Kristen - Team Basics: Practical Strategies for Team Success - QPC Press
3. Beer, Michael, and Einsenstat, Russell - The silent killers of strategy implementation and learning - Sloan Management Review

References:

1. Belanger, Peter - How to lose gracefully - TeleProfessional
2. Brenner, Steven, and Molander, Carl - Is the ethics of business changing - Harvard Business Review
3. Bureau of Business Practice - Leadership and the Law
4. Carey, Robert. “The ethics challenge.” Successful Meetings, April 1998

24OEL253 SALES AND DISTRIBUTION MANAGEMENT 3 0 0 3

Course Objective:

To equip students with the necessary tools to analyze, plan, implement, and evaluate sales and distribution strategies to maximize profitability and customer satisfaction.

Course outcomes:

The student will be able:

CO1: To Understand the importance of Sales Management entails progressing through cognitive

processes such as comprehension, analysis, and evaluation to recognize its significance in driving business operations.

CO2: To acquire knowledge about Personal Selling involves progressing through cognitive stages such as understanding, applying, and analyzing the fundamental concepts and techniques.

CO3: To Understand the nuances of Sales Force Management

CO4: To analyze more about Sales Control and Sales Expenses Management

CO5: To describe the concepts of Distribution Channel Management

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	0	0	0	2	2	1	1	1	0	2	2	0	0	2	2
CO2	0	0	0	2	2	1	1	1	0	2	2	0	0	2	2
CO3	0	0	0	2	2	1	1	1	0	2	2	0	0	2	2
CO4	0	0	0	2	2	1	1	1	0	2	2	0	0	2	2
CO5	0	0	0	2	2	1	1	1	0	2	2	0	0	2	2

Unit 1

Concept, Evolution of Professional Selling, Objectives of Sales Management, Exchange Process, Key Decision areas in Sales Management, Sales Management Cycle. Sales Strategy Formulation: Market Analysis, Setting Sales Objectives, Designing Sales Strategy. Planning for Selling efforts: Personal selling Concept, Situations conducive to personal Selling, Diversity Of Personal Selling situations, Strategies Used by Salesmen, Process of Personal Selling, Choice of basic Selling Style, and New Approaches in Selling.

Unit 2

AIDAS Theory of Selling, "Right set of Circumstances" Theory, "Buying Formula" Theory, "Behavioral Equation" Theory Salesmanship and Sales-Promotion Concept, Essential Qualities of Successful Salesman Motivating & Compensating Sales Personnel Motivation "Help from management", Financial Motivation Techniques, Non-Financial Motivation Techniques, devising a Sales Compensation Plan, Types of Compensation Plan, Fringe Benefits, Negotiating Skills.

Unit 3

Sales Organization, managing of sales territory, Management of Sales Quota Recruitment and Selection of Sales force, Training the sales force, Sales force motivation, Sales force compensation, Evaluating and controlling sales force

Unit 4

Reimbursement of Sales Expenses, Policies & Practices. Sales Budgeting &Control,Preparation of Sales Budget, Budget Implementation and Feedback Mechanism, Sales Control. Sales Meeting & Contest Planning & Staging of Sales Meeting, Sales Contests, Specific Objectives, and Contest Prizes. Managerial Evaluation of contest

Unit 5

Evolution of Marketing Channels, Retailing, wholesaling, Measuring Wholesale Performance, Franchising Distribution Channel Management, Evolution of Marketing Channels, Retailing, wholesaling, Measuring Wholesale Performance, Franchising,

Textbooks:

1. Panda Tapan K., Sahadev Sunil - Sales Distribution Management - Oxford University Press
2. Krishna K. Havaldar, Vasant M. Cavale - Sales and Distribution Management: Text and Cases – McGraw Hill

References:

1. Richard R. Still, Edward W. Cundiff, Norman A.P. Govoni - Sales Management: Decisions, Strategies & Cases - Pearson Education
2. Johnson F.M., Kurtz D.L., Scheuing E.E - Sales Management: Concepts Practice, and Cases - McGraw Hill
3. David Jobber, Geoffrey Lancaster - Selling and Sales Management - Pearson Education
4. Tanner, Honeycutt, Erffmeyer - Sales Management - Pearson Education
5. Mark W. Johnston, Greg W. Marshall - Sales Force Management – McGraw Hill

24OEL254 BASICS OF HUMAN RESOURCE MANAGEMENT 3 0 0 3

Course Objective:

This course is designed to highlight the importance of HRM in organizations and familiarize students with the process & mechanism of managing human resources students with the concepts & application f human resource practices followed in organisations.

Course outcomes:

The student will be able:

CO1: To Explain the importance of human resources and their effective management in organizations

CO2: To Demonstrate meanings of terminology and tools used in managing employees effectively

CO3: To Analyze the key issues related to administering the human elements such as motivation, compensation, appraisal, career planning, diversity, ethics, and training

CO4: To Develop an understanding of the challenges of human resources management.

CO5: To Develop necessary skill set in the students for the application of issues about Human Resource Management

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15
CO 1	1	1	0	1	1	0	0	0	0	2	2	0	0	1	1
CO 2	1	1	0	1	1	0	0	0	0	2	1	0	0	1	1
CO 3	1	1	0	1	1	0	0	0	0	2	1	0	0	1	1
CO 4	1	1	0	1	1	0	0	0	0	2	1	0	0	1	1
CO 5	1	1	0	1	1	0	2	0	0	2	2	0	0	1	1

Unit 1

Perspectives in Human Resource Management: Meaning and Definition of HRM – Purpose and Role of HRM – HR policies- traditional role of HR.

Unit 2

Meeting Human Resource Requirements: Job Analysis, Job Description, Human Resource Planning, Recruitment, Sources of Recruitment, Selection Process, Methods – Interview, placement and Induction separation

Unit 3

Training and developing Employees: Training needs assessment, methods of training, types of training,

development, performance appraisal, and various types of performance appraisal, career development

Unit 4

Motivation and leadership: Motivation-moral-theories of motivation-Leadership-theories of Leadership-promotion transfer Deviant workplace behaviour-Attrition

Unit 5

Industrial Relation &Labour Relations: Overview of Industrial Relation- Industrial Disputes- Negotiation-Discipline-Dispute settlement. Recent developments in HR-Strategic Human resource Management-Global trend & their influence on Practices

Textbooks:

1.V.S.P Rao - Human Resource Management - Konark Publishers

2. Gray Dessler - Human Resource Management - Pearson

References:

1. Edwin Flippo - Personal Management - Mei Ya publications
2. Dr. C.B Gupta - Human Resource Management – Sultan Chand and Sons

24OEL255 BASICS OF MANAGEMENT 3 0 0 3

Course Objective:

Upon completion of this course, students will understand core management concepts, principles, and social responsibility. They will gain knowledge of planning processes, organizational dynamics, and techniques for effective decision-making. Additionally, they will comprehend management concepts such as controlling, continuous improvement, and organizational design, enabling them to apply modern techniques for enhancing organizational performance.

Course Outcomes:

The student will be able:

CO1: Understand core management concepts & theories: functions, principles, & social responsibility.

CO2: To gain knowledge of planning concepts, processes, and techniques to make effective decisions.

CO3: Students will comprehend organizational dynamics including centralization, decentralization, staffing processes, and performance appraisal, fostering adeptness in managerial roles.

CO4: Understand concepts, nature, processes, and techniques of management, including controlling, and facilitating effective organizational decision-making and performance enhancement.

CO5: Apply modern techniques for continuous improvement, quality, change, well-being, problem-solving, and organizational design.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15
CO 1	1	0	0	1	1	0	0	0	0	1	2	0	0	1	1
CO 2	1	0	0	1	1	0	0	0	0	2	1	0	0	2	1
CO 3	0	0	0	1	1	0	0	0	0	1	1	0	0	2	1
CO 4	0	0	0	1	1	0	0	0	0	1	1	0	0	2	1
CO 5	0	0	0	1	1	0	1	0	1	1	2	0	0	2	1

Unit 1

Introduction to Management: Meaning, Nature and Importance, Functions and Principles of Management, Management V/S Administration. Development of Managerial Thought, Contribution by Taylor and Fayol Management by Exception and Management by objectives social responsibility of management.

Unit 2

Planning: Meaning-Nature and Importance, Elements, Concept, Process and Techniques, Barriers to effective planning, Forecasting, Decision Making, Concept and Process, Co-ordination

Unit 3

Organizing and Staffing: Concept, Nature, Principles and Significance. Centralization and Decentralization, Staffing, -Man Power Planning, Recruitment and Selection and Training, Performance Appraisal,

Unit 4

Direction & Controlling: Concept, Nature, Process and Methods, Controlling – Concept, Nature, Process and Techniques

Unit 5

Modern Management Techniques: Kaizen – Quality Circle -TQM – TPM – MIS – ISO – Change management – Stress management – Fishbone (ISHIKAWA) Diagram – Holacracy Rank and Yank – 20% time – Gamification – Flex working - Business ecosystem.

Textbooks:

1. Stephen P. Robbins, David A. Decenzo, 2016 - Fundamentals of Management - Pearson Education
2. Harold Koontz, O'Donnell and Heinz Weihrich - Essentials of Management - McGraw Hill
3. Robert Lussier - Management Fundamentals: Concepts, Applications, and Skill Development- Sage
4. Richard L. Daft - Principles of Management - Cengage Learning
5. Robbins – Management - Pearson Education

References:

1. L.M. Prasad – Principles and Practice of Management- Sultan Chand and Sons
2. Peter Drucker -Practice of Management - Harper
3. Chhabra - Business Organization and Management – Sun India Publication
4. M. C. Shukla - Business Organization and Management – S. Chand
5. Dr. C. B. Gupta – Business Organization and Management – Sultan Chand and Sons
6. Srinivasan, Chunawala – Management Principles and Practice – New Age International
7. Tripathy - Principles of Management – McGraw Hill
8. Sherlekar- Modern Business and Organization and Management – Himalaya Publishing

24OEL256 INTRODUCTION TO ENTREPRENEURSHIP DEVELOPMENT 3 0 0 3

Course Objective: To enable students to understand the various terms and concepts related to Entrepreneurship Development

Course Outcomes:

The student will be able:

CO1: To understand the various concepts of Entrepreneurial management

CO2: To get an idea of incubation and entrepreneurship **CO3:**

To have a clear picture of social entrepreneurship **C04:** To

explore family business and Entrepreneurship

C05: To know about startups and entrepreneurship councils in India

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	P014	PO15
CO1	1	0	0	1	1	1	1	0	0	1	1	0	0	0	0
CO2	1	0	0	1	1	0	0	0	0	1	1	0	1	0	0
C03	1	0	0	1	1	0	0	1	0	1	1	0	0	1	1
C04	2	0	1	1	1	0	1	1	1	1	2	2	3	1	1
C05	3	1	2	1	1	2	1	1	2	2	3	0	2	0	3

Unit 1

Introduction to Entrepreneurship and Its Evolution, Roles of an Entrepreneur, Idea Generation, Screening, Selection and Managing Resources, Leading and Building the team in an enterprise, Strategic Planning for Business, Forms of Ownership , Franchising - form of Business Ownership ,Financing Entrepreneurial Ventures ,Managing growth, expansion and winding up of business , Valuation of a new company ,Corporate entrepreneurship, Entrepreneurship in the era of Globalization: Environment and Strategy

Unit 2

Entrepreneurship, Creativity and Innovation, Centre of Innovation, Incubation and entrepreneurship - An expert Interview Entrepreneurship: Role of stimulating creativity, Creative teams and managerial responsibilities, Innovation and entrepreneurship: types and sources of innovation, Creativity and Innovations in Start Ups: A case of Altmat

Unit 3

Introduction to social entrepreneurship, Innovation and entrepreneurship in social context, Start- ups, early venture issues, Startups in India, Interviews of Founders and Supporters.

Sustainability of non-profit organizations, Financing and risks in social enterprises, Business Strategies and Scaling up.

Unit 4

Family Business: Concept, Characteristics, and Kinds of family Business, Conflict and Conflict resolution in Firm, managing leadership & succession planning in family business, Succession Planning, Succession and Continuity, Women entrepreneurship: issues, challenges, Women issues and encouraging change in family business: A case analysis of Wastengage Pvt. Ltd.

Unit 5

Financing the Entrepreneurial Business Funding and Start-up and Entrepreneurship Councils in India, Arrangement of funds, Exercise on the writing of project report Entrepreneurial Financing and Risk. Appraisal of loans by financial institutions, Role of Commercial Banks in financing Business Entrepreneurs, Venture Capital Entrepreneurship Institutions in India - A Visit to EDII

References:

1. Anna Maria Bliven - Entrepreneurship Essentials You Always Wanted To Know -

Vibrant Publishers

2. Abha Mathur - Entrepreneurship Development - Taxmann

24OEL257 UNDERSTANDING TRAVEL AND TOURISM 3 0 0 3

Course objective:

Helps the students will gain a comprehensive understanding of tourism and understand the diverse nature of tourism such as culture, place, global/local perspectives, and experience.

Course Outcomes:

The student will be able:

CO1: To Contextualize tourism within broader cultural, environmental, political and economic dimensions of society with basic concepts and contents of tourism.

CO2: To Interpret and evaluate tourism as a phenomenon and as a business system and to understand the impact of tourism at individual, local, national, regional and global levels

CO3: To Interpret practical, theoretical and personal skills required for management roles within a variety of international hotel and tourism organizations.

CO4: To provide knowledge to students in concise and understandable format so that students could learn and apply these concepts in their career.

CO5: To develop transferrable skills among the students for managing various operations efficiently so that they could be ready to join the tourism industry.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	1	0	0	1	1	0	0	0	0	1	1	0	1	1	0
CO2	1	1	0	1	1	0	0	0	0	1	1	1	1	0	0
CO3	1	1	0	1	0	0	0	0	0	1	1	0	1	0	0
CO4	1	0	0	1	0	0	0	0	0	1	1	0	1	0	0
CO5	1	1	0	1	1	0	0	0	0	1	1	1	1	1	0

Unit 1

Evolution of Tourism through the Ages - 'Renaissance', 'Age of Grand Tours'. Socio-Cultural Processes and Development of Tourism in Modern Age - Factors Affecting Growth of Tourism- Tourism Boom In The 19th And 20th Centuries- Rise Of International Tourism- Definition And Concept Of Tourism – Types Of Tourism - Tourism As An Industry.

Unit 2

Tourism- Definition, Types, Determinants- Difference between Travel and Tourism- Concepts of Excursion, Holiday, Sightseeing, Tourists and Mass Tourism - Significance of Tourism- Tourism Systems – 5 A's of Tourism - Motivations and deterrents for travel.

Unit 3

Travel Agency -Types of Travel Agencies - Tour Operators - working of a Tour Operator - Tourism Products: Definition, Concept, Characteristics and Classification - Tourism resources.

Unit 4

Nature Based Tourism Products: Islands and Beaches - Deserts and Hill Stations - Protected Areas: Wildlife Sanctuaries, National Parks And Biosphere Reserves - Adventure And Eco-Tourism - Types - Inbound, Outbound Inter-Regional Intra – Regional Tourism, Domestic, International Tourism-

Adventure- Health – Business- Conferences - Conventions - Sports, Religious - Senior Tourism- Special Interest Tourism Like Culture or Nature Oriented- Ethnic or 'Roots'

Unit 5

Tourism Marketing Mix - 8 P's, Seasonality- Indian tourism seasons - Role of Ministry of Tourism, Central and State Government in developing and promoting tourism in India - Tourism Organizations WTO, IATA, PATA, ASTA, UFTAA, IATO, TAAI, and ICAO.

Textbooks:

1. Christopher Hollway - The Business of Tourism – Prentice Hall
2. Cooper, Fletcher et al - Tourism Principles and Practices – Prentice Hall
3. Govt. Of India - Tourism Policy of India

References:

1. Kamra, Mohinder Chand - Basics of Tourism: Theory Operation and Practice – Kanishka Publishers
2. AK Bhatia - Tourism Development: Principles and Practices - Sterling Publishers

24OEL258 SUPPLY CHAIN MANAGEMENT 3 0 0 3

Course Objective:

To understand the basic concepts of supply chain management.

Course Outcomes:

The student will be able:

CO1: To understand the basic concepts of Supply Chain Management and its evolution.

CO2: To identify the significance of Supply Chain Integration.

CO3: To describe the types of sourcing and methodologies

CO4: To ascertain the relevance of outsourcing in the supply chain

CO5: To understand the strategic role of the supply chain.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	1	1	0	0	0	0	1	0	0	1	1	0	0	1	1
CO2	1	1	0	0	0	0	1	0	0	2	2	0	0	1	1
CO3	1	1	0	0	0	0	0	0	0	2	2	0	0	1	1
CO4	1	1	0	0	0	0	0	0	0	1	2	0	0	2	2
CO5	1	1	0	0	0	0	0	0	0	1	1	0	0	1	1

Unit 1

SCM: Definition – Objectives – Evolution – Importance -Difference between logistics and supply chain management – decisions involved in supply chain -SCM activities – push/pull supply chain.

Unit 2

Supply chain Integration-meaning – Stages of supply chain integration-Internal and External Integration – barriers of internal integration- global supply chain – value chain – management of supply chain.

Unit 3

Sourcing and Supply Management: Introduction-importance, Objectives. Sourcing process; types of sourcing- global, single and multiple sourcing – role and importance of inventory management- inventory control – meaning – techniques of inventory control.

Unit 4

Outsourcing in SCM: Meaning -Need-Outsourcing risks-outsourcing process -outsourcing -New opportunities in SCM outsourcing-Myths of SCM outsourcing.

Unit 5

Strategic role of the supply chain – strategic partnership – alliances – retail supply chain management – role of logistics in retail supply chain management – customer focus in supply chain- complaint handling – developing a customer service strategy.

Textbooks:

1. Chopra Sunil and Peter Meindl - Supply Chain Management: Strategy, planning and operation, Prentice Hall, Englewood Cliffs - New Jersey.
2. Bloomberg – Logistics - Pearson
3. Donald J. Bowersox, David J. Closs - Logistical Management - McGraw Hill

References:

1. Satish C. Ailawadi - Rakesh Singh - Logistics Management – Prentice Hall of India
2. Donald Waters – Logistics - Palgrave Macmillan
3. Krishnaveni Muthiah - Logistics Management and World Seaborne Trade - Himalaya Publishing House
4. Ashok Sharma, Sarika Kulkarni - Supply Chain Management - McGraw Hill

24OEL259 INTRODUCTION TO MARKETING 3 0 0 3

Course Objective:

The course of marketing will be appreciated through the fundamentals of marketing. The course primarily to understand the major elements of marketing mix with emphasis to product gives the basis of marketing.

Course Outcomes:

The student will be able:

CO1: To Develop a comprehensive understanding of foundational marketing concepts, theories, and principles.

CO2: To Analyze and interpret consumer behavior patterns, including factors influencing buying decisions and market segmentation strategies.

CO3: To Explore various marketing strategies such as product development, pricing, distribution, and promotion, and their application in diverse business scenarios.

CO4: To Acquire practical skills in conducting market research, utilizing research methodologies, and interpreting data for informed marketing decisions.

CO5: To Demonstrate critical thinking and problem-solving abilities by applying marketing concepts to real-world situations through case studies, projects, and discussions.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	3	2	1	0	2	1	0	1	2	3	0	1	2	3	0
CO2	2	3	2	1	0	2	1	0	1	2	3	0	1	2	3
CO3	1	0	3	2	1	0	2	1	0	1	2	3	0	1	2
CO4	0	1	0	3	2	1	0	2	1	0	1	2	3	0	1

CO5		1	2	1	3	2	1	0	2	1	0	1	2	3	0

Unit 1

Fundamental concept of marketing - Market- meaning, definition, features, classification of the market, introduction to marketing, definition and scope of marketing, the evolution of marketing concepts, the importance of marketing in business, marketing and selling, Marketing mix- meaning, definition, elements of the marketing mix.

Unit 2

Consumer behavior – meaning, definition, factors influencing consumer behavior, buying process and decision-making, market segmentation- definition, benefits, the pattern of segmentation, targeting- meaning, strategies and benefits, positioning – benefits, and product positioning strategies.

Unit 3

Marketing Strategies- meaning and definition of marketing strategies, steps in drawing up marketing strategies, Product development, and life cycle- marketing strategies based on PLC Pricing strategies, Distribution channels, and logistics

Unit 4

Promotional Techniques, - meaning of promotion, promotion mix, Advertising and public relations, Sales promotions and direct marketing, Digital marketing and social media strategies.

Unit 5

Market Research and Analysis- meaning, Importance of market research, research methodologies, Data analysis and interpretation.

Textbook:

1. Philip Kotler, Gary Armstrong - Principles of Marketing - Pearson

References:

1. Kevin Lane Keller, Philip Kotler - Marketing Management - Pearson
2. Del I. Hawkins, David L. Mothersbaugh - Consumer Behavior: Building Marketing Strategy – McGraw Hill
3. Naresh K. Malhotra, Satyabhushan Dash - Marketing Research: An Applied Orientation - Pearson
4. Dave Chaffey and Fiona Ellis-Chadwick - Digital Marketing: Strategy, Implementation and Practice – Pearson

24OEL260 FILM APPRECIATION 0 1 2 3

Course Objective:

This course offers an experiential approach to film appreciation, combining theoretical insights with practical analysis. Students will watch and critically evaluate a variety of films, learning to appreciate cinematic techniques, storytelling, and cultural impact. Designed as an open elective, the course aims to enhance students' understanding and enjoyment of films.

Course Outcome (CO):

By the end of this course, students will be able to:

- Identify and analyse key cinematic techniques used in films.
- Understand and appreciate the narrative structures and storytelling methods in films.
- Critically evaluate films from different genres and cultural backgrounds.

- Articulate informed critiques and analyses of films both verbally and in writing.
- Develop a personal aesthetic and critical approach to film appreciation.

Unit 1

Introduction to Film Appreciation

Understanding film as an art form and cultural product- Basic film terminology shot, scene, sequence, mise-en-scene, Viewing and analyzing short films: identifying basic elements.

Unit 2

Cinematic Techniques and Storytelling

In-depth study of shots, angles, and camera movements- Exploring the role of editing, sound, and lighting in storytelling- Screening and analysis: comparing different directorial styles

Unit 3

Masters of Cinema

Alfred Hitchcock: Suspense and psychological thrillers- Akira Kurosawa: Epic storytelling and visual style- Quentin Tarantino: Non-linear narratives and stylized violence- Charlie Chaplin: Comedy and social commentary- Satyajit Ray: Realism and humanism in cinema.

