CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)

NATIONALLY ACCREDITED (III CYCLE) WITH "A" GRADE BY NAAC

ISO 9001:2015 Certified

TIRUCHIRAPPALLI – 620 018

PG AND RESEARCH DEPARTMENT OF PHYSICS

B.Sc., PHYSICS SYLLABUS

(2022-2023 Onwards)

CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)
TIRUCHIRAPPALLI-620 018
PG AND RESEARCH DEPARTMENT OF PHYSICS

VISION

To establish a substratum for excellence and creation of knowledge by igniting the essence of learning physics and exploring its area of research with novel ideas.

MISSION

Our mission is two – fold.

- ➢ To provide an outstanding and distinctive education to our undergraduate and postgraduate students.
- ➢ To expand our research enterprises via centers and institutes to achieve national and international prominence in strategic research areas.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	Statements
PEO1	**LEARNING ENVIRONMENT** To facilitate value-based holistic and comprehensive learning by integrating innovative learning practices to match the highest quality standards and train the students to be effective leaders in their chosen fields.
PEO2	**ACADEMIC EXCELLENCE** To provide a conducive environment to unleash their hidden talents and to nurture the spirit of critical thinking and encourage them to achieve their goal.
PEO3	**EMPLOYABILITY** To equip students with the required skills in order to adapt to the changing global scenario and gain access to versatile career opportunities in multidisciplinary domains.
PEO4	**PROFESSIONAL ETHICS AND SOCIAL RESPONSIBILITY** To develop a sense of social responsibility by formulating ethics and equity to transform students into committed professionals with a strong attitude towards the development of the nation.
PEO5	**GREEN SUSTAINABILITY** To understand the impact of professional solutions in societal and environmental contexts and demonstrate the knowledge for an overall sustainable development.

PROGRAMME OUTCOMES FOR B.Sc PHYSICS PROGRAMME

PO NO.	Programme Outcome On completion of B.Sc Physics Programme, The students will be able to
PO 1	**Domain Knowledge**: Analyse, design and develop solutions by applying firm fundamental concepts of basic sciences and expertise in discipline.
PO 2	**Problem solving:** Ability to think rationally, analyse and solve problems adequately with practical knowledge to assess the environmental issues.
PO 3	**Creative thinking and Team Work:** Develop prudent decision-making skills and mobility to work in teams to solve multifaceted problems.
PO 4	**Employability:** Self-study acclimatize them to observe effective interactive practices for practical learning enabling them to be a successful science graduate.
PO 5	**Life Long Learning**: Assure consistent improvement in the performance and arouse interest to pursue higher studies in premium institutions.

PROGRAMME SPECIFIC OUTCOMES FOR B.Sc PHYSICS PROGRAMME
B.Sc PHYSICS CURRICULUM [2022-2023 Onwards]

PSO NO.	Programme Specific Outcomes Students of B.Sc Physics will be able to	POs Addressed
PSO1	Intensify the student academic capability, unique qualities and transferable skills which will give them opportunity to evolve as responsible citizens.	PO1, PO2, PO4
PSO2	Explain the fundamentals laws involved in physics.	PO1, PO5
PSO3	Understand the theory and consequence of the various physical occurrence.	PO1, PO2, PO3, PO5
PSO4	Carryout experiments to interpret the laws and concepts of Physics.	PO1, PO2, PO5
PSO5	Relate the theories learnt and the skills procured to solve enduring problems.	PO1, PO2, PO3, PO5