Unit 4

Film Genre

Introduction to major film genres: drama, comedy, horror, science fiction, documentary- Characteristics and conventions of each genre- Screening and discussion of representative films from each genre

Unit 5

Practical Film Analysis Workshop

Hands-on film analysis sessions- Group projects: Analyzing selected films and presenting findings- Final project: in-depth analysis of a chosen film.

References:

1. Bordwell, David, and Kristin Thompson - Film Art: An Introduction – McGraw Hill Education
2. Corrigan, Timothy, and Patricia White - The Film Experience: An Introduction - Bedford/St. Martins
3. Giannetti, Louis - Understanding Movies - Pearson
4. Monaco, James - How to Read a Film: Movies, Media, and Beyond - Oxford University Press
5. Phillips, William H - Film: An Introduction - Bedford/St. Martins

24OEL261 INTRODUCTION TO MEDIA STUDIES 3 0 0 3

Course Objective:

This introductory course in Media Studies aims to provide non-media students with a foundational understanding of the principles, theories, and practices within the field of media and communication. By the end of the course, students will be able to analyze and critically evaluate media texts, understand the role of media in society, and demonstrate proficiency in key concepts such as media literacy, communication theories, media industries, and ethical considerations.

Unit 1

Understanding Media and Communication

Definition of media and communication - Functions and roles of media in society - Basic communication

models (e.g., Shannon-Weaver model) - Theories of mass communication (e.g., agenda-setting theory, cultivation theory)

Unit 2

History and Evolution of Media

Evolution of print media (e.g., newspapers, books) - Rise of electronic media (e.g., radio, television) - Impact of digital media and the internet

Unit 3

Media Industries and Technologies

Overview of media industries (e.g., advertising, film, journalism) - Technological innovations in media production and distribution - Media convergence and its implications - Economic models of media production and distribution

Unit 4

Media Literacy and Criticism

Definition and importance of media literacy - Key concepts in media criticism (e.g., representation, ideology, framing) - Strategies for analyzing media texts (e.g., semiotics, narrative analysis) - Ethical considerations in media production and consumption.

Unit 5

Media and Society

Media effects on attitudes, behavior, and culture - Representation of gender, race, and class in media - Globalization and media flows - Media regulation and censorship

References:

1. Richard Campbell, Christopher R. Martin, Bettina Fabos - Media & Culture: An Introduction to Mass Communication – Macmillan Learning
2. Marshall McLuhan - Understanding Media: The Extensions of Man – MIT Press
3. Richard Campbell, Christopher R. Martin - Media Essentials: A Brief Introduction - Bedford/St Martins
4. W. James Potter - Introduction to Media Literacy - SAGE
5. Paul Marris and Sue Thornham - Media Studies: A Reader – New York University Press
6. James Curran, Nick Couldry - Media and Society: Production, Content, and Participation
7. David Barrat - Media Sociology - Routledge
8. John Fiske - Introduction to Communication Studies – Taylor & Francis
9. Arthur Asa Berger - Media and Communication Research Methods: An Introduction to Qualitative and Quantitative Approaches - SAGE

24OEL262 INTRODUCTION TO PSYCHOLOGY 3 0 0 3

Course Objective:

This course offers a comprehensive introduction to the principles, theories, and applications of psychology. Through exploration of various psychological phenomena, students will gain insight into human behavior, cognition, emotion, and development. Topics covered include research methods, biological bases of behavior, sensation and perception, learning and memory, motivation and emotion, personality, social psychology, and psychological disorders.

Course Outcomes:

CO1: Recall and summarize key concepts and theories in psychology.
CO2: Explain the fundamental principles and theories that govern human behavior and mental processes.
CO3: Apply psychological concepts to analyze and interpret real-world scenarios.
CO4: Evaluate and critique psychological research studies and methodologies.
CO5: Design basic research studies and formulate hypotheses informed by psychological principles.
CO6: Create and organize hierarchies of psychological concepts and theories according to Bloom's Taxonomy, demonstrating higher-order thinking skills in analysis and synthesis. Syllabus:

Unit 1
Foundations of Psychology
Overview of psychology, History of psychology, Research methods and ethics
Unit 2
Biological and Cognitive Processes
Biological bases of behavior, Sensation and perception, Learning and memory
Unit 3
Motivation, Emotion, and Development
Motivation and emotion, Lifespan development, Theories of personality
Unit 4
Social Psychology
Social cognition and influence, Group dynamics, Cultural influences on behavior
Unit 5
Psychological Disorders and Interventions
Classification and diagnosis of disorders, Etiology and treatment approaches, Mental health awareness and stigma reduction, Review and Application, application of psychological principles to real-life situations

References:

1. Scott O. Lilienfeld, Steven J. Lynn, Laura L. Namy, Nancy J. Woolf - Psychology: From Inquiry to Understanding - Pearson
2. James W. Kalat - Introduction to Psychology – Wadsworth Publishing
3. Wayne Weiten - Psychology: Themes and Variations – Cengage Learning
4. Don Hockenbury, Sandra Hockenbury - Discovering Psychology - W.H. Freeman & Co
5. Robert S. Feldman - Essentials of Understanding Psychology – McGraw Hill
6. Gregory J. Feist, Erika L. Rosenberg - Psychology: Perspectives, Connections – McGraw Hill
7. Saundra K. Ciccarelli, J. Noland White - Psychology: An Exploration - Pearson
8. Laura A. King - The Science of Psychology: An Appreciative View – McGraw Hill

24OEL263 INTRODUCTION TO GENDER STUDIES 3 0 0 3

Course Objective:

This course introduces students to the foundational concepts, theories, and issues within gender studies. Through interdisciplinary approaches, students will explore the social, cultural, historical, and political dimensions of gender, with a focus on understanding how gender shapes individuals' experiences, identities, and societies.

Course Outcomes:

CO 1: Demonstrate an understanding of key concepts and theories within gender studies.

CO 2: Analyse the intersections of gender with other social categories such as race, class, sexuality, and nationality.

CO 3: Evaluate historical and contemporary issues related to gender inequality and social justice.

CO 4: Develop critical thinking skills through the examination of gendered representations in media, literature, and popular culture.

CO 5: Apply gender theories to real-world contexts and contemporary debates.

CO 6: Communicate effectively about gender-related topics through written and oral presentations.

Unit 1

Introduction to Gender Studies

Introduction to Gender Studies as an academic discipline, Historical perspectives on gender roles and expectations, Key concepts: sex, gender, sexuality, and intersectionality, Feminist theories and their contributions to gender studies.

Unit 2

Gender and Identity

Social construction of gender identities, Gender socialization and its impact on individuals, Transgender and non-binary identities, Intersectionality: Gender, race, class, and sexuality.

Unit 3

Gender and Power

Patriarchy and its manifestations, Gender inequality in education, employment, and politics, Violence against women and LGBTQ+ individuals, Feminist activism and resistance movements.

Unit 4

Gender, Media, and Culture

Gender stereotypes in advertising and the media, Gender representations in film, television, and literature, The role of social media in shaping gender identities and perceptions, Queer culture and LGBTQ+ representation in media.

Unit 5

Gender in Global Contexts

Globalization and its impact on gender roles and relations, Gender and development: Empowerment vs. exploitation, Feminist perspectives on global issues such as poverty, migration, and environmental justice, Transnational feminism and solidarity movements.

References:

1. Judith Butler - Gender Trouble: Feminism and the Subversion of Identity - Routledge
2. Kimberlé Crenshaw - Intersectionality – The New Press

3. Simone de Beauvoir - The Second Sex – Vintage Classics
4. Bell Hooks - Feminism is for Everybody: Passionate Politics - Routledge
5. Julia Serano - Whipping Girl: A Transsexual Woman on Sexism and the Scapegoating of Femininity – Seal Press
6. Bonnie G. Smith - Global Feminisms Since 1945 – Taylor & Francis
7. Michael S. Kimmel - The Gendered Society – Oxford University Press

24OEL264 CONSTITUTION AND MEDIA ETHICS 3 0 0 3

Course Objective:

This course provides an introduction to the principles and concepts of media ethics within the framework of the Indian Constitution. Students will explore the intersection of media practices with legal and ethical considerations, focusing on foundational principles of freedom of speech, press freedom, and the responsibilities of media professionals as enshrined in the Indian Constitution.

Through case studies and discussions, students will develop critical thinking skills to analyze ethical dilemmas in media production and consumption within the Indian context.

Course Outcomes:

CO1: Recall and summarize key constitutional principles relevant to media ethics, including fundamental rights and duties outlined in the Indian Constitution.

CO2: Explain the ethical responsibilities and challenges faced by media professionals in India in the context of constitutional rights.

CO3: Apply ethical theories and frameworks to analyze real-world media scenarios and dilemmas within the Indian legal and cultural landscape.

CO4: Evaluate the ethical implications of media content and practices using critical reasoning and judgment, with consideration for Indian constitutional principles.

CO5: Design ethical guidelines and strategies for media production and consumption informed by Indian constitutional principles and ethical theories.

CO6: Create and defend reasoned arguments regarding media ethics issues within the Indian context, demonstrating higher-order thinking skills in analysis and synthesis.

Unit 1

Introduction to the Indian Constitution and Fundamental Rights

Overview of the Indian Constitution: historical background, drafting process, and salient features, Fundamental rights guaranteed by the Indian Constitution, including freedom of speech and expression, freedom of the press, and right to information, Fundamental duties of Indian citizens and their relevance to media ethics.

Unit 2

Ethics in Journalism and Reporting in India

Journalistic ethics and codes of conduct in the Indian context. Objectivity, bias, and fairness in reporting within the Indian media landscape. The role of media in shaping public opinion and democratic discourse in India.

Unit 3

Ethics in Digital Media and Social Networking in India
Ethical considerations in online journalism and social media platforms in India. Privacy, anonymity, and surveillance issues in the Indian digital space. Challenges of combating fake news, misinformation, and digital manipulation in India.

Unit 4
Advertising, PR, and Corporate Communication Ethics in India
Ethics in advertising and marketing communications in the Indian market. Public relations ethics and professional responsibility in India. Corporate social responsibility and ethical communication practices in Indian businesses.

Unit 5
Media Regulation and Legal Issues in India: Media laws and regulations governing print, broadcast, and digital media in India. Ethical dilemmas in media coverage of legal proceedings in India. Media censorship, prior restraint, and freedom of information issues in India. Unit 6: Ethical Decision Making and Application in the Indian Media Context. Case studies and ethical dilemmas in media production and consumption in India.

Suggested References

1. K. Augustine - Media Ethics: Truth, Fairness and Objectivity
2. V. S. Gupta - Media Ethics: Cases and Controversies
3. R. K. Singh - Ethics in Journalism
4. V.N. Shukla - Indian Constitution: Text, Context and Interpretation
5. M. Neelamalar - Media Ethics: A Global Approach - PHI
6. Ganga S. Jhala - Mass Communication Ethics and Indian Philosophy
7. S. S. Gulshan - Mass Media Laws and Regulations in India
8. Kanchan K. Malik - Journalism Ethics in Indian Context

24OEL265 INTRODUCTION TO CALLIGRAPHY 3 0 0 3

Course Objective:
Students will develop a basic understanding of calligraphy techniques, tools, and styles. They will learn to create beautiful letterforms and explore the expressive potential of calligraphy.

Course Outcomes:
CO1: Identify calligraphy tools and materials. Recall the historical significance of calligraphy.
CO2: Explain the principles of calligraphy strokes and spacing. Describe different calligraphy styles.
CO3: Practice basic calligraphy strokes. Create simple letterforms and words.

CO4: Critique calligraphy compositions for balance and aesthetics. Compare various calligraphy scripts.

CO5: Assess personal progress in calligraphy skills. Evaluate the effectiveness of different writing surfaces.

CO6: Design personalized calligraphy projects (e.g., greeting cards, quotes). Experiment with embellishments and flourishes.

Unit 1

Introduction to Calligraphy History and Styles

Explore the origins of calligraphy. Study different calligraphy scripts (e.g., Gothic, Italic).

Unit 2

Foundational Techniques

Learn pen angles, pressure, and rhythm.

Practice basic strokes (thin upstrokes, thick downstrokes).

Unit 3

Letterforms and Alphabets

Master individual letterforms (uppercase and lowercase).

Create words using calligraphic alphabets.

Unit 4

Decorative Flourishes and Embellishments

Add artistic elements (swashes, loops) to lettering.

Experiment with decorative touches.

Unit 5

Personal Calligraphy Projects

Apply skills to create personalized pieces.

Reflect on the expressive possibilities of calligraphy.

References:

1. David Haris - The Calligrapher's Bible - Herbert Press
2. Sheila Waters - Foundations of Calligraphy – John Neal Book Seller
3. Eleanor Winters - Mastering Copperplate - Dover Publications
4. David Harris - The Art of Calligraphy: A Practical Guide to the Skills and - Dorling Kindersley
5. Molly Suber Thorpe - Modern Calligraphy - St. Martin's Griffin Publication
6. Julien Chazal - Calligraphy: A Complete Guide - Stackpole Books

24OEL266 INTRODUCTION TO BRANDING 3 0 0 3

Course Objective:

Students will develop a basic understanding of branding techniques, strategies, and creative elements. They will learn how to create and manage effective brand identities**.**

Course Outcomes:

CO1: Identify key branding concepts and terminology. Recall the importance of consistent brand messaging.

CO2: Explain the elements that contribute to a strong brand identity. Describe the role of branding in marketing and communication.

CO3: Develop basic brand guidelines (e.g., logo usage, color palette). Create simple brand collateral (e.g., business cards, letterheads).

CO4: Evaluate existing brand identities (case studies). Analyze brand consistency across different touchpoints.
CO5: Assess the effectiveness of branding strategies. Critique brand messaging for alignment with organizational goals.
CO6: Design a basic brand identity for a fictional company. Develop a brand positioning statement.

Unit 1
Introduction to Branding Concepts
Definition of branding. Importance of brand consistency. Brand vs. product.
Unit 2
Elements of Brand Identity
Logo design and visual identity. Brand colors, typography, and imagery.
Unit 3
Brand Strategy and Positioning
Target audience identification. Unique selling proposition (USP). Brand positioning matrix.
Unit 4
Brand Communication and Marketing
Creating brand messages. Social media branding. Content marketing for brand awareness.
Unit 5
Brand Management and Evaluation
Brand audits and assessments. Tracking brand performance. Rebranding considerations.

References:

1. Michael Johnson - Branding: In Five and a Half Steps – Thames and Hudson
2. Donald Miller - Building a Story Brand – Harper Collins
3. Alina Wheeler - Designing Brand Identity - Wiley
4. Marty Neumeier - The Brand Gap – New Riders Publication
5. Al Ries, Laura Ries - 22 Immutable Laws of Branding – Profile Books
6. David Airey - Identity Designed: The Definitive Guide to Visual Branding - Rockport Publishers

24OEL267 INTRODUCTION TO INDIAN SCULPTURE 3 0 0 3

Course Objective:

Introduction to Indian Sculptures is a captivating journey through the artistic heritage of India, where stone, metal, and wood come alive in intricate forms. This course delves into the soul of Indian culture, exploring the evolution of sculptural traditions across different periods and regions. From the serene grace of Mauryan sculptures to the vibrant Chola bronzes, students will unravel the stories embedded in each chisel mark. We'll discuss techniques, materials, and the spiritual context that shaped these masterpieces. By the end of this course, students will not only appreciate the aesthetics but also be inspired to create their own sculptural expressions, echoing the timeless legacy of Indian art.

Course Outcomes:

CO1: Recall basic facts about Indian sculpture.
CO2: Explain the significance of different styles and materials used in Indian sculpture.
CO3: Analyze and interpret specific works of Indian sculpture.

CO4: Explore the cultural and historical context of various Indian sculptural style.
CO5: Assess the aesthetic value of different sculptures.
CO6: Produce their own artworks inspired by Indian sculptural traditions

Unit 1
Introduction to Indian Sculpture
Definition of sculpture. History of Indian sculpture. Techniques and materials used in Indian sculpture.
Unit 2
Early Indian Sculpture:
Mauryan period sculpture. Gandhara art. Mathura art
Unit 3
Medieval Indian Sculpture:
Gupta period sculpture. Chola bronzes. Hoysala sculptures
Unit 4
Late Medieval and Early Modern Indian Sculpture:
Vijayanagara sculptures. Mughal period sculptures
Unit 5
Contemporary Indian Sculpture:
Exploration of modern and contemporary Indian sculptors

References:

1. John Guy - Indian Temple Sculpture - Victoria & Albert Museum Publication
2. Heinrich Zimmer - The Art of Indian Asia: Its Mythology and Transformations - Motilal Banarsidass Publishers
3. Pratap Aditya Pal - Indian Sculpture: A Catalogue of the Los Angeles County Museum of Art Collection - University of California Press
4. Vidya Dehejia - The Sensuous and the Sacred: Chola Bronzes from South India – Amer Federation of Arts Publication
5. Susan Huntington - The Art of Ancient India - Motilal Banarsidass Publishers
6. Ananda K. Coomaraswamy - The Dance of Shiva: Fourteen Indian Essays - Oriental Book Company

24OEL268 INTRODUCTION TO FIGURE DRAWING 0 1 2 3

Course Objective:
In this course, students will explore the art of capturing the human form through drawing. We'll delve into the rich history of figure drawing, from ancient classical sculptures to contemporary interpretations. Students will learn essential techniques, study anatomy, and experiment with light and shadow. By the end of the course, they'll not only appreciate the beauty of the human body but also create their own expressive figure drawings.
Course Outcomes:
CO1: Recall basic facts about figure drawing.
CO2: Explain the significance of different techniques and materials used in figure drawing.
CO3: Analyze and interpret specific works of figure drawing.

CO4: Explore the cultural and historical context of various figure drawing styles.
CO5: Assess the aesthetic value of different figure drawings.
CO6: Produce their own artworks inspired by figure drawing traditions.

Unit 1
Introduction to Figure Drawing
Definition of figure drawing. History of figure drawing. Techniques and materials used in figure drawing.
Unit 2
Basic Anatomy
Proportions and measurements. Skeletal structure. Muscular structure
Unit 3
Light and Shadow
Value scales. Chiaroscuro. Cast shadows.
Unit 4
Composition and Perspective
Rule of thirds. Golden ratio. One-point, two-point, and three-point perspective
Unit 5
Advanced Techniques
Gesture drawing. Foreshortening. Cross-hatching

References:

1. Andrew Loomis - Figure Drawing for All It's Worth – Titan Books
2. Jack Hamm - Drawing the Head and Figure – Tarcher Perigee Publication
3. David K. Rubins - The Human Figure: An Anatomy for Artists – Penguin Books
4. Sarah Simblet, John Davis - Anatomy for the Artist – Dorling Kingsley
5. Kimon Nicolaides - The Natural Way to Draw – Read Books
6. Burne Hogarth - Dynamic Anatomy - Watson-Guptill Publications

24OEL269 INTRODUCTION TO PRODUCT SKETCHING 0 1 2 3

Course Objective:

This course aims to introduce students to the fundamental principles of sketching in the context of product design. The course will cover both 2D and 3D sketching techniques, emphasizing the importance of visual communication in the design process. Students will learn to: Understand the role of sketching in product design. Develop basic sketching skills using different materials. Apply perspective and shading techniques to represent 3D forms. Communicate design ideas effectively through sketches. Explore the concept of family of forms and metaphors in design.

Course Outcomes:

CO1: Identify different types of sketching materials.
CO2: Explain the significance of sketching in the design process.
CO3: Create 2D and 3D sketches of simple objects.
CO4: Critique and analyze existing product sketches.
CO5: Generate new forms through sketching.
CO6: Assess the impact of metaphors in shaping design concepts.

Unit 1

Introduction to 2D and 3D Form

Basics of line drawing and shape representation. Radii manipulation in 2D and 3D forms.

Unit 2

Exploration of Surface Textures

Techniques for depicting different material textures. Rendering textures in sketches.

Unit 3

Form Transition

Understanding how forms transition from 2D to 3D. Sketching form variations.

Unit 4

Imagination and Insight

Using metaphors to inspire new forms. Developing creative sketches.

Unit 5

Sketching Techniques

Perspective drawing in product design. Effective use of line and shadow.

References:

1. Koos Eissen, Roselien Steur - Sketching: Drawing Techniques for Product Designers
2. Erik Olofsson and Klara Sjolen - Design Sketching

3. Scott Robertson - How to Draw: Sketching and Drawing Objects and Environments from Your Imagination – Design Studio Press
4. Hardi Meybaum - The Art of Product Design: Changing How Things Get Made - Wiley
5. Bill Buxton - Sketching User Experiences: The Workbook - Morgan Kaufmann
6. **Conrad B. Rider - Sketching for Product Design and AEC**

24OEL270 BASICS OF WATER COLOUR PAINTING 0 1 2 3

Course Objective:

By the end of this course, students will be able to: Understand the history and significance of watercolour painting as an art form. Master foundational techniques for creating beautiful watercolour paintings. Apply watercolor painting skills to create expressive and evocative artworks. Explore various watercolour painting styles and their unique characteristics. Develop an appreciation for the aesthetics and versatility of watercolour painting.

Course Outcomes:

CO1: Understand the history and significance of watercolour painting as an art form. **CO2:** Develop an appreciation for the aesthetics and versatility of watercolour painting. **CO3**: Apply watercolour painting skills to create expressive and evocative artworks.

CO4: Explore various watercolour painting styles and their unique characteristics.

CO5: Critique your own work and that of others in terms of composition principles.

CO6: Apply design concepts to create visually engaging artworks.

Unit 1

Introduction to Water colour Painting History and Styles

Explore the origins of watercolour painting and its cultural significance. Study different watercolour painting styles (such as traditional, contemporary, and experimental).

Unit 2

Foundational Techniques

Learn about brush types, sizes, and shapes. Practice basic techniques (such as washes, glazes, and layering).

Unit 3

Colour Theory and Mixing

Master colour theory concepts (such as hue, saturation, value). Experiment with colour mixing to create harmonious palettes.

Unit 4

Composition and Design

Learn about composition principles (such as balance, contrast, rhythm). Apply design concepts to create visually engaging artworks.

Unit 5

Project Work and Personal Expression

Apply watercolour painting skills to create personalized projects (such as landscapes, portraits, or still lifes). Reflect on the expressive potential of watercolour painting.

References:

1. Tom Hoffmann - Watercolor Painting: A Comprehensive Guide for Artists - Watson-

Guptill Publication
2. Erik Olofsson and Klara Sjolen - Design Sketching
3. Gordon MacKenzie - The Watercolorist's Essential Notebook: Keep Painting! A Treasury of Tips to Inspire Your Watercolor Painting Adventure - North Light Books
4. Michael Reardon - Watercolor Techniques: Painting Light and Color in Landscapes and Cityscapes - North Light Books
5. Chuck Long - Watercolor Success! 52 Essential Tips for Painting Better Watercolors
6. Kelly Klapstein - The Art of Watercolor Lettering: A Beginner's Step-by-Step Guide to Painting Modern Calligraphy and Lettered Art - Quarry Books
7. Haridas Nareekal - Understanding Watercolour: A Book on Watercolour Painting

24OEL271 BASICS OF LANDSCAPE PAINTING IN WATER COLOURS0 1 2 3

Course Objective:

By the end of this course, students will be able to: Understand the significance of landscape painting in art history and its role in visual storytelling. Apply foundational watercolour techniques to create expressive and realistic landscape artworks. Analyze and interpret various landscape elements (such as skies, trees, water, and mountains) in their paintings. Evaluate their own work in terms of composition, colour harmony, and mood. Create original landscape paintings that evoke emotions and connect with viewers.

Course Outcomes:

CO1: Understand the significance of landscape painting in art history.
CO2: Analyze and interpret various landscape elements in paintings.
CO3: Apply foundational watercolour techniques to create expressive landscape artworks.
CO4: Evaluate your own work in terms of composition and colour harmony.
CO5: Critique landscape paintings based on their emotional impact.
CO6: Create original landscape paintings that connect with viewers.

Unit 1

Introduction to Landscape Painting

Explore the historical context of landscape painting. Understand the role of landscapes in visual storytelling.

Unit 2

Tools and Materials for Landscape Painting

Learn about watercolour brushes, papers, and pigments suitable for landscapes. Experiment with different brush strokes and textures.

Unit 3

Foundational Techniques for Landscapes

Practice wet-on-wet and wet-on-dry techniques. Study colour mixing for natural elements (such as grass, rocks, and water).

Unit 4

Elements of Landscape Composition

Analyze the visual components of landscapes (horizon lines, focal points, foreground-background

balance). Explore techniques for creating depth and perspective.

Unit 5

Specific Landscape Elements

Study how to paint skies (clouds, sunsets, and atmospheric effects). Explore techniques for trees, foliage, and water (rivers, lakes, and reflections). Creating Mood and Emotion in Landscapes: Understand how colour choices and lighting impact the mood of a landscape. Experiment with different approaches to evoke emotions in your paintings.

References:

1. Ron Ranson - Watercolor Landscape
2. Gordon MacKenzie - **The Watercolorist's Essential Notebook: Keep Painting! A Treasury of Tips**

to Inspire Your Watercolor Painting Adventure - North Light Books

3. Michael Reardon - **Watercolor Techniques: Painting Light and Color in Landscapes and Cityscapes - North Light Books**.
4. Tom Hoffmann - **Watercolor Painting: A Comprehensive Guide for Artists - Watson-Guptill Publication**
5. Chuck Long - **Watercolor Success! 52 Essential Tips for Painting Better Watercolors**
6. **Haridas Nareekal - Understanding Watercolour: A Book on Watercolour Painting**
7. Charles LeClair - The Art of Watercolor: Techniques and New Directions – Prentice Hall

24OEL272 BASICS OF OIL PAINTING 0 1 2 3

Course Objective:

This course serves as an introduction to the materials and techniques used in oil painting. Emphasis will be placed on developing mastery of techniques, understanding composition, and exploring color as a vehicle for visual expression.

Course Outcomes:

CO1: Students will **demonstrate knowledge** of various oil painting techniques, including brushwork, color mixing, and surface preparation.

CO2: Students will be able to **describe** the aesthetics and techniques used by old masters and contemporary painters.

CO3: Students will **apply** contour, gesture, and value (tones) in their oil paintings.

CO4: Students will **explore** principles of composition and design, creating dynamic compositions in their artwork.

CO5: Students will **develop a unique personal vision** in their oil paintings, integrating technical skills with creative expression.

CO6: Students will **create and critique** works of fine art using aesthetic principles, evaluating their own and others' paintings.

Unit 1

Introduction to Oil Painting Techniques

Materials and tools. Color mixing. Brushwork and application

Unit 2

Composition and Design

Principles of composition. Creating dynamic compositions

Unit 3

Still Life Painting

Observational skills. Rendering form and texture

Unit 4

Figure Painting

Anatomy and proportions. Capturing gesture and movement

Unit 5

Landscape Painting

Perspective and depth. Atmospheric effects

References:

1. Harold Speed - Oil Painting Techniques and Materials - Dover Publications
2. Kathleen Staiger - The Oil Painting Course You've Always Wanted - Watson-Guptill Publication
3. Ian Sidaway - Color Mixing Bible - Watson-Guptill Publication
4. Suzanne Brooker - The Elements of Landscape Oil Painting - Watson-Guptill Publication
5. Ralph Mayer - The Artist's Handbook of Materials and Techniques – Viking Publication
6. Linda Cateura - Oil Painting Secrets from a Master - Watson-Guptill Publication

24OEL273 ANCHORING AND PROGRAMME CASTING 0 1 2 3

This course is designed to equip students with the essential skills required for effective anchoring and media presentation. Through a combination of theoretical instruction, practical exercises, and hands-on projects, students will learn the fundamentals of on-camera performance, scriptwriting, audience engagement, and the use of media technology. The course will also address the ethical considerations and professional standards necessary for a successful career in media presentation.

Course Objectives:

- To develop on-camera performance and presentation skills.
- To master the techniques of scriptwriting and live reporting.
- To enhance the ability to engage and interact with audiences effectively.
- To learn the technical aspects of media production, including lighting, sound, and teleprompter use.
- To understand the ethical considerations and professional standards in media presentation.

Unit 1

Fundamentals of Anchoring

Introduction to anchoring and media presentation, Role and responsibilities of an anchor

Voice modulation, body language, and facial expressions, overcoming stage fright and building on-camera confidence, Practicum: Basic anchoring exercises and on-camera introductions.

Unit 2

Scriptwriting and Content Development

Principles of scriptwriting talk shows and interviews, Structuring scripts for different formats: news bulletins, live reports, feature stories, writing engaging headlines and lead-ins, Techniques for ad- libbing and improvisation, Practicum: Writing and delivering news scripts.

Unit 3

Audience Engagement and Interaction

Techniques for engaging and retaining audience attention, Effective use of language and storytelling in media presentation, conducting interviews: Asking effective questions and managing responses, handling live audience interactions and on-air call-ins, Practicum: Simulated live broadcasts and interview sessions.

Unit 4

Technical Skills and Media Technology

Basics of camera operation and shot composition, Understanding and using teleprompters effectively, Lighting and sound techniques for on-camera presentation, Introduction to video editing and post-production basics, Practicum: Recording and reviewing practice segments with technical setups.

Unit 5

Professional Standards and Ethics

Ethical considerations in media presentation and journalism, managing bias and maintaining objectivity, Dealing with breaking news and sensitive topics responsibly, Professional standards and best practices for anchors, Practicum: Case studies and ethical dilemma discussions.

References:

1. C.A. Tuggle, Forrest Carr, Suzanne Huffman - Broadcast News Handbook: Writing, Reporting, and Producing – McGraw Hill
2. Kenneth T. Kawamoto - Television News Anchoring: A Handbook for the Television News Professional – AITBS Publishers
3. Selected articles, case studies, and multimedia resources

24OEL274 BASICS OF PHOTOGRAPHY 0 1 2 3

Course Objective:

This course aims to equip students with comprehensive knowledge and practical skills in photography techniques and practices essential for effective communication. Through a combination of theoretical learning and hands-on exercises, students will develop a deep understanding of various photographic concepts, tools, and methods, enabling them to create compelling visual narratives and imagery.

Course Outcome (CO):

By the end of this course, students will be able to:

CO1: Learn basic shooting techniques, including focus and sharpness.

CO2: Explain the relationship between aperture, shutter speed, and ISO in achieving proper exposure.

CO3: Explore various framing techniques.

CO4: Explain the concept of white balance and its importance in different lighting conditions.

CO5: Develop advanced shooting techniques and explore specialized areas of photography such as macro or street photography.

CO6: Create and present a photography project, demonstrating an understanding of various concepts and techniques learned throughout the course**.**

Unit 1

Introduction to Photography

Introduction to camera types, components, and basic operations -Hands-on exercises: Camera handling and basic shooting techniques, Focus and sharpness.

Unit 2

Basics Framing and Composition

Focus Attention, Rule of thirds, leading lines, balancing elements in a farm, and framing techniques.

Unit 3

Fundamentals of Exposure

Camera Operation and Manual Settings. - Understanding the exposure triangle: aperture, shutter speed, and ISO. - Exposure metering modes and techniques. - Depth of field and its creative applications. Motion blur control and techniques.

Unit 4

Lighting Techniques

White balance and its uses in different lighting situations. - Natural light vs. artificial light: characteristics and applications. - Understanding light quality, direction, and intensity. - Using reflectors, diffusers, and artificial lighting equipment. - Hands-on exercises: Lighting setups and portrait photography.

Unit 5

Project

Hands-on exercises: shooting techniques and exploration of photography.
Project and presentation on different topics in photography.

References:

1. Michael Langford - Langford's Basic Photography: The Guide for Serious Photographers – Focal Press/Routledge
2. Fil Hunter, Steven Biver, Paul Fuqua - Light Science and Magic: An Introduction to Photographic Lighting – Focal Press/Routledge
3. Michael Freeman - The Photographer's Eye: Composition and Design for Better Digital Photos – Focal Press
4. Scott Kelby - The Digital Photography Book - Peachpit Press

24OEL275 BASICS OF VIDEOGRAPHY 0 1 2 3

Course Objectives:

The objective of this course is to provide students with hands-on experience in the fundamental techniques and skills necessary for videography. Students will learn the basics of camera operation, lighting, sound recording, editing, and the overall process of creating high-quality video content. By the end of the course, students will complete a short video project showcasing their skills and creativity in various videography techniques.

Course Outcomes (CO):

By the end of this course, students will be able to:

CO1 Recall terminology related to digital video camera settings, lenses, camera support systems, audio settings, basic light setup, and composition.

CO2 Understand the fundamental principles of digital videography including resolution, frame rates, camera settings, camera support systems. Knowing basic lighting setup, shot types and different compositions.

CO3 Apply technical skills in operating digital cameras, camera support system, lighting setups, and audio recording equipment to effectively capture high-quality video footage in various shooting

environments.

CO4 Critically evaluates video compositions in video productions, identifying strengths and areas for improvement.

CO5 Assess their own video projects and those of their peers, providing constructive feedback based on aesthetic principles, technical execution, and storytelling effectiveness.

CO6 Design and execute a comprehensive digital video project, considering pre-production planning, production logistics, and post-production workflows. Create a video project showcasing diverse videography skills.

Unit 1

Introduction to Videography and Equipment

- Types of digital video cameras, lenses, and their functions.
- Camera settings: resolution and frame rate.
- Basic camera operations: focusing, white balance, and exposure.
- Introduction to tripods, stabilizers, and other support equipment.

Unit 2

Lighting Techniques

- Types of lights: key light, fill light, back light.
- Lighting setups: three-point lighting and natural light usage.
- Color temperature and white balance adjustment.

Unit 3

Sound Recording and Audio Equipment

- Importance of sound in videography.
- Basics of sound recording: levels, clarity, and background noise.
- Syncing audio with video.

Unit 4

Video Shooting Techniques and Composition

- Basics of shot composition and framing.
- Camera movements: pans, tilts, tracking, and zooms.
- Script and shot planning.

Unit 5

Video Editing and Post-Production

- Introduction to video editing software (e.g., Adobe Premiere, Mobile video editing applications)
- Basic editing techniques: cutting, transitions.
- Adding titles and credits.

References:

Brown, B. - Cinematography: Theory and Practice: Image Making for Cinematographers and Directors - Focal Press.

Rabiger, M - Directing: Film Techniques and Aesthetics - Routledge.

24OEL276 INTRODUCTION TO FASHION PHOTOGRAPHY 0 1 2 3

Course Objective:

The primary objective of the Fashion Photography course is to equip students with the skills and knowledge necessary for capturing fashion images. Students will explore the intersection of fashion, aesthetics, and visual storytelling through photography. By the end of the course, they should be proficient in creating high-quality fashion photographs.

Course Outcomes:

CO1: Learn basic shooting techniques, including focus and sharpness.

CO2: Apply principles of composition, and camera techniques to create fashion images.

CO3: Critically evaluate fashion photographs in terms of aesthetics and lighting choices.

CO4: Compare and work with natural light and studio lighting setups for outdoor and studio fashion shoots.

CO5: Apply their knowledge through practical shooting techniques, exploring various aspects of fashion photography.

CO6: create and deliver presentations on different fashion photography topics, enhancing their communication abilities.

Unit 1

Introduction to Photography

Introduction to camera types, components, and basic operations -Hands-on exercises: Camera handling and basic shooting techniques, Focus and sharpness.

Unit 2

Foundations of Fashion Photography

Introduction to Fashion Photography: Overview of Visual Aesthetics in Fashion: Composition rules, Styling and posing.

Unit 3

Fundamentals of Exposure

Camera Operation and Manual Settings. - Understanding the exposure triangle helps fashion photography: aperture, shutter speed, and ISO. Depth of field and its creative applications. -Motion blur control and techniques.

Unit4

Fashion Lighting Techniques

Natural Light vs. Studio Lighting: Outdoor fashion shoots, Studio equipment - setups (softboxes, reflectors, etc.)

Unit 5

Project

Hands-on exercises: shooting techniques and exploration of fashion photography.

Project and presentation on different topics of fashion photography.

References:

1. Bruce Smith - Fashion Photography: A Complete Guide to the Tools and Techniques of the Trade - Amphoto Books
2. Eliot Siegel - The Fashion Photography Course: First Principles to Successful Shoot - The Essential Guide - Thames & Hudson Publication

24OEL278 FILM THEORY 3 0 0 3

Course Objective:

This course provides a fundamental introduction to film theory, focusing on essential concepts, historical perspectives, and basic analysis techniques. Designed as an open elective, it aims to equip students with the tools to understand and appreciate films critically.

Course Outcomes (CO):

By the end of this course, students will be able to:

CO1: Identify and analyse different types of shots, angles, and camera movements, and explain their significance in film storytelling.

CO2: Understand and apply key editing techniques and concepts to evaluate the role of the editor in shaping a film's narrative structure and rhythm.

CO3: Recognize and differentiate between diegetic and non-diegetic sound and analyse the functions and techniques of sound in creating mood, realism, and audience engagement.

CO4: Define and discuss the importance of film genres, analyse common genre conventions and expectations, and understand the evolution and blending of genres over time.

CO5: Compare and contrast major film theories such as formalism, realism, feminist theory, auteur theory, and structuralism, and apply these theories to the analysis of films.

Unit 1

Shots, Angles, Camera Movements, and Mise-en-Scene.

Definition and importance of shots in film: long shot, medium shot, close-up, extreme close-up Camera angles: high angle, low angle, eye-level, Dutch angle- Camera movements: pan, tilt, tracking, dolly, crane, handheld, zoom- Mise-en-scene: elements and significance (setting, costume, lighting, composition)

Unit 2

Editing in Film

Definition and importance of editing in film- Types of editing: continuity editing, montage, cross-cutting, jump cuts- The role of the editor: pacing, rhythm, and narrative structure- Key concepts: match on action, shot/reverse shot, eyeline match, parallel editing.

Unit 3

Sound in Film

Importance of sound in film: diegetic vs. non-diegetic sound- Elements of sound: dialogue, sound effects, music, silence- Functions of sound: creating mood, enhancing realism, guiding audience attention-Techniques: sound bridges, sound perspective, off-screen sound.

Unit 4

Film Genre

Definition and importance of genre in film- Analysis of common genres: horror, comedy, drama, science fiction, film noir- Genre conventions and audience expectations- Evolution of genres over time and genre blending.

Unit 5

Overview of Film Theory

Formalism vs. realism-Feminist film theory: the male gaze and gender representation-Auteur theory: significance and critique-Structuralism and semiotics: basic principles and application.

References:

1. Bordwell, David, and Kristin Thompson - Film Art: An Introduction – McGraw Hill.

2. Nowell-Smith, Geoffrey - Making Waves: New Cinemas of the 1960s – Continuum
3. Bazin, André - What Is Cinema? Vol. 1 - University of California Press

24OEL279 EVENT MANAGEMENT 3 0 0 3

Course Objective:

This course aims to equip students with the knowledge, skills, and practical experience necessary to plan, coordinate, and execute successful events across various industries. Through theoretical learning, hands-on exercises, and real-world case studies, students will develop proficiency in event management principles, including budgeting, marketing, operations, legal compliance, and ethical considerations. By the end of the course, students will be prepared to excel as competent and ethical event managers capable of delivering memorable and impactful events.

Course Outcomes:

CO1: Demonstrate proficiency in planning, coordinating, and executing various types of events.
CO2: Apply budgeting and financial management principles to effectively manage event finances.
CO3: Develop comprehensive event marketing strategies utilizing both traditional and digital channels.
CO4: Exhibit proficiency in vendor selection, negotiation, and management for successful event execution.
CO5: Understand and apply legal and ethical considerations in event planning and execution.
CO6: Evaluate the success of events through post-event analysis and apply lessons learned to future event management endeavours.

Unit 1

Introduction to Event Management

Understanding the concept and scope of event management, Historical overview of event management, Types of events and their characteristics, Role, and responsibilities of an event manager.

Unit 2

Event Planning and Coordination

The event planning process: from conception to execution, Budgeting and financial management for events, Vendor selection, negotiation, and management, Logistics, and operations management for events.

Unit 3

Marketing and Promotion for Events

Developing event marketing strategies, utilizing traditional and digital marketing channels, Creating promotional materials and campaigns, Sponsorship acquisition and management.

Unit 4

Event Execution and Operations

On-site management and coordination, Handling emergencies and crisis management, Guest and attendee management, Evaluating event success and post-event analysis.

Unit 5

Event Legal and Ethical Considerations

Legal aspects of event management: contracts, permits, and insurance, Ethical considerations in event planning and execution, Risk management strategies for events, Sustainability practices in event management.

References:

1. Razaq Raj, Sumeet Malik - Event Management: Principles and Practices - SAGE
2. Judy Allen - Event Planning: The Ultimate Guide to Successful Meetings, Corporate Events, Fundraising Galas, Conferences, Conventions, Incentives, and Other Special Events - Wiley
3. Leonard H. Hoyle - Event Marketing: How to Successfully Promote Events, Festivals, Conventions, and Expositions - Wiley
4. Tarlow Peter and Uysal Muzaffer - Risk Management in Events: An Introduction -
5. Judy Allen - The Business of Event Planning: Behind-the-Scenes Secrets of Successful Special Events - Wiley
6. Laura Capell - Event Management for Dummies – John Wiley and Sons

24OEL280 DOCUMENTING SOCIAL ISSUES 0 1 2 3

Course Objective:

The objective of the course on documenting social issues is to equip students with the knowledge, skills, and ethical understanding necessary to effectively research, document, and communicate about contemporary social issues through various mediums such as writing, photography, videography, and multimedia presentation.

Course Outcomes:

CO 1: Identify and analyse key social issues in contemporary society.

CO 2: Develop proficiency in a range of research methods for documenting social issues.

CO 3: Demonstrate competence in visual storytelling through photography and videography.

CO 4: Develop strong writing skills for advocating social change through various mediums.

CO 5: Create multimedia presentations to effectively communicate social issues to diverse audiences.

CO 6: Understand the ethical considerations involved in documenting and presenting social issues.

Unit 1

Introduction to Social Issues Documentation

Understanding the importance of documenting social issues, Identifying key social issues in contemporary society, Ethical considerations in documenting social issues.

Unit 2

Research Methods for Social Issues Documentation

Conducting literature reviews on social issues, Data collection techniques: interviews, surveys, and observation, Introduction to qualitative and quantitative analysis methods.

Unit 3

Visual Documentation of Social Issues

Photography techniques for social documentation, Videography and documentary filmmaking basics, Visual storytelling and its impact on social change.

Unit 4

Writing for Social Change

Narrative journalism and feature writing, Op-ed and advocacy writing, crafting compelling narratives to raise awareness and inspire action.

Unit 5

Multimedia Presentation and Distribution

Creating multimedia presentations using various platforms, Strategies for effective distribution and outreach, Leveraging social media and online platforms for maximum impact.

References:

1. Sheila Curran Bernard - Documentary Storytelling: Creative Nonfiction on Screen - Focal Press
2. John W. Creswell - Qualitative Inquiry and Research Design: Choosing Among Five Approaches - SAGE
3. Gillian Rose - Visual Methodologies: An Introduction to Researching with Visual Materials - SAGE
4. Howard S. Becker - Writing for Social Scientists: How to Start and Finish Your Thesis, Book, or Article - University of Chicago Press
5. Seth Gitner - Multimedia Storytelling for Digital Communicators in a Multiplatform World - Routledge

24OEL281 COMMUNICATION STRATEGIES FOR EVENT MANAGEMENT
2 0 1 3

Course Objectives:

To introduce the students to the techniques of business communication. To inculcate the skills of event management.

Course Outcomes:

CO1: Describe Business communication and Event Management.

CO2: Apply the principles of event management.

CO3: Demonstrate the use of various media tools to manage events.

CO4: Develop the ability to communicate effectively in business situations.

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1				2	2										
CO2		2												1	
CO3			2										1		
CO4	2					2									

Unit 1

Introduction to Event Management and Communication - Defining events, Types of events, Event Team, Principles of event Management, SWOT Analysis, Introduction to communication - principles, forms and objectives of communication, barriers to effective communication, types and techniques of effective communication. The cross-cultural dimensions of business communication. Business and social etiquette.

Unit 2

Event Planning, Team Management and Group communication - Event Planning - Creativity, Taking a brief, Timelines and budgeting, Event Calendar, Creation of Check list, Group communication - importance, meetings, group discussions. Video conferencing. Reporting an event - types of business

reports - format, choice of vocabulary, coherence and cohesion.

Unit 3

Marketing of Events and presentation- The Need for Marketing, Event Promotion, Tools of Promotion - Advertising, Public Relations, Media kit, Direct Marketing, Word of Mouth, Hospitality, Websites, The Promotion Schedule, Planning a Promotion Campaign for an Event. Event Sponsorship, Event Organizer, Event Partners, Event Associates, sponsorships. Techniques of Presentation.

Unit 4

Business Communication and propaganda - Understanding Business Communication – types and techniques – PR strategies - methods of propaganda – use of media (print and electronic) – use of celebrities.

Unit 5

Writing press releases and reports - Define Press Release – features of press release – need for press release and reports – drafting press release and report for an event – media relations for business promotion

REFERENCE BOOKS:

1. Devesh Kishore, Ganga Sagar Singh - Event Management: A Blooming Industry and an Eventful Career - Har-Anand Publications
2. Swarup K. Goyal - Event Management - Adhyayan Publishers

SUGGESTED READING:

1. Savita Mohan - Event Management and Public Relations - Enkay Publishing House
2. Semenik - Promotion and IMC - Thomson.
3. Hory Sankar Mukerjee - Business Communication: Connecting at Work
4. Bryan a Graner: HBR Guide to Better Business Writing- 2013
5. Lesiler & Flat lay - Basic Business communication - McGraw Hill.
6. Savita Mohan - Event Management and Public Relations - Enkay Publishing House.
7. Steve Mandel - Effective Presentation Skills: A Practical Guide for Better Speaking
8. Devesh Kishore, Ganga Sagar Singh - Event Management: A Booming Industry and an Eventful Career - Har-anand Publications
9. Swarup K. Goyal - Event Management - Adhyayan Publisher
10. Savita Mohan - Event Management and Public Relations - Enkay Publishing House.
11. Anton Shone, Bryn Parry - Successful Event Management - A Practical Handbook
12. July Allen - Event Planning - The ultimate guide - Wiley
13. S.J. Sebellin Ross - Public Relations – Kindle edition

Evaluation Pattern:

Assessment Component	Weightage (Internal)	Weightage (External)
Continuous Assessment	30 (Lab 20 + Theory 10)	
Mid Term	30	
End Sem		40

24OEL282 EFFECTIVE LEADERSHIP THROUGH NON-VIOLENCE IN COMMUNICATION 3 0 0 3

Course Objectives:

To understand the principles of non-violent communication and its role in effective leadership.
To comprehend the importance of positive thinking, trust and connection in building relationships To develop the skill of group work through empathetic communication
To engage in discussions and debates on ethical leadership practices and the importance of non-violence in communication.

Course Outcomes:

CO1 Identify the principles of non-violent communication.
CO2 Apply strategies for building trust and fostering connection in communication
CO3 Develop emotional intelligence for effective leadership.
CO4 Create a culture of respect, inclusivity, and collaboration.
CO5 Implement non-violent communication in everyday leadership scenarios.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	3													2	
CO2		2													
CO3				3											
CO4					3										3
CO5								3							

Unit 1

Introduction to Non-violent Communication-Communication as an essential soft skill-Understanding the principles of non-violent communication – importance of empathy and active listening in leadership-principles of democracy in communication - Assertive communication, Aggressive communication, and Passive communication

Unit 2

Building trust and connection- Strategies for building trust and fostering connection in communication – conflict resolution techniques through non-violent communication

Unit 3

Emotional Intelligence in Leadership - Developing emotional intelligence for effective leadership - managing emotions and reactions in communication. - positive thinking - principles of cooperation and fellowship.

Unit 4

Cultivating a Positive Work Environment- Creating a culture of respect, inclusivity, and collaboration – addressing power dynamics and promoting equality in communication- Team work and productive results.

Unit 5

Sustaining Non-violent Communication Practices - Implementing non-violent communication in everyday leadership scenarios – strategies for continuous improvement and growth in communication skills – ethical leadership practices

REFERENCE TEXTS:

1. Marshall B Rosenberg - Nonviolent Communication: A Language of Life - PuddleDancer Press
2. Brene Brown - Daring Greatly: How the Courage to be Vulnerable Transforms the Way We Live, Love, Parent, and Lead – Penguine Books
3. Travis Bradberry, Jean Greaves - Emotional Intelligence 2.0 - Perseus Books Group
4. Daniel Coyle - The Culture Code: The Secrets of Highly Successful Groups - Random House Business

5. Kerry Patterson, Joseph Grenny, Ron MaMillan, Al Switzler - Crucial Conversations: Tools for Talking When Stakes are High – McGraw Hill

Evaluation Pattern:

Assessment Component	Weightage of Marks
Continuous Evaluation (Class Tests, Assignments, Class Activities)	20
Mid Term Examination	30
End Semester Examination	50
Total	**100**

24OEL283 BASICS OF PSYCHOLOGY AND PERSONALITY DEVELOPMENT
3 0 0 3

Course Objectives:

To understand the basic principles of psychology and personality development. To enable the students to understand self and others.

To familiarise the students with the dynamics of personality development.

To enhance the students' personality to make them fit for various professional avenues.

Course Outcomes:

CO 1: Explain the basic concepts of Psychology with reference to personality development.

CO 2: Define and analyze personality - self and others.

CO 3: Classify the factors of personality development.

CO 4: Analyse the dynamics of personality development.

CO 5: Use theoretical knowledge to develop better personality disposition.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	1	2	0	2	0	0		0	0	0					
CO2	1				3			2							
CO3		1							3						
CO4										1	2				
CO5						1	2								

Unit 1

Introduction to Psychology - The Pioneers and Basic Concepts – Freud - Jung – Adler - Study of personality as an aspect of Psychology

Unit 2

Definition and concept of personality - Factors of personality development: Biological - Psychological - Environmental

Unit 3

Theories of Personality- Cognitive Processes - Memory, learning, and cognition - Language development and communication - Problem-solving and decision-making

Unit 4

Social Psychology - Social influence and group dynamics - Attitudes, stereotypes, and prejudice - Interpersonal relationships and communication

Unit 5

Personality Development - Theories of personality - Factors influencing personality development - Self-concept, self-esteem, and identity formation - Assessment of personality: Approaches and Methods - Self-Report - Personality Inventory.

CORE READING:

1. Morgan, Clifford - A Brief Introduction to Psychology - McGraw Hill
2. Siccarelli, Soundra K, Glenn E. Meyer – Psychology - Pearson
3. Ewen, R.B. - An Introduction to Theories of Personality - Lawrence Earlbaum Associates
4. Baron, R.A. – Psychology - Pearson
5. Hall, Calvin S., Gardner Lindsay, John B. Campbell - Theories of Personality - Wiley Student Edition

SUGGESTED READING:

1. Feldman, Robert S - Understanding Psychology - McGraw Hill
2. Onkar, R.M. - Personality Development and Career Management - S. Chand
3. 3.Baronn,R.A. - Social Psychology - Ally and Bacon
4. Mcgrath, E.H. S.J. - Skills for All - Prentice Hall of India

Evaluation Pattern:

Assessment Component	**Weightage of Marks**
Continuous Evaluation (Class Tests, Assignments, Class Activities)	20
Mid Term Examination	30
End Semester Examination	50
Total	**100**

24OEL284 INTRODUCTION TO SCI-FI STUDIES 3 0 0 3

Course Objectives:

To understand Science fiction as a literary genre

To understand the contemporary trends in Science fiction To understand the basic orientations in Sci-fi studies **Course Outcomes:**

CO1: Describe the general nature of science fiction

CO2: Classify the Subgenres

CO3: Analyse the major techniques dealt with SF.

CO4: Appraise the relevance of foundational texts and concepts to contemporary Science Fiction

CO5: Compare and contrast Current Cyberpunk fiction and film and other contemporary forms

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	3														
CO2		3											1		
CO3	1		3												
CO4				3											
CO5					3										1

Unit 1

Introduction - Definition, Characteristics, and evolution of science fiction, Difference between Science Fiction, Speculative Fiction and Fantasy Fiction, World Building in Science Fiction

"Utopia and Science Fiction"- Raymond Williams

"How We Became Posthuman"- Katherine Hayles **Unit**

2

Fiction – *Snow Crash* – Neal Stephenson

Unit 3

Short Stories - "The Distance of the Moon" - Italo Calvin

"I, Robot"- Issac Asimov

Unit 4

Poems - "A Martian Sends a Post card Home"- Craig Raine

"A Portrait of the Artist"-Vandana Singh

Unit 5

Films - *2001: A Space Odyssey* - Stanley Kubrick, Interstellar - Christopher Nolan

Blindness - Fernando Meirelle

REFERENCES:

1. Roberts, Adam - Science Fiction, 2nd ed, Routledge
2. Parrinder, Patrick (ed) - Science Fiction: A Critical Guide (1979), Longman Publishers
3. Bould, Mark et.al. (ed) - The Routledge Companion to Science Fiction (2009), Routledge
4. Gunn, James and Michael Candelaria – 2005 - Excerpt from Speculations on Speculation: Theories of Science Fiction - Scarecrow Press
5. Williams, Raymond. 1978. - Utopia and Science Fiction: Science Fiction Studies # 16 Vol. 5 (Part 3): 203-14
6. Hayles, Katherine. 1999 - Chapter 10 (247-82) in How We Became Posthuman. Chicago, Ill. - University of Chicago Press.

SUGGESTED READING:

1. Brave New World - Aldous Huxley
2. The Handmaid's Tale - Margaret Atwood
3. Harvest - Manjula Padmanabhan
4. Frankenstein - Mary Shelley
5. Blade Runner - Scott, Ridley

Evaluation Pattern:

Assessment Component	Weightage of Marks
Continuous Evaluation (Class Tests, Assignments, Class Activities)	20
Mid Term Examination	30
End Semester Examination	50
Total	**100**

24OEL285 CAMPUS NOVELS 3 0 0 3

Course Objectives:

To familiarise the students to the genre of Campus/Academic novels To understand the socio-political background of academia.

To initiate discussions on the growth of Campus novels. To critically analyse the past and present academic novels.

Course Outcomes:

CO 1: Identify genre specific elements of Campus Novels

CO2: Analyse the socio-political background of academic novels.

CO3: Compare and contrast different works to identify trends and shifts from past to present campus novels.

CO4: Critically analyse the role of academics in the transformation of society.

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	3				0	0		0	0	0					
CO2		2										2			
CO3					2										2
CO4						2									

Unit 1:

Introduction to Campus Novel/Academic Novels – growth and development of Campus Novel.

Unit 2:

The Bachelor of Arts – R. K. Narayan

Atom and the Serpent – Prema Nandakumar

Unit 3:

The Drunk Tantra – Ranga Rao

Unit 4:

Lucky Jim – Kingsley Amis

Unit 5:

Chemistry - Weiki Wang

CORE READING:

1. R. K. Narayan - The Bachelor of Arts - Indian Thought Publication
2. Ranga Rao - The Drunk Tantra - Penguin Books
3. Kingsley Amis - Lucky Jim - Penguin Books
4. Prema Nandakumar - Atom and the Serpent -Affiliated East-West Press

5. Weike Wang – Chemistry: A Novel – Knopf Publication

SUGGESTED READING:

1. Elaine Showalter - Faculty Towers: The Academic Novel and Its Discontents - Oxford University Press
2. Jenny Stringer - The Oxford Companion to Twentieth-Century Literature in English - Oxford University Press
3. Janice Rossen - The University in Modern Fiction: When Power is Academic - Palgrave Macmillan
4. Mark Bosco, Kimberly Rae Connor - Academic Novels as Satire: Critical Studies of an Emerging Genre - Edwin Mellen Press
5. Mortimer R. Proctor - The English university novel - University of California Press
6. Kenneth Womack - Postwar Academic Fiction: Satire, Ethics, Community - Palgrave Macmillan

Evaluation Pattern:

Assessment Component	**Weightage of Marks**
Continuous Evaluation (Class Tests, Assignments, Class Activities)	20
Mid Term Examination	30
End Semester Examination	50
Total	**100**

24OEL286 TECHNICAL COMMUNICATION 3 0 0 3

Course Objectives:

To introduce the students to the fundamentals of the mechanics of writing. To facilitate comprehension of various formal written communication.
To initiate critical and logical thinking in a professional set up. To enhance their technical presentation skills.

Course Outcomes:

CO1: Identify the mechanics of writing and the elements of formal correspondence.
CO2: Summarise technical documents.
CO3: Use the basic elements of language in formal correspondence.
CO4: Interpret information and organize ideas in a logical and coherent manner. CO5: Write technical documents with accuracy and clarity.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	0	0	0	3	0	0	0	0	0	2	0	0	0	0	0
CO2	2	0	0	3	0	0	0	0	0	2	2	2	0	0	1
CO3	0	0	0	3	0	0	0	0	0	2	0	0	0	0	0
CO4	2	0	0	3	0	0	0	0	0	2	2	2	0	2	1
CO5	2	0	0	3	0	0	0	0	0	2	2	2	0	0	1

Unit 1

Introduction to Technical communication - Definition, Aspects and forms of technical communication, importance of technical communication, technical communication skills (Listening, speaking, reading,

writing), linguistic ability – vocabulary, tone, and style in technical communication **Unit 2**

Comprehension of Technical Materials/Texts (reading and listening comprehension) - Interpreting and summarizing technical texts, Note taking and note making - Listening to technical talks, conversation, discussion, etc.- reading comprehension based on technical topics

Unit 3

Introduction to various kinds of technical documents - Research and Information Gathering - Finding and evaluating relevant information -Technical Document Design and Layout – drafting a brief technical article – use of Infographics (Visual elements) - Proper citation practice - Ethical Considerations in Technical Writing - Plagiarism, intellectual property, and responsible communication.

Unit 4

Technical Writing, Grammar, and Editing - Technical writing process - drafting and revising, Basics of grammar and punctuation, common errors in writing and speaking, editing strategies to achieve appropriate technical style - Planning, drafting, and writing Official Notes, Letters, E-mail, Resume, Job Application, Minutes of Meetings, technical reports, and proposals.

Unit 5

Oral presentation of technical documents – effective ppts for presentation – proper use of AI tools

CORE READING:

1. Raman, Meenakshi and Sharma, Sangeeta - Technical Communication: Principles and Practices - Oxford University Press
2. Hirsh, Herbert. L - Essential Communication Strategies for Scientists, Engineers and Technology Professionals, II Edition - IEEE press
3. Anderson, Paul. V - Technical Communication: A Reader-Centred Approach. 5th Edition - Harcourt Brace College Publication
4. Michael Swan - Practical English Usage - Oxford University Press

SUGGESTED READING:

1. Strunk, William Jr., White. EB - The Elements of Style - Alliyan & Bacon
2. Riordan, G. Daniel, Pauley E. Steven - Technical Report Writing Today, VIII Edition (Indian Adaptation) - Biztantra
3. L. U. B Pandey - Practical Communication: Process and Practice - A.L.T.B.S Publication
4. Sharma, R C, Mohan, Krishna - Business Correspondence and Report Writing - McGraw Hill

Evaluation Pattern:

Assessment Component	**Weightage of Marks**
Continuous Evaluation (Class Tests, Assignments, Class Activities)	20
Mid Term Examination	30
End Semester Examination	50
Total	**100**

24OEL287 ENGLISH FOR ACADEMIC WRITING 3 0 0 3

Course Objectives:

To improve the English language skills for academic purposes. To make students familiar with academic style and presentation in writing. To produce good academic content.

Course Outcomes:

CO1: Identify relevant information from academic discourses.
CO2: Apply strategies of active reading and comprehension**.**
CO3: Develop clear, coherent and engaging content for specific academic purposes.
CO4: Write different types of academic content in English.
CO5: Evaluate academic reports

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	2					1									
CO2	3				2										
CO3		2		3							3				
CO4				3							3	3	2		

Unit 1

Introduction to Academic Writing. Define English for academic purposes. Difference between listening, reading, writing, and speaking in everyday situations and in academic contexts. Listening, reading, writing, and speaking in academic contexts.

Activities:

a) Various academic and non-academic/everyday situations are given to the students, and they are expected to indulge in conversations/communication in each specific situation. This activity would bring out how the nature of communication (style, tone, choice of words, perspective, flow, logic, opinions, personal dynamics etc.) differs in each situation and how the demands of each situation are different.
b) A writing task based on different contexts (academic, non-academic, casual, formal, informal, official, personal etc.) could be given. Analyse how do you differentiate between fact and opinion? What is the purpose of the communication? What is your tone? Is it appropriate? Are there assumptions and generalizations? Is there logic? Is it effective?

Unit 2

Strategies for active reading & comprehension – identifying main ideas and making inferences. Differentiate between fact and opinion – identifying the purpose, argument, tone, bias, generalizations, and errors in reasoning. Make notes and summarize the main arguments, evaluate, and present the information.

Activities:

a) Various articles (business, entertainment, news, blogs, etc.) would be given to students as sample assignments. Students will analyse the articles and express their understanding of the content. Develop an academic vocabulary. Identify the problems in the comprehension of academic discourses.
b) Read a text and answer - factual and inferential questions, evaluate an argument, what are the main ideas? Is the argument sound? is the author biased? Is the tone & style of the author appropriate? Does the author make any generalizations? Any errors in logical reasoning?

Unit 3

Purpose and features of academic writing – planning, organizing information - paraphrasing and summarizing information – use of references, quotations, definitions, examples, visual representations – writing introduction, development of ideas, core arguments, conclusions – re- writing and proof reading – ensuring cohesion, logical reasoning, academic style, academic vocabulary.

Activities:

a) Draft an essay – ensure that all the vital elements of academic writing are properly followed in the

exercise.

b) Design a survey questionnaire – Apply every aspect of effective reading, comprehension and writing in the exercise.

Unit 4

Academic integrity, avoiding plagiarism (intended/unintended), guidelines on paraphrasing, incorporating information from various sources, acknowledging/citing original sources of information and ideas. Ethical values of trust, respect, fairness, and honesty in academic writing.

Activities:

a) Read a text, identify and evaluate internet sources and other resources used to prepare the write-up. Identify the unacknowledged sources and materials. Prepare a report on plagiarism. Discuss how it affects the academic and ethical integrity of the author.

Unit 5

Draft reports - survey, assessment, lecture, events, etc., study materials, questionnaires, digital content for specific academic purposes. Discussions and critical evaluation of the written documents.

Activities:

a) Prepare reports on socially/academically relevant topics. Evaluate the reports and engage in constructive criticism and discussions and suggest revisions.

CORE READING:

1. Swales, John M, Feak, Christine B. - Academic Writing for Graduate Students. 3rd Ed. - The University of Michigan Press
2. Silvia, Paul J. - How to Write a Lot: A Practical Guide to Productive Academic Writing - American Psychological Association
3. Bailey, Stephen - Academic Writing: A Handbook for International Students, Fifth Ed. - Routledge
4. Savage Alice - Effective Academic Writing - Oxford University Press
5. Raman, Usha - Writing for the Media - Oxford University Press

SUGESTED READING:

1. Garrand, Timothy - Writing for Multimedia and the Web: A Practical Guide to Content Development for Interactive Media - Routledge
2. Lincoln, Jeremy - Create Passive Income with Digital Content: Accumulate $100 in Writing, Music, Photos, Illustrations, Videos, Cartoons and Apps - Jeremy Lincoln
3. Wallwork, Adrian - English for Academic Research: Writing Exercises. 2nd Ed. - English for Academic Research Series

Evaluation Pattern:

Assessment Component	**Weightage of Marks**
Continuous Evaluation (Class Tests, Assignments, Class Activities)	20
Mid Term Examination	30
End Semester Examination	50
Total	**100**

24OEL288 ENGLISH FOR INFORMAL COMMUNICATION

2 0 1 3

Course Objectives:

To familiarize the students with a variety of inter-personal communication

To enhance the learner's communication skills (LSRW)

To enable the learner to use English effectively in informal situations.

Course Outcomes:

CO1: Recognize the importance of context and audience in communication choices.

CO2: Use language skills to attain conversational proficiency.

CO3: Summarise Speech and Telephonic Communication

CO4: Practice real-life Conversation Skills (Role play)

CO5: Engage in Discussions and Presentation Skills.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1				2	2										
CO2						2				3					
CO3							1				2				
CO4	2								3						
O5		2												3	

Unit 1

Basics of Communication - Elements of communication (Formal & Informal - Communication barriers, Socio-psychological barriers)

Unit 2

Developing conversational ability - Describing people, process, procedures, objects - Telling stories, narrating events, Reading Dialogues. Listening to commentaries, dialogues, telephone conversations and interviews.

Unit 3

Making short speeches, Extempore, Telephonic Communication, making notes and summaries, taking messages, Picture description (framing story based on picture/visual)

Unit 4

Conversation Practice in real life situations: (shops, markets, bank, hospitals, etc.)

Asking for help and direction, booking rooms for guests, accepting invitations, making complaints effectively, expressing regrets, negotiating, and persuading people, expressing sympathy, Apologizing, giving a conversation with a total stranger, telephonic conversations.

Unit 5

Discussions on news events, debates, enactment, interviews (how to conduct one's self formally in an informal set-up), presentations, Group Discussions (Brainstorming sessions for increasing productivity), Role Play, conversation in actual situations, announcements, compering, commentaries, introducing guests. Presentations and interpersonal communication

CORE READING:

1. Turk Christopher - Effective Speaking. Spon press – Taylor and Francis
2. Kamlesh Sadanand, Susheela Punitha - Spoken English: A Foundation Course. Part I & II - Orient Longman
3. Kenneth Anderson, Joan Maclean, Tony Lynch - Study Speaking – Cambridge University Press
4. Mohan, Krishna Singh - Speaking English Effectively - Macmillan

SUGGESTED READING:

1. Hargie, Owen. Ed - The Handbook of Communication Skills - Routledge
2. Barker, Alan - Improve Your Communication Skills - Kogan Page
4. Bygate, Martin – Speaking – Oxford University Press
4. Kamlesh, Susheela Punitha - Spoken English: A Foundation Course Part A & B – Orient Longman
5. Roger Mason - Speaking on Special Occasions – Teach Yourself Publication
6. O 'Neil, R - English in Situations – Oxford University Press
7. Taylor, Grant - English Conversation Practice - Mc Graw Hill
8. Spencer. D. H. - English Conversation Practice - Oxford University Press

Evaluation Pattern:

Assessment Component	Weightage (Internal)	Weightage (External)
Continuous Assessment	30 (Lab 20 + Theory 10)	
Mid Term	30	
End Sem		40

24OEL289 ORIENTATION IN CREATIVE WRITING 2 0 1 3

Course Objectives:

To introduce to the students to the art and craft of creative writing. To strengthen their creative talents and writing skills.

To motivate the students to engage themselves in creative writing. To analyse and appreciate literary works.

Course Outcomes:

CO1: Recognize the basic elements of creative writing.

CO2: Interpret the creative elements of various literary genres.

CO3: Use the creative skills for literary production.

CO4: Analyze given literary texts.

CO5: Compose a creative work

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	3														
CO2		3													
CO3	1			3											
CO4					3										
CO5	1														3

Unit 1

Introduction to Creative Writing: Overview of different forms of creative writing - Creativity – Inspiration and imagination- Experience as the raw material- Influences-Language as the instrument.

John Steinbeck- "Letter to Edith Mirrielees"

Unit 2

Elements of Creative Writing - Character development - Plot structure - Setting and atmosphere - Dialogue and narrative voice

Katherine Mansfield - "The Life of Ma Parker"

A.C. Doyle – "The Adventure of the Speckled Band"

Unit 3

Writing Techniques - Point of view - Show, don't tell - Use of sensory details - Experimenting with different writing styles

O Henry - "The Last Leaf"

William Wordsworth "Daffodils"

Unit 4

Genre Studies - Exploring different genres such as fiction, poetry, drama, and creative non-fiction - Understanding the conventions and characteristics of each genre

Lewis Carroll – Alice in Wonderland [Abridged version]

Tales from Panchatantra (Selected five tales).

Unit 5

Workshop and Feedback - Peer review sessions - Revising and editing techniques - Developing a personal writing style - Presentation of final projects.

CORE READING:

1. William Zinsser - On Writing Well: The Classic Guide to Writing Non-Fiction - HarperCollins
2. Anjana Neira Dev, Anuradha Marwah, Swati Pal - Creative Writing: A Beginner's Manual - Pearson
3. Lewis Carroll - Alice in Wonderland (Abridged) - Wonder House Books
4. Paul Mills - The Routledge Creative Writing Course Book - Routledge

REFERENCES:

1. Abrams, M.H. - A Glossary of Literary Terms, Seventh Edition - Heinle Publication
2. Prasad, B. - A Background to the Study of English Literature - Macmillan
3. Bernays, Anne, Pamela Painter - What If: Writing Exercises for Fiction Writers - William Morrow & Company
4. Robert Scholes, Nancy R. Comley, Carl H. Klaus, Michael Silverman - Elements of Literature: Essay, Fiction, Poetry, Drama, Film – Oxford University Press
5. Hal Zina Bennet - Write from the Heart: Unleashing the power of Your Creativity - New World Librar
6. Sylvan Bamet, William E. Cain - A Guide to Writing about Literature - Pearson
7. Heather Leach, Robert Graham - Everything You Need to Know About Creative Writing: (But Knowing Isn't Everything...) - Continuum International Publishing Group

ONLINE RESOURCES:

1. http:llwww.chillibreeze.com/articles various/creative-writer.asp
2. http://www.contentwriter.in/articles/writing/
3. http:llwww.cbse.nic.in/cw-xiilcreative-writing-xii-Unit-1.pdf.·(downloadable tree)

Evaluation Pattern:

Assessment Component	Weightage (Internal)	Weightage (External)
Continuous Assessment	30 (Lab 20 + Theory 10)	
Mid Term	30	
End Sem		40

24OEL290 ENGLISH FOR COMPETITIVE EXAMINATIONS AND INTERVIEWS 3 0 0 3

Course Objectives:

To enhance the students' vocabulary and grammar to effectively communicate ideas and meet the requirements of competitive examinations.

To develop the students' critical thinking abilities to analyse and evaluate information, draw logical conclusions, and solve complex problems encountered in competitive exam questions.

To develop listening, speaking, reading, and writing skills for success in competitive examinations and interviews.

Course Outcomes:

CO1: Recall the fundamental concepts of English language.

CO2: Apply verbal, analytical and problem-solving skills.

CO3: Interpret the information given.

CO4: Compose diverse types of professional documents in error free language.

CO5: Demonstrate techniques and skills in facing interviews

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	1	0	0	1	0	0	0	0	0	1	2	0	0	0	1
CO2	3	1	0	1	1	0	1	0	0	2	3	2	1	2	2
CO3	2	2	1	0	1	0	1	0	0	1	3	1	1	2	3
CO4	2	0	0	2	1	0	1	0	0	1	2	2	0	1	1

Unit 1

Vocabulary – synonyms and antonyms, verbal analogy, cloze test, idioms and phrases, one-word substitutions, words often confused and misused, misspelt words – homonyms, homophones and homographs.

Unit 2

Grammar – phrases and clauses, prefixes and suffixes, active and passive voice, reported Speech, conjunction, prepositions, tenses, connectives, comparative adjectives, articles, concord, error detection.

Unit 3

Reading Comprehension – sentence rearrangement, para jumbles, sentence and paragraph completion, critical thinking

Unit 4

Descriptive writing – writing short and long messages – essay writing, precis writing, expository, argumentative, descriptive, persuasive, narrative styles - Writing for specific purposes – email writing, picture description, circulars, memo, reports, proposals, describing visual representations (graphs, diagrams, etc.) – official and business letters

Unit 5

Facing interviews – preparations – guidelines – Human Resource and soft skills development – understanding personal strengths and weaknesses – developing knowledge base (general- subject – professional) - confidence building – resourcefulness – Mock interviews (conducting and attending)

Activities: Practice tests to be administered for all components of the syllabus.

Innovative Games and activities involving various aspects of vocabulary and grammar can be planned.

Samples of descriptive writing can be displayed, and the writings of the students can be checked and edited by giving suggestions for improvement.

Tests involving all vocabulary, grammar, reading comprehension and descriptive writing can be administered based on samples of various competitive examinations.

CORE READING:

1. Bakshi. S.P. - Objective General English - Arihant Publication
2. Gupta. S.C. - General English for all Competitive Course - Arihant Publication
3. Khare, Pulkit - Essays for Civil Services and other Competitive Exams - Arihant Publication
4. Singh, A.K.- Corrective Grammar - MB Publications
5. Kiran Prakashan, - Competitive General English, 1st Edition – Kiran Prakashan Publication

SUGGESTED READING:

1. Lewis, Norman - Word Power Made Easy - Goyal Publishers & Distributors
2. Prasad, Hari Mohan, Uma Sinha - Objective English for Competitive Examination - McGraw Hill

Evaluation Pattern:

Assessment Component	Weightage (Internal)	Weightage (External)
Continuous Assessment	30	
Mid Term	20	
End Sem		50

24OEL291 INTRODUCTION TO COMIC STUDIES 3 0 0 3

Course Objectives:

To familiarise students with the development of comic studies

To explore the social, and political significance of the comic genre

To study the representation of cultural elements in comics

To understand and analyse comics as part of popular culture

Course Outcomes:

CO1: Describe the tenets and history of Comic Studies

CO2: Identify the relevance of comic study in contemporary literature

CO3: Discuss the fields and trends of comic studies.

CO4: Appraise the influence of the comic medium in politics and society

CO5: Evaluate representations of culture in comic narratives.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	3														
CO2	1	3													
CO3			2												
CO4				3											
CO5					3	1									

Unit 1

Introduction - Definition and history of comics - Different forms of comics (comic strips, comic books, graphic novels, webcomics) - Key terms and concepts in comic studies

1. *Understanding Comics: The Invisible Art* by Scott McCloud

2. *The Power of Comics: History, Form, and Culture* (Chapters 2 and 3 on the history of comic books) Edited by Rancy Ducan and Mathew J Smith

Unit 2

Comic Strips, Cartoons and Cartoon Movies

1. *The Very Best of the Common Man* by R.K. Laxman
2. *Calvin and Hobbes* by Bill Watterson
3. "Why Comics Studies?" by Angela Ndalianis

Unit 3

Comics, Memoirs, and Graphic Medicine

1. *Fun Home: A Family Tragicomic* by Alison Bechdel
2. *Marbles: Mania, Depression and Me* by Ellen Forney
3. "Graphic medicine: Comics as medical narrative" by Ian Williams

Unit 4

Asian Comics

1. *Uncle Pai's Folk Tale Collection* by Amar Chithra Katha
2. *Beast Master Vol I* Manga series by Kyousuke Motomi,
3. "Adult Manga: Culture and Power in Contemporary Japanese Society" by Sharon, Kinsella.

Unit 5

New Trends- Comics Journalism, Urban Comics

1. *Safe Area Gorazde* by Joe Sacco
2. *Corridor* by Sarnath Banerjee
3. "Drawing on the Facts: Comics Journalism and the Critique of Objectivity." by Isabel Macdonald

CORE READING:

1. McCloud, Scott - Understanding Comics: The Invisible Art - HarperCollins
2. Laxman, R.K. - The Very Best of the Common Man – Penguin Publishing
3. Ducan, Rancy, Mathew J Smith. Eds. - The Power of Comics: History, Form, and Culture - The Continuum International Publishing Group
4. Watterson, Bill - The Calvin and Hobbes Portable Compendium Set 1 - The Andrews McNeel Publishing
5. Bechdel, Alison - Fun Home: A Family Tragicomic - Random House
6. Marbles: Mania, Depression, Me- Ellen Forney - Penguin Publishing
7. Pai, Anand. Ed - Uncle Pai's Folk Tale Collection - Amar Chithra Katha
8. Motomi, Kyousuke - Beast Master Vol. I - Viz Media
9. Sacco, Joe - Safe Area Gorazde - Jonathan Cape
10. Banerjee, Sarnath – Corridor - Penguin Books
11. Ndalianis, Angela - Why Comics Studies? - Cinema Journal. 50. 113-117. 10.1353/cj.2011.0027.
12. Williams, Ian - Graphic medicine: Comics as medical narrative. Medical humanities. 38. 21-7. 10.1136/medhum-2011-010093.
13. Macdonald, Isabel - Drawing on the Facts: Comics Journalism and the Critique of Objectivity - The Comics of Joe Sacco: Journalism in a Visual World, 2015, pp. 54-66, https://doi.org/10.2307/j.ctt15zc587.

SUGGESTED READING:

1. Ndalianis, Angela - Why Comics Studies? - Cinema Journal, vol. 50, no. 3, 2011, pp. 113–17. JSTOR, http://www.jstor.org/stable/41240726.
2. Dey, Abilash - The Austere and Mute Glory of R K Laxman's Cartoons and Illustrations - Indian Scholar,2015,pp. 1-9 https://www.academia.edu/33630711/THE_AUSTERE_AND_MUTE_GLORY_OF_R_K_LAXMAN_S_CARTO ONS_AND_ILLUSTRATIONS
3. Ewert, C. Jeanne - Reading Visual Narrative: Art Spiegelman's "Maus", Narrative, vol. 8, no. 1, 2000, PP. 87-103, JSTOR, https://www.jstor.org/stable/20107202.
4. Lydenberg, Robin - Reading Lessons in Alison Bechdel's Fun Home: A Family Tragicomic. College Literature, vol. 44, no. 2, 2017, pp. 133-65, JSTOR, http://www.jstor.org/stable/44507177
5. Cresson, Jodi - Company, counterbalance, and closure in Ellen Forney's Marbles, Journal of Graphic Novels and Comics, vol. 10, no. 2, 2018, pp. 259-272, https://www.tandfonline.com/doi/citedby/10.1080/21504857.2018.1480506?scroll=top&needAccess=tr ue
6. Norris, Craig - Manga, Anime and Visual Art Culture. The Cambridge Companion to Modern Japanese Culture, edited by Yoshio Sugimoto, Cambridge UP, 2009, pp. 236–60.
7. Goswami, Nilakshi - Ideological History, Contested Culture, and the Politics of Representation in" Amar Chitra Katha. Status Quaestionis 20 (2021).
8. Macdonald, Isabel - Drawing on the Facts: Comics Journalism and the Critique of Objectivity. The Comics of Joe Sacco: Journalism in a Visual World, 2015, pp. 54-66, https://doi.org/10.2307/j.ctt15zc587.

9. Macdonald, Isabel - The Comics of Joe Sacco: Journalism in a Visual World, 2015 - Universal Press of Mississippi.
10. Frazer, Benjamin - Danger, Disease, and Death in the Graphic Urban Imagination. Visible Cities, Global Comics: Urban Images and Spatial Form, University Press of Mississippi, 2019, pp. 174–216. *JSTOR*, http://www.jstor.org/stable/j.ctvpbnq63.9.

Evaluation Pattern:

Assessment Component	Weightage (Internal)	Weightage (External)
Continuous Assessment	20	
Mid Term	30	
End Sem		50

24OEL292 INTRODUCTION TO FOOD STUDIES 3 0 0 3

Course Objectives:

To introduce students to food studies

To familiarise students with the techniques and the narrative styles of food literature To introduce students to different food cultures

Course Outcomes:

CO1: Comprehend the basic framework of food studies.

CO2: Understand food systems and their pluralistic nature.

CO3: Appraise the cultural and literary roots in various forms of food narratives.

CO4: Critically analyze food writings and appreciate varied representations.

CO5: Examine contemporary Indian food culture in the context of globalization.

CO-PO MAPPING:

.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO 15
CO1	1	1	2												
CO2					2		2								
CO3	2			2											
CO4								2			2				
CO5									2	3					

Unit 1

Basics of Food studies - key concepts, interdisciplinarity, and orientations in Food Studies (Historical, cultural, sociopolitical, environmental aspects) - Critical approaches to Food justice, gender, race, power, and class structure - Social constructions based on diet pattern, and food practices - culinary memoirs (discussion)

Unit 2

Food writing – stories, memoirs, blogs, travel writings - structures and representations

Jhumpa Lahiri: *Indian Takeout*

Unit 3

Food in the context of Globalization - Impact of other food cultures on indigenous food practices in India.
Ashis Nandy: *The Changing Popular Culture of Indian Food: Preliminary Notes*

Unit 4

Sociological implications of food and culinary practices Margaret Mead *: The Changing Significance of Food* Tamil movie: *Kakka Muttai (2014*)

Unit 5

Food Fiction, short stories
Bhabani Bhattacharya: *So Many Hungers*
Gita Hariharan: *Remains of the Feast*

CORE READING:

1. Banerji, Chitrita - Eating India: An Odyssey into the Food and Culture of the Land of Spices - Bloomsbury
2. jumpa lahiri. (n.d.) - Indian takeout
3. Bhattacharya, B. - So many hungers - Orient Paperbacks.
4. Hariharan, Githa - The Art of Dying and Other Stories - Penguin Books
5. Malhotra, Simi, et al - Food Culture Studies in India - Springer Nature

SUGGESTED READING:

1. Marte, Lidia. 2007 - Fodmaps: Tracing Boundaries of 'Home' Through Food Relations - Food and Foodways.
2. Mintz, Sidney - Sweetness and power. The place of sugar in modern history – Penguin Books
3. Gilbert and Porter - Introduction to Eating Words
4. Dianne Jacob (from Will Write for Food) - What, Exactly, Is Food Writing?
5. Terry Eagleton - Edible Ecriture
6. Alfonso Morales - Growing Food and Justice: Dismantling Racism through Sustainable Food Systems
7. Robert Gottlieb, Anupama Joshi - Growing and Producing Food
8. Unbroken Ground. 2016 film
9. https://youtu.be/3Ezkp7Cteys?feature=shared
10. Documentary film - We Feed the World.
    https://youtu.be/KAuA_slgM_w?feature=shared
11. Khilnani, Sunil - The Idea of India – Penguin Books
12. Vasudhaiva Kutumbakam - Short Film - Zee Entertainment Company Ltd

Evaluation Pattern:

Assessment Component	Weightage (Internal)	Weightage (External)
Continuous Assessment	20	
Mid Term	30	
End Sem		50

24OEL293 FILM AND LITERATURE 3 0 0 3

Course Objectives:

This course delves into the fascinating intersection of film and literature, examining how these two art forms influence each other, share common themes, and employ distinct storytelling techniques. Through a combination of film screenings, readings, discussions, and critical analysis, students will gain a deeper appreciation for both mediums.

Course Outcomes:

CO1: Identify the distinct narrative structures and techniques employed in both film and literature.

CO2: Compare storytelling methods, recognizing how filmmakers and authors convey meaning.

CO3 Analyze film adaptations of literary works

CO4 Explore the literary and cinematic interfaces in films

CO5 Appraise adaptations of literary works into films.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	3														
CO2		3													
CO3				3			1								
CO4					3										
CO5															3

Unit 1

Introduction to Film and Literature-Defining film and literature -Comparative analysis of storytelling methods-Adaptation Theory - The art of adaptation: From page to screen- Case studies: Successful and unsuccessful adaptations.

Unit 2

Literary Classics on Film-Screening and discussion: Adaptations of Shakespearean plays -Analyzing fidelity to the source material

Unit 3

Genre Studies- Film noir and hardboiled detective fiction -Gothic literature and horror films

Unit 4

Visual Storytelling Techniques-Cinematography, mise-en-scène, and editing -Reading film as a visual text

Unit 5

Modern Literature and Contemporary Cinema-Exploring postcolonial literature and global cinema - Independent films and their impact-Themes and Motifs - Love and tragedy in literature and film- The hero's journey across mediums – writing film reviews (assignment)

TEXTS AND MATERIAL:

1. Charlie Kaufman - "Adaptation" (book and film)
2. Jane Austen - **"Pride and Prejudice"** (book and film adaptation)

REFERENCE TEXTS:

1. Villarejo, Amy - Film Studies: the Basics - Routledge
2. Hayward, Susan - Key Concepts in Cinema Studies - Routledge
3. Bywater, Tim, Thomas Sobchack - Introduction to Film Criticism - Pearson India
4. Corrigan, Timothy, J. - A Short Guide to Writing about Film - Pearson India
5. Kupsc, Jarek - The History of Cinema for Beginners. Chennai - Orient Blackswan
6. Dix, Andrew - Beginning Film Studies - Viva Books

7. Stam, Robert, Alessandra Raengo - Literature and Film: A Guide to Theory and Adaptation - Oxford: Blackwell
8. Seger, Linda, Edward Jay Whetmore - From Script to Screen: A Collaborative Art of Film Making
9. Kooperman, Paul - Screenwriting: Script to Screen - Insight Publications
10. Annete Kuhn - Oxford Dictionary of Film Studies
11. Linda Hutcheon - A Theory of Adaptation
12. Wilfred L. Guerin - "A Handbook of Critical Approaches to Literature"

SUGGESTED VIEWING LIST:

1. Michael Radford's Il Postino
2. Robert Wiene's The Cabinet of Dr. Caligari
3. Sergei Eisenstein's Battleship Potemkin
4. Victorio De Sica's Bicycle Thief
5. John Ford's Stagecoach
6. Mehboob's Mother India
7. Satyajit Ray's Pather Panchali
8. Abbas Kiarostami Ten
9. George Melies: An Impossible Voyage
10. Lumiere brothers: Arrival of a Train S
11. Charlie Chaplin: Modern Times
12. Werner Herzog: Aguirre, Wrath of God
13. Francis Ford Coppola: The Godfather
14. Orson Welles: The Magnificent Ambersons
15. Jean Luc-Godard: Breathless
16. Styajith Ray's Films
17. V. K. Prakash: *Karmayogi* [Malayalam]

Evaluation Pattern:

Assessment Component	Weightage (Internal)	Weightage (External)
Continuous Assessment	30	
Mid Term	20	
End Sem		50

24OEL294 COMPUTER AIDED LANGUAGE LEARNING 3 0 0 3

Course Objectives:

To familiarize the students with the world of technology-based language learning

To introduce them to various on-line learning platforms

Course Outcomes:

CO1: Recognize language-technology interface, impacts and developments in ICT.

CO2: Describe technology assisted teaching- learning as paradigm shift in instructional practices

CO3: Relate the impact of Communication technology on ELT and pedagogy
CO4: Use the possibilities of online learning and resources
CO5: Analyse contemporary trends in instructional technology

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	2								1						
CO2		2													
CO3	1			2											
CO4						2								1	
CO5		2											2		

Unit 1

English in the Age of Globalization - Language Education and Technology-Impact of ICT- Introduction to Computer-Aided Language Learning (CALL) and its benefits - Computer Supported Collaborative Learning-Digitized Texts-Digital Game-Based Learning-Use of Multimedia.

Activity: Create a quiz. Prepare a visual story

Unit 2

Language Learning Software and Applications - Introduction to popular language learning software and apps - Interactive exercises and activities for language practice - Virtual classrooms and online language learning platforms (SWAYAM, MOOC, etc.) – interactive websites for language learning.

Activity: Analyze blog posts, Wikipedia articles, or interactive websites.

Unit 3

Digital Language Learning - Incorporating multimedia resources in language lessons - Using social media and online resources for language practice - presentation software - creating a good ppt.

Activity: prepare ppt presentations on specific topic

Unit 4

Use of E-learning apps - Gamification and Language Learning - Gamified language learning apps and platforms - Benefits of gamification in language learning – explore online dictionary and thesaurus **Activity:** Online Dictionary Scavenger Hunt - Assign students specific language features (idioms, phrasal verbs, synonyms). Ask them to explore online dictionaries (e.g., WordWeb, Merriam- Webster) to find examples and meanings.

Unit 5

Using technology for language assessment - Automated feedback and evaluation tools - Monitoring student progress and performance in CALL environments - multi-literacies and translanguaging -Supporting learners of specific needs.

Activity: Take up some online grammar tests

CORE READING

1. Crystal David - The Language and the Internet - CUP
2. Warschauer, Mark, Shetzer, Heidi - Internet for English Teaching - Virginia
3. Thorne, Steven L, Mary, Stephen (Eds) - Language Education and Technology - Springer

SUGGESTED READING/E-RESOURCES

1. Cunnings, J.(et al.) (Eds.) - International Handbook of English Language Teaching - Springer

2. Ranandya, W.A. (et al.) (Eds.) - English Language Teaching Today - Springer
3. Pawlak, Miroslav, Antonin Larissa (Eds.) - Essential Topics in Applied Linguistics and Multiculturalism - Springer
4. Pawlak, Miroslav(et al.) (Eds.) - Issues in Teaching, Learning and Testing Speaking in a Second Language - Springer

www.bbc.co.uk/learningenglish , www.learningenglish.voanews.com / www.esl-lab.com/ www.eslpdf.com/www.englishbanana.com , E-book available at www.englishskillsone.com **Evaluation Pattern:**

Assessment Component	Weightage (Internal)	Weightage (External)
Continuous Assessment	30	
Mid Term	20	
End Sem		50

24OEL295 THEATRE AND COMMUNICATION 3 0 0 3

Course Objectives:

To acquaint students with the concept of theatrical communication To underscore the significance of communication through theatre To understand the interfaces of performance and communication

To analyze the concept of theatrical communication with reference to Indian and world drama.

Course Outcomes:

CO1: Illustrate the history of theatre and its cultural relevance.

CO2: Compare different forms of dramatic expressions.

CO3: Explore the classical Indian and western theatre aesthetics.

CO4: Investigate the concepts of modern drama.

CO5: Evaluate different theatrical styles and their impact.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	3														
CO2		3													
CO3				3											
CO4					3										
CO5															3

Unit 1

Introduction to Drama and Theatre Arts – History of Theatre – Theatre as a dramatic art of communication - Cultural Relevance of Theatre.

Unit 2

Elements of Drama – Differences between Screen Play and Performance - Histrionics - verbal communication- facial expressions, body language, proxemics, and proximity.

Girish Karnad: *Nagamandala*

Unit 3

Classical Theatre – Aesthetics of Indian Theatre –Bharata's *Natyashastra*- Folk Theatre – Aesthetics of Western Theatre – Aristotle's *Poetics.*

Unit 4

Pioneers of Modern drama- The ideas of Ibsen, Shaw, and Brecht on theatre. Henrik Ibsen.

A Doll's House – for **Detailed study.**

Unit 5

Modern Theatre – Theatre of Cruelty – Absurd Theatre – Street Theatre –Epic Theatre – Avant Garde Theatre – Post Drama.

REFERENCES:

1. Dr. N.P. Unni (Tr) – Natyasastra
2. John Russell Brown – The Oxford Illustrated History of Theatre
3. Robert Leach – Makers of Modern Theatre: An Introduction
4. D P. Pattanayak, Peter J Claus – Indian Folklore
5. Richard Schechner – Performance Studies: An Introduction
6. Phillip Zarrilli – Indian Theatre Traditions of Performance
7. Williams, Raymond - Drama in Performance - Open University Press
8. Simon Shepherd and - Drama/Theatre/Performance - Routledge

Evaluation Pattern:

Assessment Component	Weightage (Internal)	Weightage (External)
Continuous Assessment	30	
Mid Term	20	
End Sem		50

24OEL296 WOMEN'S WRITING IN INDIA 3 0 0 3

Course Objectives:

To provide students with a comprehensive understanding of women's writing in India. To provide an understanding of the socio-political issues addressed by women writers. To provide an overview of historical, contemporary, and feminist perspectives.

To encourage creative expression and critical engagement with gender issues in literature.

Course Outcomes:

CO1: Recognise the historical context of women's writing in India.

CO2: Explore the themes of gender identity, patriarchy, and empowerment in women's writing.

CO3: Analyse major works and writing styles of prominent women writers in India

CO4: Explore social, cultural and political perspectives in the writings

CO5: Analyse emerging voices and themes in contemporary women's literature

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	3														
CO2		3													
CO3				3											

CO4					3										
CO5															3

Unit 1

Introduction to Women's Writing in India - Historical Context of Women's Writing in India - Exploration of early women writers and their contributions - Understanding the societal and cultural factors influencing women's writing in India.

Unit 2

Early Women Writers in India - Themes and Issues in Women's Writing - Exploration of topics such as gender, identity, patriarchy, and empowerment - Discussion of how women writers navigate and challenge societal norms through their works.

Toru Dutt: Our Casuarina Tree

Sarojini Naidu: The Coromandel Fishers

Unit 3

Contemporary Women Writers in India - Prominent Women Writers in India - Analysis of their major works, writing styles, and contributions to Indian literature - Examination of the impact of these writers on the literary landscape of India.

Mamta Kalia: Tribute to Papa

Gauri Deshpande: The Female of the Species

Unit 4

Perspectives in Women's Writing in India - Exploration of social, cultural and political perspectives – feminism – questions of identity and representation - caste, class, religion, and sexuality - understanding the diversity of women's experiences in Indian literature

Gita Hariharan: The Remains of the Feast

Unit 5

Contemporary Trends in Women's Writing in India - An overview of current trends in women's writing in India - Analysis of emerging voices and themes in contemporary women's literature - Diaspora writing

Anita Desai: *Cry the Peacock*

REFERENCES:

1. **https://digital.library.upenn.edu/women/sultana/dream/dream.html**
2. Forbes, Geraldine - Women in India - Cambridge,
3. Kumkum Sangari, Sudesh Vaid (eds) - Recasting Women – Rutgers University Press
4. Tutun Mukherjee (Tr) - Staging Resistance: Plays by Women in Translation – Oxford University Press
5. R K Dhawan
6. Oxford Anthology of Indian Poetry
7. Online Sources

Evaluation Pattern

Assessment Component	Weightage (Internal)	Weightage (External)
Continuous Assessment	30	
Mid Term	20	
End Sem		50

25PHY241(MDC 3) Machine Learning 3 0 0 3

Course Outcomes:

CO1: To understand the basics of supervised leaning.

CO2: To understand the basics of unsupervised learning.

CO3: To understand the basics of deep learning and its applications.

CO4: Carry out some case studies using ML techniques..

Supervised Learning (Regression/Classification) : Basic methods: Distance-based methods, Nearest Neighbors, Decision Trees, Naïve Bayes. Linear models: Linear Regression, Logistic Regression, Generalized Linear Models. Support Vector Machines, Nonlinearity and Kernel Methods. Beyond Binary Classification: Multi-class/Structured Outputs, Ranking

Unsupervised Learning: Clustering: K-means/Kernel K-means. Dimensionality Reduction: PCA and kernel PCA. Matrix Factorization and Matrix Completion. Generative Models (mixture models and latent factor models)

Assorted Topics: Evaluating Machine Learning algorithms and Model Selection. Introduction to Statistical Learning Theory. Ensemble Methods (Boosting, Bagging, Random Forests). Sparse Modeling and Estimation. Modeling Sequence/Time-Series Data. Deep Learning and Feature Representation Learning. Scalable Machine Learning (Online and Distributed Learning). A selection from some other advanced topics, e.g., Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference.

Text books/ Reference books.

1. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012

2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009 (freely available online)

3. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.

4. Hal Daumé III, A Course in Machine Learning, 2015 (freely available online).

V. ABILITY ENHANCEMENT COURSES (AEC)

LAYOUT OF AEC COURSES IN THE CURRICULUM

Course Code	Course Title	L T P	Cr
	SEMESTER 1		
AEC 1	Modern Indian Language	2 0 0	2
	SEMESTER 2		
AEC 2	English I	2 0 0	2
	SEMESTER 3		
AEC 3	Life Skills I	1 0 2	2
AEC 4	English II	1 0 2	2
	SEMESTER 4		
AEC 5	Life Skills II	1 0 2	2
	SEMESTER 5		
AEC 6	Life Skills III	1 0 2	2

24ENG101 **English I** **2 0 0 2**

Objectives:

To help students obtain an ability to communicate fluently in English; to enable and enhance the students' skills in listening, speaking, reading, and writing; to impart an aesthetic sense and enhance creativity

Cos	Course Outcomes
CO 1	Demonstrate competence in the mechanics of writing
CO 2	Summarise audio and written texts to convey messages effectively
CO 3	Apply mechanics of writing and AI tools to draft academic and professional documents
CO4	Organise ideas and thoughts for clear written and oral communication
CO 5	Critically evaluate literary texts

Unit I

Mechanics of writing - Parts of speech – use of prepositions, adjectives, adverbs and determiners – word order – collocation – concord (Subject-Verb, Pronoun-Antecedent) – kinds and patterns of sentences

Unit II

Tenses - Modal auxiliaries - Reported speech - Active and Passive Voice - Phrasal Verbs - Linkers/ Discourse Markers - Question Tags

Unit III

Pre-writing techniques - Paragraph writing – Cohesion – Development – types: definition, comparison, classification, contrast, cause and effect - Essay writing: Descriptive and Narrative - Introduction to the use of Gen AI in writing (AI tools, Do's and Don'ts while using AI, how to write prompts, etc.)

Unit IV

Listening comprehension (3 pieces – Do Schools kill creativity? By Sir Ken Robinson, Steve Jobs' 2005 Stanford Commencement Address, India Questions Dr Abdul Kalam- Aired August 2007) - Reading Comprehension – Skimming and Scanning- Inference and Deduction – Reading different kinds of material – Speaking**:** Narration of incidents / stories/ anecdotes.

Unit V

Shashi Tharoor – "'Kindly Adjust' to Our English

A. G. Gardiner – "A Fellow Traveller"

Ruskin Bond – "The Eyes Have It"
Mrinal Pande – "Girls"
W. H. Auden – "Unknown Citizen"
W H Davies - "Leisure"

References:

1. Murphy, Raymond, *Murphy's English Grammar,* CUP, 2004
2. Syamala, V. *Speak English in Four Easy Steps*, Improve English Foundation Trivandrum: 2006
3. Martinet, Thomson, *A Practical English Grammar*, IV Ed. OUP, 1986.
4. The Week - June 03, 2018, LAST WORD; https://www.theweek.in/columns/shashi-tharoor/2018/05/25/kindly-adjust-to-our english.html?fbclid=IwAR3IhtdXqvuV4ySECn9S7SA6HmCEYISyd1QHd3BlwKgiNKKwdkeSg3qWp-U/
5. A G Gardiner – *Leaves in the Wind*, Digicat (e-book), 2015
6. Ruskin Bond – *The Best of Ruskin Bond*; India Penguin. April 2016.
7. Mrinal Pande – *Stepping Out*; Penguin India; 2003
8. W H Auden – *Another Time*; Random House Pub; 1940
9. William H Davies – *Songs of Joy and Others*; Andesite Press, August 2017.
10. Sir Ken Robinson – "Do schools kill creativity?". https://go.ted.com/6WoC
11. Steve Jobs' 2005 Stanford Commencement Address. https://youtu.be/UF8uR6Z6KLc?si=1nMNYJOk3Yw7H7tF
12. India Questions Dr Abdul Kalam (aired: August 2007). https://youtu.be/erg3CmVm6M4?si=YudsxXZOFY1do91C

24ENG111 English II 1 0 2 2

Objectives:

To train students to convey and document information in a formal environment; to facilitate them to acquire the skill of self-projection in professional circles; to inculcate critical and analytical thinking.

Cos	Course Outcomes
CO 1	Illustrate comprehension of the fundamentals of writing
CO 2	Analyse audio text focussing on English phonetics, pronunciation and meaning comprehension
CO 3	Apply theoretical knowledge to write professional documents
CO 4	Infer from current news to formulate ideas and opinions
CO5	Prepare appropriate content for mini project and make effective presentation

Unit I

Vocabulary Building: One-word substitutes; Antonyms and Synonyms; Words often Confused Error Analysis (Subject-Verb Agreement; Tense Sequence; Usage of Articles and Prepositions; Determiners; Redundancy); Modifiers (misplaced**,** dangling, etc.)

Unit II

Circulars; Memos; Formal Letter writing; e-Mail Etiquette; Instruction, Suggestion & Recommendation; Essay writing: Analytical and Argumentative

Unit III

Sounds of English: Stress, Intonation - Listening Comprehension (3 pieces – Women in Technology Panel discussion, India Questions Abdul Kalam, UPSC Topper Mock interview Akshat Jain) - Current News Awareness

Unit IV

Reports: Incident Report, Event Report

Situational Dialogue; Group Discussion (Opinion)

Unit V
Mini Project and Presentation
References:

1. Felixa Eskey. *Tech Talk*, University of Michigan. 2005
2. Michael Swan. *Practical English Usage*, Oxford University Press. 2005
3. Anderson, Paul. *Technical Communication: A Reader Centered Approach*, V Edition, Hercourt, 2003 .
4. Martinet, Thomson, *A Practical English Grammar*, IV Ed. OUP, 1986.
5. Raymond V. Lesikar and Marie E. Flatley. *Basic Business Communication*, Tata

McGraw Hill Pub. Co. New Delhi. 2005. Tenth Edition.

6. Thampi, G. Balamohan. *Meeting the World: Writings on Contemporary Issues*. Pearson, 2013.
7. Lynch, Tony. *Study Listening*. New Delhi: CUP, 2008.
8. Kenneth, Anderson, Tony Lynch, Joan Mac Lean. *Study Speaking*. New Delhi: CUP, 2008.
9. Marks, Jonathan. *English Pronunciation in Use*. New Delhi: CUP, 2007.
10. Syamala, V. *Effective English Communication for You (Functional Grammar, Oral and Written Communication)*: Emerald, 2002.
11. Sample Question Papers from Competitive Examinations
12. Women in Technology Panel discussion
    https://youtu.be/T44XdGH5s-8?si=A1cDVEt777FH7vFR
13. India Questions Abdul Kalam
    https://youtu.be/erg3CmVm6M4?si=WjP_SV1vy6FrsGHg
14. UPSC Topper Mock interview, Akshat Jain
    https://youtu.be/lsJBGvyiAHI?si=L-u6kTadzJmghHLI

24MAL101 **Malayalam I** **LTPC: 2 0 0 2**

Course Objectives:
- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- Enable students to communicate in the language they have studied in a range of contexts and for a variety of purposes
- To analyse language in context to gain an understanding of vocabulary, spelling, punctuation and speech

Course outcomes:
CO1: Develop the ability to read and critically appreciate a given text
CO2: Develop fluency in speaking the language
CO3: Ability to blend language and Indian spirituality.

Unit	Topic
1	**Adhyatmaramayanam,** Tharopadesam(Enthinnu Sokam.…thulom) **----------** **Jnanappana** (sthanamanangal….Trishnakondubhramikkunnathokkeyum)
2	Modern Poets: Mampazham-Vyloppilly Sreedharamenon Critical analysis of the poem.
3	Short stories from period 1/2/3:**Poovanpazham**-Vaikaom Muhammed Basheer
4	Literary Criticism: **Bharatha Paryatanam**-*Vyasante Chiri*–Ithihasa studies-Kuttikrishna Marar-Outline of literary Criticism in Malayalam Literature
5	Error-freeMalayalam: **1**.Language; **2**.Clarity of expression; **3**.Punctuation-Thettillatha Malayalam – Writing-**a**. Expansion of ideas; **b**.PrecisWriting; **c**. Essay Writing

Text books/Reference :

1. Adhyatmaramayanam – Thunjath Ramanujan Ezhuthachan
2. Ramayanavichinthanam-Dr. A. M. Unnikrishnan
3. Thunjan Padhanangal-Prof.Panmana Ramachandran
4. Compleate Works including Jnanappana-Poonthanam
5. Vyloppilly-M.N.Vijayan
6. Vyloppilli-Vyakthi,Kavi-Dr.M.Leelavathi/S.Gupthan Nair
7. Basheerinte Poonkavanam-Prof.M.N.Karasseri
8. Basheer-Life & Works
9. Bharatha Paryatanam-Kuttikrishna Marar
10. Lavanyasastrathinte Yukthisilpam-Dr.Thomas Mathew

11)Thettillatha Malayalam – Prof.Panmana Ramachandran Nair(His all books on Error Free Malayalam)

24HIN101 HINDI I 2 0 0 2

Course Objective: The course will enable the students to understand the basics of grammar and usage, to appreciate the literary compositions, and to understand the intricacies of language and literature.

Course Outcomes: By the end of the course the students will be able to:

1. Distinguish various literary genres.
2. Explore tradition and culture through literature.
3. Apply the basics of grammar.
4. Critically analyse the prescribed literary texts.

UNIT 1

Hindi Sahithya ki Panch shresht Kahaniyam**:**

a.Sughmay Jeevan –Chandradhar Sharma ,Guleri

b.Dhan ki Bhent-Rabindranath Tagore

c.Anbola –Jayashankar Prasad

d.Swamini (Manasrovar bhagh-1) Premchand

UNIT 2.

Hindi Kavitha:

a.'Aarya" –Maithili Sharan Gupth

b. "Meribhi abha he Ismein' .,"Mubarak Ho Naya Saal"-_Nagarjun

c. "Nishaa Ki rod eta Rakesh- Nihar se'.,Shoonya Mandir meinBanoongi-Sandhya Geet se - Mahadevi varma

d.'KhoobLadi Mardani vahtho Jhansi Vali rani thi'-subhadra Kumari chohan

UNIT 3.

Hindi Ekanki**:**

a) Mohan Rakesh :Andeke Chilke

b) Vishnu Prabhakar :Sarkari Noukari

UNIT 4.

Grammar:1)Karak2) Upasarg3)Pratyay4)Vakya Rachana 5)Padaparichay.6)Sarvanam7)kriya 8)Adjective 9)Adverb10)Tenses

REFERENCE

1. Sugam Hindi Vyakarn, :Prof.Vanshidhar & Dharmapal Shastri
2. Vyavaharik Hindi Vyakarantatha Rachana: Dr.Hardev Bahari

Shiksharthi HindiVyakaran:Dr. Nagappa

3. Hindi Sahithya ki Panch shresht Kahaniyam**:** Edited by: Dr.Sachidanandh Shuklu

(Printed and Published by V&S publishers, Abridged, AnsariGanj, Delhi)

4. Hindi Samay.com,/Hindikahani.com/exotic indiaart.com

24KAN101 **Kannada I** **LTPC: 2 0 0 2**

Objectives:

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- Enable students to communicate in the language they have studied in a range of contexts and for a variety of purposes
- To analyse language in context to gain an understanding of vocabulary, spelling, punctuation and speech

Course Outcome

CO1	velop the ability to read, listen and write in Kannada and to understand and use the language in a variety of contexts and situations
CO2	enable the learners to understand the grammatical structures of classes of words
CO3	velop ability to speak fluently and interactively in both personal and professional context

Course Contents

UNIT – 1

Adalithadalli Kannadada balake: (Use of Kannada in business and administration)
Bhashe – swaroopa, stityantaragalu,
Aadu bhashe, pradeshika bhashe, Grantika bhashe
Paaribhaashika padagalu

UNIT – 2

Padagala rachane,deshiya – anya deshiya padagalu
Lekhana Chinnhegalu
Kannada bharavanigeya shuddha mattu ashuddha roopagalu,
Dwiruktigalu, jodunudigalu

UNIT – 3

Nudigattgalu, gaade vistarane
Listening to radio speech, tongue twister - practice

UNIT – 4

Patra Lekahna - aupachaarika haagu anoupachaarika
Kandikegala rachane
Prabandhagalu: vivaranaatmaka haagu niroopanatmaka

UNIT – 5

Poems

- Vachanagalu – kaalugalembavu gaali kandaya – Allamaprabhu,Ratnada sankoleyaadade todarallve – Akkamahadevi, ole hatti uridare nilabahudallade - Basavanna
- Keerthanegalu – Tanuva nirolagaddi phalavenu – Purandaradasa, Tallanisadiru kandya taalu manave - Kanakadaasa
- Tripadigalu – Saalavanu kombaaga haalogarundante - Sarvagna
- Janapada geetegalu - Yaake badtaadti tamma

Short stories

- Sambhanda – Shrikrishna Alanahalli
- Moksha – Sethuram

Prabandhagalu

- Namma Maneya Deepa – Ha.Ma.Nayak
- Bhadhuku Kanasalla, Ondhu Kale – N K Kulakarni

References:

1. H.S.Krishnaswamy Iyangaar – Adalitha Kannada – Chetana publication, Mysuru
2. Kannada Vyakarana mattu Rachane – N.Gopalakrishna Udupa, M.C.C.Publication
3. G.H.Naayak – Kannada Sanna Kathegalu – Chetana Book House
4. Shatamaanada Lalitha Prabandha – Gurulinga Kaapase - Karnataka Sahitya Academy
5. Naavalla – Kathasankalana – Sethuram
6. Basavannanavara Vachanagalu – G.V.Shastri – Paaru prakashana
7. Kannadada Balake – H.S.Krishnaswamy Iyangaar – Chetana book house
8. Sarvagnana Vachanagalu – Venkata Subbaiha, Vijayavaahini Publications

24SAN101 **SANSKRIT I** **2 0 0 2**

Course Objectives:

- To enable the students to acquire basic skills in functional language
- To develop independent reading skills and reading for appreciating literary works.
- To analyse language in context to gain an understanding of vocabulary, spelling, punctuation and speech
- Grasp the connection between Sanskrit language and Indian philosophy

Course Outcomes:

CO 1 Read and understand Sanskrit verses and sentences and communicate in Sanskrit

CO 2 Imbibe values of life and Indian tradition propounded by the scriptures

Module I

Introduction to Sanskrit language, Devanagari script - Vowels and consonants, pronunciation, classification of consonants, conjunct consonants, words – nouns and verbs, cases – introduction, numbers, Pronouns, communicating time in Sanskrit. Practical classes in spoken Sanskrit

Module II

Verbs- Singular, Dual and plural — First person, Second person, Third person.

Tenses – Past, Present and future – Atmanepadi and parasmaipadi-kartharipra yoga.

Module III

General group words for communication and moral stories.

Module IV

ChanakyaNeeti chapter III (part I), Bhagavad Gita chapter 14 (part I)

Module V

Translation of simple sentences from Sanskrit to English and vice versa.

24TAM101 **TAMIL I** **2 0 0 2**

Course Objectives:

To teach Tamil for effective communication in different spheres of life: - cultural relations in society.

Course Outcomes:

1. Giving exposure to history of Tamil literature and Introduction of select Classics
2. Initiating Students to the spirit of Bhakti literature
3. Encouraging creativity of students by teaching Contemporary Literature poetry, modern poetry, Short Story, Prose, Novel, etc
4. Introduction of basic Grammar, Letter writing and essay writing skills of Tamil language.

அலகு-1

தமிழ்இலக்கியவரலாற்றில்சங்கஇலக்கியம்: முதல், இடை, கடைசங்கம்.

சங்கஇலக்கியங்கள்பத்துப்பாட்டு.

குறுந்தொகை (6,8பாடல்கள்),

புறநானூறு (184,192பாடல்கள்).

சங்கம்மருவியகாலஇலக்கியம்:

சிலப்பதிகாரம் (வழக்குறைக்காதை),

பதிணெண்கீழ்கணக்குநூல்கள்,

திருக்குறள் (மருந்து)

UNIT-1 History of Tamil Literature: First, Intermediate, Last sangam. Sangam Literature, Pattuppaattu. Kuṟuntogai, Puṟanaanuuru.

Literature of the Sangam Maruviya period – Silappathiagaram (vazhakkuraikaathai), PatiṇeṇkiizhKaṇakkuNuulkal. TirukkuṟaL (Marunthu)

அலகு 2

பக்திஇலக்கியம்:–

பன்னிருதிருமுறைகள்அறிமுகம்,

மாணிக்கவாசகர் (திருவாசகம்- சிவபுராணம்)

UNIT 2 Bhakti Literature – Introduction to PanniruThirumuraikal, Manikkavasagar (Thiruvasagam- Siva Puranam)

அலகு -3

தற்காலஇலக்கியம்:-

கவிதை : பாதியார் (குயில்பாட்டு), பாரதிதாசன் (தமிழின்இனிமை).

உரைநடை: ஞா.தேவநேயப்பாவாணர் (தமிழும்திரவிடமும்சமமா?),
பரிதிமாற்கலைஞர் (தமிழ்மொழியின்வரலாறு (ஆதிவரலாறு)).
சிற்பி (வள்ளுவர்வகுக்கும்இன்பம்)

சிறுகதை: அழகியபெரியவன் – (வனம்மாள்)

நாவல்: இமையம் (பெத்தவன்)

UNIT-3 Contemporary Literature: Poetry - Bharathiar(kuyilpāṭṭu), Bharathidasan (tamiḻiṉiṉimai, iṉpattamiḻ) Pattukottai Kalyanasundaram.

Prose: G. DevaneyaBhavanar (TamizhumDhiravidamumsamamaa?), Paritimāṟkalaiñar (paranarkettaparisu), chirbi (valluvarvakukkuminbam)

Short Story: Azhagiya Periyavan – (VanammaaL)

Novel: Imaiyam (Peththavan)

அலகு – 4தொல்காப்பியம்:

எழுத்து – பிறப்பியல்.

நிறுத்தக்குறிகள்மற்றும்

கடிதம்எழுதுதலும்கட்டுரைஎழுதுதலும்

UNIT – 4tolkāppiyam: Alphabet – piṟappiyal. Punctuation marks and Letter writing and essay writing.

REFERENCE

இமையம், *பெத்தவன்*, க்ரியாவெளியீடு 2019.

அழகியபெரியவன் ,*அழகியபெரியவன்கதைகள்*, நற்றிணைபதிப்பகம், 2016

சி.பாலசுப்பிரமணியன், *கட்டுரை-வளம்*, நறுமலர்ப்பதிப்பகம், பத்தாம்பதிப்பு 1994

பரிதிமாற்கலைஞர் ,*தமிழ்மொழியின்வரலாறு*, பூம்புகார்பதிப்பகம், ஆறாம்பதிப்பு 2013.

அகளங்கன், *பன்னிருதிருமுறை – அறிமுகம்*, இந்துமாமன்றம்வவுனியா, 1994

ரா. சீனிவாசன ,*தமிழ்இலக்கியவரலாறு* ,https://ta.wikisource.org/s/99uk

மாணிக்கவாசகர் (திருவாசகம்- சிவபுராணம்

பொன்மணிமாறன் "அடோன்தமிழ்இலக்கணம் "அடோன்பப்ளிஷிங்குரூப், வஞ்சியூர், திருவனந்தபுரம், 2007.

http:/www.tamilvu.org/libirary/libindex.htm.

http:/www.gunathamizh.com/2013/07/blog0post_24.html

24MAL111 Malayalam II LTPC: 2 0 0 2

Course objective:

- To develop independent reading skills and reading for appreciating literary works.
- To develop elaboration and modernization of the vocabulary of a language
- To enable the students to plan, draft, edit & present a piece of writing.

Course outcomes:

CO1: Develop the ability to read and critically appreciate a given text

CO2: Develop fluency in communication

CO3: Develop interest in blending of language and Indian Spirituality

CO4: To enable the learners to understand the grammatical structures of classes of words

Unit Topic

1 Memoirs-One of the Selecrtion from Chiudambara Smarana-Balachandran Chullikkadu-Critical analysis of his poetry)

2 Ancient Drama: Kerala Sakunthalam (Act 4), Kalidasan (Transilated by Attoor Krishna

Pisharody).

3 Satire One of the Selection from Chemmanam Chacko,VKN Or Punathil Kunjabdulla-philosophical dimens of Satire

4 Part of an auto-biography/travelogue:
Valarnnu varunna oratmavu(from Kanneerum Kinavum)-VT Bhattathirippad

5 Error-freeMalayalam: 1.Language; 2.Clarity of expression; 3.Punctuation-Thettillatha Malayalam – Writing-a. Expansion of ideas

Text books/Reference:

1) Hasa Sahithyam Kuttikrishna Mararu
2) Sakunthalam-Attoor/Kuttikrishna Marar
3) Kalidasa Hridayam-K.P.Narayana Pisharady
4) VKN-K.P.Appan
5) N.V.Krishna Warriar & Modern Poetry studies
6) Kanneerum Kinavum –V.T. Bhattathirippad
7) Adukkalayil Ninnu Arangatheykku-V.T.Bhattathirippadu
8) Nalla Malayalam- C.V.Vasudeva Bhattathiri
9) Tettum Sariyum-Prof. Panmana Ramachandran Nair

24HIN111	HINDI II	2 0 0 2

Course Objective: The course will allow students to apply grammar in language structures, appreciate the literary compositions and provide them with a good command over translation techniques.

Course outcomes: By the end of the course the students will be able to:

1. Understand the postmodern trends of literature...
2. 2.Explore tradition and culture through literature.
3. Apply ethical and professional translation strategies.
4. Demonstrate linguistic competence in written communication.

UNIT 1

Hindi Laghu Upanyas **:Mamatha Kaliya- ' Doud'**

UNIT 2

Hindi Natak**:** Swadesh Deepak- "Kort Marshal"

UNIT 3.

Adhunik Hindi Kavya a.Jayashankar Prasad-(Lahar, Aah!Vedhana Mili Vidayi)., b.Suryakanth Tripathi „Nirala"- (Anamika -4)., c.Subadhra Kumari , Chouhan- (Swadesh Ke Prathi, Smruthiyam), d.Gajanan Madhav Muktibodh- (ek swapna Katha)

UNIT 4.

A)Sankshepan,

B) .Anuvad: Paribhasha,Prakar,AnuvadKeLakshan,AnuvadKiAvashyakata,Passage (Translation)

c)Paragraph writing

D)Technical writing

REFERENCE

1. Prayojan Mulak Hindi Ke Naye Ayam : Dr. Pandit Banne
2. Prayojan Mulak Hindi Ki Nayi Bhumika : Kailash Nath Pandey
3. Prayojan Mulak Hindi Ke Vividh Roop : Dr. Rajendra Mishra, Rakesh Sharma
4. "Adhunik Kavya Sangraha" Edited by . Dr. Urvashi Sharma (Printed and Published by Malik & Company, Jaipur)
5. Hindi Samay.com,/Hindikahani.com/exotic indiaart.com

24KAN111 Kannada II LTPC: 2 0 0 2

Objectives:

- To develop the standard of orthography and spelling system.
- To develop independent reading skills and reading for appreciating literary works.
- To develop elaboration and modernization of the vocabulary of a language.
- To enable the students to plan, draft, edit & present a piece of writing.

Course Outcome

O1	Develop the ability to read and critically appreciate a given text
O2	Develop pattern of communication as required for different professional context
O3	Develop fluency in speaking the language

Course Contents

UNIT – 1

Prabandhagalu

- Thotadacheya Bhoota – Kuvempu
- Bantu Bannada Holi – G. S. Shivarudrappa

UNIT – 2

Poems

- Ni hinga nodabayda Nanna – Da. Ra. Bendre
- Huttarihaadu – Panje Mangesh Rao
- Tungabadre – K.S.Narasimhaswamy
- Nanna Janagalu – Dr.Siddhalingaya

UNIT – 3

Novel

- Jugari Cross – Poornachandra Tejaswi

UNIT – 4

- Suttole
- Kadata
- prakatane
- Arjigalu
- Aadesha patraa

UNIT- 5

- Varadigalu
- Sanshikpta Baravanige
- Prabandhagalu: vaadaatmaka haagu vishleshanatmaka

References:

1. Jugari Cross – Poornachandra Tejaswi – Pustaka Prakashana
2. Shatamaanada Lalitha Prabandha – Gurulinga Kaapase - Karnataka Sahitya Academy
3. N.Gopalkrishna Adiga – Kannada Vyakarana mattu Rachane – MCC Publications
4. Maadhari Patragalu – S.R.Siddharaju – Kannada Saahitya Parishattu
5. H.S.Krishnaswamy Iyangar – Adalitha Kannada – Chetana publication, Mysuru

24SAN111 SANSKRIT II LTPC: 2 0 0 2

Module I

Seven cases, Avyayas, sentence making with Avyayas, Sapthakakaras.

Module II

Kthavathu Prathyaya, Upasargas, Kthvatha, Thumunnantha, LyabanthaPrathyaya. Three Lakaras – brief introduction, Lot lakara

Module III

New words and sentences for the communication, Slokas, moral stories, Subhashithas, riddles (Selected from the Pravesha Book)

Module IV

Introduction to classical literature, classification of Kavyas, classification of Dramas - Important five Mahakavyas

Module V

Translation of paragraphs from Sanskrit to English and vice versa

Module VI

Chanakya Neeti chapter III (Part II), Bhagavad Geeta chapter 14 (Part II)

Essential Reading:

1, Praveshaha; Publisher :Samskritabharati, Aksharam, 8th cross, 2nd phase, girinagar, Bangalore -560 085
2, Sanskrit Reader I, II and III, R.S. Vadhyar and Sons, Kalpathi, Palakkad
3, PrakriyaBhashyam written and published by Fr. John Kunnappally
4, Sanskrit Primer by Edward Delavan Perry, published by Ginn and Company Boston
5, Sabdamanjari, R.S. Vadyar and Sons, Kalpathi, Palakkad
6, Namalinganusasanam by Amarasimha published by Travancore Sanskrit series
7, SubhashitaRatnaBhandakara by Kashinath Sharma, published by Nirnayasagarpress

24TAM111 TAMIL II 2 0 0 2

Course Objective: The course will allow students to understandthewriting competency in Tamil literature.

Course outcomes: By the end of the course the students will be able to:

1. Introduction to Tamil Folklore
2. Learning the nuances of Tamil spiritual literature
3. Exposure to the advanced aspects of Tamil grammar
4. Imbibing the spirit of language through familiarising with linguistics, translation and creative writing

அலகு 1

சிற்றிலக்கியங்கள்அறிமுகம்: கலிங்கத்துப்பரணி (பபோர்போடியது),

முக்கூடற்பள்ளு 35. நோட்டுபுறவியல்: வரரவிலக்கணம், நோட்டுபுறப்போடல்கள், கரதகள், கரதப்போடல்கள், பழமமோழி, விடுகரதகள், கரலகள்.

Introduction to CiRRilakkiyam: Kalingaththupparani (Poor Padiyathu) - MukkdaRpallu 35. Folklore: Definition, Folksongs - Stories – kathaipPaadal - pazhamozhi - vidukathai - kalaikaL.

அலகு 2
பக்திஇலக்கியம்: ஆண்டோள்முழுவரலோறு, திருப்போரவ (1,2,3,4)

அலகு 3
மதோல்கோப்பியம்: மபோருளிலக்கணம் - மோல்லிலக்கணம்
அலகு 4
மமோழிமபயப்பு: மமோழிமபயப்புவரகககள்,
மமோழிமபயர்ப்பின்முக்கியதுவமும்பதரவயும், இயந்திரமமோழிமபயர்ப்பு, மகோள்ரகககள், இலக்கியமமோழிமபயர்ப்பு. மமோழியியல்அறிமுகம்: மமோழியும்மமோழியியலும், பயன்போடுமமோழியின்தன்ரமகள் ,மமோழியியல்துரறகள். பரடப்புஉருவோக்குதல் (கருத்துபரிமாற்றம் - கவிரதஇலக்கியம்- அறிமுகம், விடுதரலக்குமுன்னும்பின்னும் - நாடகம் - சிறுகதத).
Translation: Types of translation - Importance and need of translation - Machine translation - Principles - Literary translation.
Introduction to Linguistics: Language and Linguistics- Linguistics – Characteristics of applied language – Fields of Linguistics. Creation of creativity (Exchange of ideas - introduction to poetry literature, before and after liberation - drama - short story).

REFERENCES

மு.வரதரோன்“ தமிழ்இலக்கியவரலோறு” ோஹித்யஅகமடமிபப்ளிபகஷன்ஸ் , 2012
மபோன்மணிமோறன் “அபடோன்தமிழ்இலக்கணம் “அபடோன்பப்ளிஷிங்குரூப், வஞ்சியூர், திருவனந்தபுரம், 2007. http:/www.tamilvu.org/libirary/libindex.htm.
http:/www.gunathamizh.com/2013/07/blog0post_24.html நோ.வோனமோமரல, “தமிழர்நோட்டுப்போடல்கள்” நியூமஞ்சுரிபுத்தகமவளியீட்டகம் 1964,2006
நோ.வோனமோமரல “பழங்கரதகளும், பழமமோழிகளும் ”நியூமஞ்சுரிபுத்தகமவளியீட்டகம், 1980,2008

23LSK201 Life Skills I L-T-P-C: 1-0-2-2

Pre-requisite: An open mind and the urge for self-development, basic English language skills, knowledge of high school level mathematics.

Course Objective: To assist students in inculcating soft skills, developing a strong personality, empowering them to face life's challenges, improving their communication skills and problem-solving skills.

Course Outcomes

CO1: Soft Skills - To develop greater morale and positive attitude to face, analyze, and manage emotions in real life situations, like placement process.

CO2: Soft Skills - To empower students to create better impact on a target audience through content creation, effective delivery, appropriate body language and overcoming nervousness, in situations like presentations, Group Discussions and interviews.

CO3: Aptitude – To analyze, understand and solve questions in arithmetic and algebra by employing the most suitable methods.

CO4: Aptitude - To investigate and apply suitable techniques to solve questions on logical reasoning.

CO5: Verbal – To infer the meaning of words & use them in the right context. To have a better understanding of the nuances of English grammar and become capable of applying them effectively.

CO6: Verbal - To identify the relationship between words using reasoning skills. To develop the capacity to communicate ideas effectively.

Skills: Communication, self-confidence, emotional intelligence, presentation skills and problem-solving Skills.

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	2	3	3	-	3
CO2	-	-	-	-	-	-	-	3	2	3	-	3
CO3	-	3	-	-	-	-	-	-	-	-	-	3
CO4	-	3	-	-	-	-	-	-	-	-	-	3
CO5	-	-	-	-	-	-	-	-	-	3	-	3
CO6	-	-	-	-	-	-	-	-	3	3	-	3

Syllabus

Soft Skills

Soft Skills and its importance: Pleasure and pains of transition from an academic environment to work-environment. New-age challenges and distractions. Learning to benefit from constructive criticisms and feedback. Need for change in mindset and up-skilling to keep oneself competent in the professional world.

Managing Self: Knowing oneself, Self-perception, Importance of positive attitude, Building and displaying confidence, Avoiding being overconfident, Managing emotions, stress, fear. Developing Resilience and handling failures. Self-motivation, Self-learning, and continuous knowledge up-gradation / Life-long learning. Personal productivity - Goal setting and its importance in career planning, Self-discipline, Importance of values, ethics and integrity, Universal Human Values.

Communication: Process, Language Fluency, Non-verbal, Active listening. Assertiveness vs. aggressiveness. Barriers in communication. Digital communication

Aptitude

Numbers: Types, Power Cycles, Divisibility, Prime, Factors & Multiples, HCF & LCM, Surds, Indices, Square roots, Cube Roots and Simplification.

Percentage: Basics, Profit, Loss & Discount, and Simple & Compound Interest.

Ratio, Proportion & Variation: Basics, Alligations, Mixtures, and Partnership.

Averages: Basics, and Weighted Average.

Equations: Basics, Linear, Quadratic, Equations of Higher Degree and Problems on ages.

Logical Reasoning I: Blood Relations, Direction Test, Syllogisms, Series, Odd man out, Coding \& Decoding, Cryptarithmetic Problems and Input - Output Reasoning.

Verbal Skills

Vocabulary: Familiarize students with the etymology of words, help them realize the relevance of word analysis and enable them to answer synonym and antonym questions. Create an awareness about the frequently misused words, commonly confused words and wrong form of words in English.

Grammar (Basics): To learn the usage of grammar and facilitate students to identify errors and correct them.

Reasoning: Stress the importance of understanding the relationship between words through analogy questions. Emphasize the importance of avoiding the gap (assumption) in the argument/ statements/ communication.

Speaking Skills: Make students conscious of the relevance of effective communication in today's world through individual speaking activities.

Writing Skills: Introduce formal written communication and keep the students informed about the etiquette of email writing.

References:

1. Gulati. S., (1006) "Corporate Soft Skills", New Delhi, India: Rupa & Co.
2. The hard truth about Soft Skills, by Amazon Publication.
3. Verbal Skills Activity Book, CIR, AVVP
4. Nova's GRE Prep Course, Jeff Kolby, Scott Thornburg & Kathleen Pierce
5. The BBC and British Council online resources
6. Owl Purdue University online teaching resources
7. www.thegrammarbook.com online teaching resources
8. www.englishpage.com online teaching resources and other useful websites
9. Student Workbook: Quantitative Aptitude & Reasoning, Corporate & Industry Relations, Amrita Vishwa Vidyapeetham.
10. Quantitative Aptitude for All Competitive Examinations, Abhijit Guha.
11. How to Prepare for Quantitative Aptitude for the CAT, Arun Sharma.
12. How to Prepare for Data Interpretation for the CAT, Arun Sharma.
13. How to Prepare for Logical Reasoning for the CAT, Arun Sharma.
14. Quantitative Aptitude for Competitive Examinations, R S Aggarwal.
15. A Modern Approach to Logical Reasoning, R S Aggarwal.
16. A Modern Approach to Verbal & Non-Verbal Reasoning, R S Aggarwal.

Evaluation Pattern

Assessment	Internal	External
Continuous Assessment (CA)* – Soft Skills	30	-
Continuous Assessment (CA)* – Aptitude	10	25
Continuous Assessment (CA)* – Verbal	10	25
Total	50	50

*CA - Can be **presentations, speaking activities and tests.**

23LSK211 Life Skills II L-T-P-C: 1-0-2-2

Pre-requisite: Willingness to learn, communication skills, basic English language skills, knowledge of high school level mathematics.

Course Objective: To help students understand the corporate culture and assist them in improving their group discussion skills, communication skills, listening skills and problem-solving skills.

Course Outcomes

CO1: Soft Skills - To improve the inter-personal skills, professional etiquette and leadership skills, vital for arriving at win-win situations in Group Discussions and other team activities.

CO2: Soft Skills - To develop the ability to create better impact in a Group Discussions through examination, participation, perspective-sharing, ideation, listening, brainstorming and consensus.

CO3: Aptitude - To interpret, critically analyze and solve questions in arithmetic and algebra by employing the most suitable methods.

CO4: Aptitude - To analyze, understand and apply suitable methods to solve questions on logical reasoning.

CO5: Verbal - To be able to use vocabulary in the right context and to be competent in spotting grammatical errors and correcting them.

CO6: Verbal - To be able to logically connect words, phrases, sentences and thereby communicate their perspectives/ideas convincingly.

Skills: Communication, etiquette and grooming, inter-personal skills, listening skills, convincing skills, problem-solving skill.

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	2	3	3	2	3
CO2	-	-	-	-	-	-	-	2	3	3	2	3

CO3	-	3	-	-	-	-	-	-	-	-	-	3
CO4	-	3	-	-	-	-	-	-	-	-	-	3
CO5	-	-	-	-	-	-	-	-	-	3	-	3
CO6	-	-	-	-	-	-	-	-	3	3	-	3

Syllabus

Soft Skills

Professional Grooming and Practices: Basics of corporate culture, key pillars of business etiquette – online and offline: socially acceptable ways of behavior, body language, personal hygiene, professional attire and cultural adaptability and managing diversity. Handling pressure, multi-tasking. Being enterprising. Adapting to corporate life: Emotional Management (EQ), Adversity Management, Health consciousness. People skills, Critical Thinking and Problem solving.

Group Discussions: Advantages of group discussions, Types of group discussion and Roles played in a group discussion. Personality traits evaluated in a group discussion. Initiation techniques and maintaining the flow of the discussion, how to perform well in a group discussion. Summarization/conclusion.

Aptitude

Logarithms, Inequalities and Modulus: Basics

Sequence and Series: Basics, AP, GP, HP, and Special Series.

Time and Work: Basics, Pipes & Cistern, and Work Equivalence.

Time, Speed and Distance: Basics, Average Speed, Relative Speed, Boats & Streams, Races and Circular tracks.

Logical Reasoning II: Arrangements, Sequencing, Scheduling, Venn Diagram, Network Diagrams, Binary Logic, and Logical Connectives, Clocks, Calendars, Cubes, Non-Verbal reasoning and Symbol based reasoning.

Verbal Skills

Vocabulary: Help students understand the usage of words in different contexts.

Grammar (Medium Level): Train Students to comprehend the nuances of Grammar and empower them to spot errors in sentences and correct them.

Reading Comprehension (Basics): Introduce students to smart reading techniques and help them understand different tones in comprehension passages.

Reasoning: Enable students to connect words, phrases and sentences logically.

Oral Communication Skills: Aid students in using the gift of the gab to interpret images, do a video synthesis, try a song interpretation or elaborate on a literary quote.

References:

1. Adair. J., (1.986), "Effective Team Building: How to make a winning team", London, U.K: Pan Books.
2. Gulati. S., (2006) "Corporate Soft Skills", New Delhi, India: Rupa & Co.
3. The Hard Truth about Soft Skills, by Amazone Publication.
4. Verbal Skills Activity Book, CIR, AVVP
5. Nova's GRE Prep Course, Jeff Kolby, Scott Thornburg & Kathleen Pierce
6. The BBC and British Council online resources
7. Owl Purdue University online teaching resources
8. www.thegrammarbook.com online teaching resources
9. www.englishpage.com online teaching resources and other useful websites
10. Student Workbook: Quantitative Aptitude & Reasoning, Corporate & Industry Relations, Amrita Vishwa Vidyapeetham.
11. Quantitative Aptitude for All Competitive Examinations, Abhijit Guha.
12. How to Prepare for Quantitative Aptitude for the CAT, Arun Sharma.

13. How to Prepare for Data Interpretation for the CAT, Arun Sharma.
14. How to Prepare for Logical Reasoning for the CAT, Arun Sharma.
15. Quantitative Aptitude for Competitive Examinations, R S Aggarwal.
16. A Modern Approach to Logical Reasoning, R S Aggarwal.
17. A Modern Approach to Verbal & Non-Verbal Reasoning, R S Aggarwal.

Evaluation Pattern

Assessment	Internal	External
Continuous Assessment (CA)* – Soft Skills	30	-
Continuous Assessment (CA)* – Aptitude	10	25
Continuous Assessment (CA)* – Verbal	10	25
Total	50	50

*CA - Can be **presentations, speaking activities and tests**

23LSK301	**Life Skills III**	**L-T-P-C: 1-0-2-2**

Pre-requisite: Team Spirit, self-confidence and required knowledge, basic English language skills, knowledge of high school level mathematics.

Course Objective: To help students understand the nuances of leadership, know the importance of working in teams, face challenging situations, crack interviews, improve communication skills and problem-solving skills.

Course Outcomes

CO1: Soft Skills - To acquire the ability to work in teams, present themselves confidently and showcase their knowledge, skills, abilities, interests, practical exposure, strengths and achievements to potential recruiters through a resume, video resume, and personal interview.
CO2: Soft Skills - To have better ability to prepare for facing interviews, analyse interview questions, articulate correct responses and respond appropriately to convince the interviewer of one's right candidature through displaying etiquette, positive attitude and courteous communication.
CO3: Aptitude - To manage time while arriving at appropriate strategies to solve questions in geometry, statistics, probability and combinatorics.
CO4: Aptitude - To analyze, understand and apply suitable methods to solve questions on data analysis and data sufficiency.
CO5: Verbal - To use diction that is less verbose and more refined and to use prior knowledge of grammar to correct/improve sentences.
CO6: Verbal - To understand arguments, analyze arguments and use inductive/deductive reasoning to arrive at conclusions. To be able to generate ideas, structure them logically and express them in a style that is comprehensible to the audience/recipient.
Skills: Communication, teamwork, leadership, facing interviews and problem-solving.

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	2	3	3	-	3
CO2	-	-	-	-	-	-	-	2	3	3	-	3
CO3	-	3	-	-	-	-	-	-	-	-	-	3
CO4	-	3	-	-	-	-	-	-	-	-	-	3
CO5	-	-	-	-	-	-	-	-	-	3	-	3
CO6	-	-	-	-	-	-	-	-	3	3	-	3

Syllabus

Soft Skills

Team Work: Value of teamwork in organizations, Definition of a team. Why team? Effective team building. Parameters for a good

team, roles, empowerment and need for transparent communication, Factors affecting team effectiveness, Personal characteristics of members and its influence on team. Project Management Skills, Collaboration skills.
Leadership: Initiating and managing change, Internal problem solving, Evaluation and co-ordination, Growth and productivity, Importance of Professional Networking.
Facing an interview: Importance of verbal & aptitude competencies, strong foundation in core competencies, industry orientation / knowledge about the organization, resume writing (including cover letter, digital profile and video resume), being professional. Importance of good communication skills, etiquette to be maintained during an interview, appropriate grooming and mannerism.

Aptitude

Geometry: 2D, 3D, Coordinate Geometry, and Heights & Distance.

Permutations & Combinations: Basics, Fundamental Counting Principle, Circular Arrangements, and Derangements.

Probability: Basics, Addition & Multiplication Theorems, Conditional Probability and Bayes' Theorem.

Statistics: Mean, Median, Mode, Range, Variance, Quartile Deviation and Standard Deviation.

Data Interpretation: Tables, Bar Diagrams, Line Graphs, Pie Charts, Caselets, Mixed Varieties, and other forms of data representation.

Data Sufficiency: Introduction, 5 Options Data Sufficiency and 4 Options Data Sufficiency.

Campus recruitment papers: Discussion of previous year question papers of all major recruiters of Amrita Vishwa Vidyapeetham.

Miscellaneous: Interview Puzzles, Calculation Techniques and Time Management Strategies.

Verbal Skills

Vocabulary: Create an awareness of using refined language through idioms and phrasal verbs.

Grammar (Advanced Level): Enable students to improve sentences through a clear understanding of the rules of grammar.

Reasoning Skills: Facilitate the student to tap his reasoning skills through Syllogisms, and critical reasoning arguments.

Reading Comprehension (Advanced): Enlighten students on the different strategies involved in tackling reading comprehension questions.

Public Speaking Skills: Empower students to overcome glossophobia and speak effectively and confidently before an audience.

Writing Skills: Practice closet tests that assess basic knowledge and skills in usage and mechanics of writing such as punctuation, basic grammar and usage, sentence structure and rhetorical skills such as writing strategy, organization, and style. Practice formal written communication through writing emails especially composing job application emails.

References:

1. Adair. J., (1.986), "Effective Team Building: How to make a winning team", London, U.K: Pan Books.
2. Gulati. S., (2006) "Corporate Soft Skills", New Delhi, India: Rupa & Co.
3. The Hard Truth about Soft Skills, by Amazone Publication.
4. Verbal Skills Activity Book, CIR, AVVP
5. Nova's GRE Prep Course, Jeff Kolby, Scott Thornburg & Kathleen Pierce

6. The BBC and British Council online resources
7. Owl Purdue University online teaching resources
8. www.thegrammarbook.com online teaching resources
9. www.englishpage.com online teaching resources and other useful websites
10. Student Workbook: Quantitative Aptitude & Reasoning, Corporate & Industry Relations, Amrita Vishwa Vidyapeetham.
11. Quantitative Aptitude for All Competitive Examinations, Abhijit Guha.
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17. A Modern Approach to Verbal & Non-Verbal Reasoning, R S Aggarwal.

Evaluation Pattern

Assessment	Internal	External
Continuous Assessment (CA)* – Soft Skills	30	-
Continuous Assessment (CA)* – Aptitude	10	25
Continuous Assessment (CA)* – Verbal	10	25
Total	50	50

*CA - Can be **presentations, speaking activities and test**

VI. VALUE ADDED COURSES (VAC)

LAYOUT OF VAC COURSES IN THE CURRICULUM

Course Code	Course Title	L T P	Cr
	SEMESTER 1		
VAC 1	MAstery Over Mind (MAOM)	1 0 2	2
	SEMESTER 2		
VAC 2	Amrita Value Programme I	1 0 0	1
	SEMESTER 3		
VAC 3	Amrita Value Programme II	1 0 0	1
	SEMESTER 3		
VAC 4	Environmental Science and Sustainability	3 1 0	4

22AVP103 Mastery Over Mind (MAOM) 1-0-2 2

1. Course Overview

Master Over the Mind (MAOM) is an Amrita initiative to implement schemes and organise university-wide programs to enhance health and wellbeing of all faculty, staff, and students (UN SDG -3). This program as part of our efforts for sustainable stress reduction gives an introduction to immediate and long-term benefits and equips every attendee to manage stressful emotions and anxiety facilitating inner peace and harmony.

With a meditation technique offered by Amrita Chancellor and world-renowned humanitarian and spiritual leader, Sri Mata Amritanandamayi Devi (Amma), this course has been planned to be offered to all students of all campuses of AMRITA, starting off with all first years, wherein one hour per week is completely dedicated for guided practical meditation session and one hour on the theory aspects of MAOM. The theory section comprises lecture hours within a structured syllabus and will include invited guest lecture series from eminent personalities from diverse fields of excellence. This course will enhance the understanding of experiential learning based on university's mission: "Education for Life along with Education for Living", and is aimed to allow learners to realize and rediscover the infinite potential of one's true Being and the fulfilment of life's goals.

2. Course Syllabus

Unit 1 (4 hours)

Causes of Stress: The problem of not being relaxed. Need for meditation -basics of stress management at home and workplace. Traditions and Culture. Principles of meditation– promote a sense of control and autonomy in the Universal Human Value System. Different stages of Meditation. Various Meditation Models. Various practices of Meditation techniques in different schools of philosophy and Indian Knowledge System.

Unit 2 (4 hours)

Improving work and study performance. Meditation in daily life. Cultivating compassion and good mental health with an attitude of openness and acceptance. Research and Science of Meditation: Significance of practising meditation and perspectives from diverse fields like science, medicine, technology. philosophy,

culture, arts, management, sports, economics, healthcare, environment etc. The role of meditation for stress and anxiety reduction in one's life with insights based on recent cutting-edge technology. The effect of practicing meditation for the wholesome wellbeing of an individual.

Unit 3 (4 hours)

Communications: principles of conscious communication. Relationships and empathy: meditative approach in managing and maintaining better relationships in life during the interactions in the world, role of MAOM in developing compassion, empathy and responsibility, instilling interest, and orientation to humanitarian projects as a key to harness intelligence and compassion in youth. Methodologies to evaluate effective awareness and relaxation gained from meditation. Evaluating the global transformation through meditation by instilling human values which leads to service learning and compassion driven research.

TEXT BOOKS:

1.Mata Amritanandamayi Devi, "Cultivating Strength and vitality," published by Mata Amritanandamayi Math, Dec 2019
2.Swami Amritaswarupananda Puri ,"The Color of Rainbow " published by MAM, Amritapuri.

REFERENCES:

1.Craig Groeschel, "Winning the War in Your Mind: Change Your Thinking, Change Your Life" Zondervan Publishers, February 2019
2.R Nagarathna et al, "New Perspectives in Stress Management "Swami Vivekananda Yoga Prakashana publications, Jan 1986
3. Swami Amritaswarupananda Puri "Awaken Children Vol 1, 5 and 7 - Dialogues with Amma on Meditation", August 2019
4. Swami Amritaswarupananda Puri "From Amma's Heart - Amma's answer to questions raised during world tours" March 2018
5. Secret of Inner Peace- Swami Ramakrishnananda Puri, Amrita Books, Jan 2018.
6. Mata Amritanandamayi Devi "Compassion :The only way to Peace:Paris Speech", MA Center, April 2016.
7. Mata Amritanandamayi Devi "Understanding and collaboration between Religions", MA Center, April 2016.
8. Mata Amritanandamayi Devi "Awakening of Universal Motherhood: Geneva Speech" M A center, April 2016.

3. Evaluation and Grading

Internal			**External**	**Total**
Components	*Weightage*		Practical (attendance and class participation) 60%	100%
Quizzes(based on the reading material)	20%	40%		
Assignments (Based on webinars and lecture series)	20%			

4. Course Outcomes (CO)

CO1: Relate to the causes of stress in one's life.
CO2: Experiment with a range of relaxation techniques CO3: Model a meditative approach to work, study, and life.
CO4: Develop appropriate practice of MA-OM technique that is effective in one's life CO5: Inculcate a higher level of awareness and focus.
CO6: Evaluate the impact of a meditation technique
***Programme Outcomes(PO)**(As given by NBA and ABET)

PO1: Engineering Knowledge
PO2: Problem Analysis
PO3: Design/Development of Solutions
PO4: Conduct Investigations of complex problems
PO5: Modern tools usage
PO6: Engineer and Society
PO7: Environment and Sustainability
PO8: Ethics
PO9: Individual & Team work
PO10: Communication
PO11: Project management & Finance
PO12: Lifelong learning

CO – PO Affinity Map

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	3	2		-	2	3	-	3	-	3	-	-	-
CO 2	3	3	3	2	2	_	2	3	3	3	-	3	-	-	-
CO 3	3	3	2	2	2	2	2	3	3	3	-	3	-	-	-
CO 4	3	3	3	2	-	2	3	3	3	3	-	3	-	-	-
CO 5	3	2	2	2	-	2	-	3	2	2	-	2	-	-	-
CO 6	3	2	2	2	3	2	_	3	2	2	-	2	-	-	-

AMRITA VALUE PROGRAMMES I & II

22AVP201 Message from Amma's Life for the Modern World

Amma's messages can be put to action in our life through pragmatism and attuning of our thought process in a positive and creative manner. Every single word Amma speaks and the guidance received in on matters which we consider as trivial are rich in content and touches the very inner being of our personality. Life gets enriched by Amma's guidance and She teaches us the art of exemplary life skills where we become witness to all the happenings around us still keeping the balance of the mind.

22ADM211 Leadership from the Ramayana

Introduction to Ramayana, the first Epic in the world – Influence of Ramayana on Indian values and culture – Storyline of Ramayana – Study of leading characters in Ramayana – Influence of Ramayana outside India – Relevance of Ramayana for modern times.

22ADM201 Strategic Lessons from the Mahabharata

Introduction to Mahabharata, the largest Epic in the world – Influence of Mahabharata on Indian values and culture – Storyline of Mahabharata – Study of leading characters in Mahabharata – Kurukshetra War and its significance - Relevance of Mahabharata for modern times.

22AVP204 Lessons from the Upanishads

Introduction to the Upanishads: Sruti versus Smrti - Overview of the four Vedas and the ten Principal Upanishads - The central problems of the Upanishads – The Upanishads and Indian Culture – Relevance of Upanishads for modern times – A few Upanishad Personalities: Nachiketas, SatyakamaJabala, Aruni, Shvetaketu.

22AVP205 Message of the Bhagavad Gita

Introduction to Bhagavad Gita – Brief storyline of Mahabharata - Context of Kurukshetra War – The anguish of Arjuna – Counsel by Sri. Krishna – Key teachings of the Bhagavad Gita – Karma Yoga, Jnana Yoga and Bhakti Yoga - Theory of Karma and Reincarnation – Concept of Dharma – Concept of Avatar - Relevance of Mahabharata for modern times.

22AVP206 Life and Message of Swami Vivekananda

Brief Sketch of Swami Vivekananda's Life – Meeting with Guru – Disciplining of Narendra - Travel across India - Inspiring Life incidents – Address at the Parliament of Religions – Travel in United States and Europe – Return and reception India – Message from Swamiji's life.

22AVP207 Life and Teachings of Spiritual Masters India

Sri Rama, Sri Krishna, Sri Buddha, AdiShankaracharya, Sri Ramakrishna Paramahamsa, Swami Vivekananda, Sri RamanaMaharshi, Mata Amritanandamayi Devi.

22AVP208 Insights into Indian Arts and Literature

The aim of this course is to present the rich literature and culture of Ancient India and help students appreciate their deep influence on Indian Life - Vedic culture, primary source of Indian Culture – Brief introduction and appreciation of a few of the art forms of India - Arts, Music, Dance, Theatre.

22AVP209 Yoga and Meditation

The objective of the course is to provide practical training in YOGA ASANAS with a sound theoretical base and theory classes on selected verses of Patanjali's Yoga Sutra and Ashtanga Yoga. The coverage also includes the effect of yoga on integrated personality development.

22AVP210 Kerala Mural Art and Painting

Mural painting is an offshoot of the devotional tradition of Kerala. A mural is any piece of artwork painted or applied directly on a wall, ceiling or other large permanent surface. In the contemporary scenario Mural painting is not restricted to the permanent structures and are being done even on canvas. Kerala mural paintings are the frescos depicting mythology and legends, which are drawn on the walls of temples and churches in South India, principally in Kerala. Ancient temples, churches and places in Kerala, South India, display an abounding

tradition of mural paintings mostly dating back between the 9th to 12th centuries when this form of art enjoyed Royal patronage. Learning Mural painting through the theory and practice workshop is the objective of this course.

22AVP213 Traditional Fine Arts of India

India is home to one of the most diverse Art forms world over. The underlying philosophy of Indian life is 'Únity in Diversity" and it has led to the most diverse expressions of culture in India. Most art forms of India are an expression of devotion by the devotee towards the Lord and its influence in Indian life is very pervasive. This course will introduce students to the deeper philosophical basis of Indian Art forms and attempt to provide a practical demonstration of the continuing relevance of the Art.

22AVP214 Principles of Worship in India

Indian mode of worship is unique among the world civilizations. Nowhere in the world has the philosophical idea of reverence and worshipfulness for everything in this universe found universal acceptance as it in India. Indian religious life even today is a practical demonstration of the potential for realization of this profound truth. To see the all-pervading consciousness in everything, including animate and inanimate, and constituting society to realise this truth can be seen as the epitome of civilizational excellence. This course will discuss the principles and rationale behind different modes of worship prevalent in India.

22AVP215 Temple Mural Arts in Kerala

The traditional percussion ensembles in the Temples of Kerala have enthralled millions over the years. The splendor of our temples makes art enthusiast spellbound, warmth and grandeur of color combination sumptuousness of the outline, crowding of space by divine or heroic figures often with in vigorous movement are the characteristics of murals.

The mural painting specially area visual counterpart of myth, legend, gods, dirties, and demons of the theatrical world, Identical myths are popular the birth of Rama, the story of Bhīma and Hanuman, Shiva, as Kirata, and the Jealousy of Uma and ganga the mural painting in Kerala appear to be closely related to, and influenced by this theatrical activity the art historians on temple planes, wood carving and painting the architectural plane of the Kerala temples are built largely on the pan-Indians almost universal model of the Vasthupurusha.

22AVP218 Insights into Indian Classical Music

The course introduces the students into the various terminologies used in Indian musicology and their explanations, like Nadam, Sruti, Svaram – svara nomenclature, Stayi, Graha, Nyasa, Amsa, Thala,- Saptatalas and their angas, Shadangas, Vadi, Samavadi, Anuvadi. The course takes the students through Carnatic as well as Hindustani classical styles.

22AVP219 Insights into Traditional Indian Painting

The course introduces traditional Indian paintings in the light of ancient Indian wisdom in the fields of aesthetics, the Shadanga (Sixs limbs of Indian paintings) and the contextual stories from ancient texts from where the paintings originated. The course introduces the painting styles such as Madhubani, Kerala Mural, Pahari, Cheriyal, Rajput, Tanjore etc.

22AVP220 Insights into Indian Classical Dance

The course takes the students through the ancient Indian text on aesthetics the Natyasastra and its commentary the AbhinavaBharati. The course introduces various styles of Indian classical dance such as Bharatanatyan, Mohiniyatton, Kuchipudi, Odissy, Katak etc. The course takes the students through both contextual theory as well as practice time.

22AVP221 Indian Martial Arts and Self Defense

The course introduces the students to the ancient Indian system of self-defense and the combat through various martial art forms and focuses more on traditional Kerala's traditional KalariPayattu. The course introduces the various exercise technique to make the body supple and flexible before going into the steps and techniques of the martial art. The advanced level of this course introduces the technique of weaponry.

24ENV200 ENVIRONMENTAL SCIENCE AND SUSTAINABILITY 3 1 0 4

Course Objective:

To provide a general understanding of our environment, problems during exploitation of natural resources, the importance of biodiversity and the need for its conservation, pollution and its impacts, and approaches for environment sustainability.

Course Outcomes:

The student will be able to:

- CO1: Understand the over-exploitation of our natural resources and the need for Sustainable development.
- CO2: Understand the concept of ecosystem, its structure and function and threats to Ecosystems.
- CO3: Understand the concept of bio-diversity, its importance and conservation.
- CO4: Classify pollution and its impacts
- CO5: Inferring different approaches for attaining environmental sustainability.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	0	0	0	1	1	1	0	1	1	1	1	1	1	0	0
CO2	1	1	0	1	1	1	1	1	2	1	1	1	1	1	1
CO3	1	1	0	1	1	1	1	1	2	1	1	1	1	1	1
CO4	2	2	0	1	1	1	1	1	2	1	1	1	1	1	1
CO5	2	2	1	2	2	2	1	2	2	1	1	1	1	2	2

Unit 1

Multidisciplinary nature of environmental studies, Renewable and non-renewable Natural resources, Overexploitation and conservation of the following natural resources: forest, water, food, energy, mineral and land resources, Concept of sustainability, sustainable development, Concept of three R's (Reduce, Reuse, and Recycle), Concept of zero waste, Need for environmental education.

Unit 2

Concept of ecosystem. Components, structure and function of an eco-system, A brief description of forest ecosystem and desert ecosystem, Food chain and food web, Ecological Pyramids, Biogeochemical Cycles (examples-Carbon, Nitrogen and Phosphorous), EcosystemServices (example forest), Threats to ecosystems, Conservation of ecosystems.

Unit 3

Concept of Biodiversity, hot spots of biodiversity, India as a mega diversity nation, Threats tobiodiversity, Value of biodiversity, Brief description of economic valuation of biodiversity, RedData Base and Red data Book, International Union for Conservation of Nature (IUCN), Red List of Threatened Species (Brief description), Conservation of biodiversity.

Unit 4

Pollution of air, acid rain, global warming and climate change, ozone layer depletion, Water pollution, Soil pollution. Industrial and urban solid wastes, Hospital wastes, Hazardous waste,Collection, segregation of solid wastes, Different household disposal methods for degradable solid wastes, Commercial water purification devices for households, Plastic pollution, microplastics and its environmental and health effects, E-waste.

Unit 5

Ecological foot prints, brief description of Carbon Footprint and Water Footprint, Linear and Circular resource management, System thinking, Industrial ecosystems, Environmental Impact Assessment (EIA), Environment Management Plan (EMP), Green Technology, Green Business, Green Accounting, Green Buildings, Eco-Labeling, Sustainable (Green) Cities, Roleof individuals in the up keeping of environment.

Text Books:

Palanisamy P. N., Manikandan P., Geetha A., Manjula Ran – Environmental Science - PearsonEducation.

Harikumar P.N., Susha D. And Manoj Narayanan K. S. – Environment management and humanrights - Himalaya Publishing House.

Asthana D.K and Meera Asthana – A Textbook of Environmental Studies - S. Chand &Company

References:

Bala Krishnamoorthy – Environmental Management: Text and Cases - PHI

Jacob Thomas – Environmental management: Text and Cases - Pearson.

Rajagopalan R. – Environmental Studies: From crisis to cure - Oxford University Press

22ADM101 Foundations of Indian Heritage 2 0 1 2

UNIT 1

Introduction to Indian Culture - Introduction to Amma's life and Teachings – Symbols of Indian Culture.

UNIT 2

Science and Technology in Ancient India - Education in Ancient India - Goals of Life – Puru sharthas - Introduction to Vedanta and Bhagavad Gita.

UNIT 3

Introduction to Yoga - Nature and Indian Culture - Values from Indian History – Life and work of Great Seers of India.

TEXTBOOKS:

1. The Glory of India (in-house publication)

2. The Mother of Sweet Bliss, (Amma's Life & Teachings

22ADM111 Glimpses of Glorious India 2 0 1 2

Unit 1

1. Relevance of Sri Rama and Sri Krishna in this Scientific Age
2. Lessons from the Epics of India
3. Ramayana & Mahabharata

Unit 2

4. Who is a Wise Man?
5. A Ruler's Dharma
6. The Story of King Shibi

Unit 3

7. Introduction to the Bhagavad Gita
8. Bhagavad Gita – Action without Desire

Unit 4

9. Role and Position of Women in India
10. The Awakening of Universal Motherhood

Unit 5

11. Patanjali's Astanga - Yoga System for Personality Refinement
12. Examples of Heroism and Patriotism in Modern India

Recommended Readings

1. Common Resource Material II (in-house publication)
2. Sanatana Dharma - The Eternal Truth (A compilation of Amma's teachings on Indian Culture)