Semester	Part	Course	Course Title	Course Code	Inst. Hrs. / week	Credits	Exam			Total
							Hrs.	Marks		
								Int	Ext	
I	I	Language Course-I (LC)	இக்கால இலக்கியம்	22ULT1	6	3	3	25	75	100
			Hindi Literature & Grammar-I	22ULH1						
			History of Popular Tales, Literature and Sanskrit Story	22ULS1						
			Basic French – I	22ULF1						
	II	English Language Course- I(ELC)	Functional English for Effective Communication – I	22UE1	6	3	3	25	75	100
	III	Core Course – I(CC)	Properties of Matter, Waves and Acoustics	22UPH1CC1	5	5	3	25	75	100
		Core Practical - I (CP)	Properties of Matter, Waves and Acoustics (P)	22UPH1CC1P	3	3	3	40	60	100
		First Allied Course- I (AC)	Calculus and Fourier Series	22UPH1AC1	4	3	3	25	75	100
		First Allied Course- II (AC)	Algebra, Analytical Geometry of 3D & Trigonometry	22UPH1AC2	4	3	3	25	75	100
	IV	Ability Enhancement Compulsory Course-I (AECC)	UGC Jeevan Kaushal – Universal Human Values	22UGVE	2	2	-	100	-	100
		Total			**30**	**22**				**700**
II	I	Language Course-II (LC)	இடைக்கால இலக்கியமும் புதினமும்	22ULT2	5	3	3	25	75	100
			Hindi Literature & Grammar –II	22ULH2						
			Poetry, Textual Grammar and Alakara	22ULS2						
			Basic French – II	22ULF2						
	II	English Language Course- II(ELC)	Functional English for Effective Communication –II	22UE2	6	3	3	25	75	100
	III	Core Course – II (CC)	Mechanics and Relativity	22UPH2CC2	5	5	3	25	75	100
		Core Practical - II (CP)	Mechanics and Digital Electronics (P)	22UPH2CC2P	3	3	3	40	60	100
		Core Course -III (CC)	Introduction to Digital Electronics	22UPH2CC3	3	3	3	25	75	100
		First Allied Course – III (AC)	ODE, PDE, Laplace Transforms and Vector Analysis	22UPH2AC3	4	3	3	25	75	100
	IV	Ability Enhancement Compulsory Course-II (AECC)	Environmental Studies	22UGEVS	2	2	-	100	-	100
		Ability Enhancement Compulsory Course-III (AECC)	Innovation and Entrepreneurship	22UGIE	2	1	-	100	-	100
		Extra Credit Course	SWAYAM		As per UGC Recommendation					
		Total			**30**	**23**				**800**

III	I	Language Course-III (LC)	காப்பியமும் நாடகமும்	22ULT3	5	3	3	25	75	100
			Hindi Literature & Grammar -III	22ULH3						
			Prose, Textual Grammar and Vakyarachana	22ULS3						
			Intermediate French-I	22ULF3						
	II	English Language Course-III(ELC)	Learning Grammar Through Literature – I	22UE3	6	3	3	25	75	100
	III	Core Course– IV (CC)	Thermal Physics and Statistical Mechanics	22UPH3CC4	6	6	3	25	75	100
		Core Practical – III (CP)	Thermal Physics (P)	22UPH3CC3P	3	3	3	40	60	100
		Second Allied Course-I (AC)	Chemistry – I	22UPH3AC4	4	3	3	25	75	100
		Second Allied Course- II (AP)	Chemistry-I (P)	22UPH3AC5P	4	3	3	40	60	100
	IV	Generic Elective Course- I (GEC)	Physics in Everyday Life	22UPH3GEC1	2	2	3	25	75	100
			Basic Tamil - I	22ULC3BT1						
			Special Tamil - I	22ULC3ST1						
		Extra Credit Course	SWAYAM		As per UGC Recommendation					
		Total			30	23				700

15 Days INTERNSHIP during Semester Holidays

IV	I	Language Course - IV (LC)	பண்டைய இலக்கியமும் உரைநடையும்	22ULT4	6	3	3	25	75	100
			Hindi Literature & Functional Hindi	22ULH4						
			Drama, History of Drama Literature	22ULS4						
			Intermediate French -II	22ULF4						
	II	English Language Course – IV (ELC)	Learning Grammar Through Literature– II	22UE4	6	3	3	25	75	100
	III	Core Course – V (CC)	Electricity, Magnetism and Electromagnetism	22UPH4CC5	6	6	3	25	75	100
		Core Practical – IV (CP)	Electricity and Magnetism (P)	22UPH4CC4P	4	4	3	40	60	100
		Second Allied Course- III (AC)	Chemistry – II	22UPH4AC6	4	3	3	25	75	100
		Internship	Internship	22UPH4INT	-	2	-	25	75	100
	IV	Generic Elective Course- II (GEC)	Photography and Videography	22UPH4GEC2	2	2	3	25	75	100
			Basic Tamil - II	22ULC4BT2						
			Special Tamil - II	22ULC4ST2						
		Skill Enhancement Course – I (SEC)	Web Designing (P)	22UPH4SEC1P	2	2	3	40	60	100
		Extra Credit Course	SWAYAM		As per UGC Recommendation					
		Total			30	25				800

V	III	Core Course – VI (CC)	Optics	22UPH5CC6	6	6	3	25	75	100
		Core Practical – V (CP)	General and Electronics (P)	22UPH5CC5P	3	3	3	40	60	100
		Core Course – VII (CC)	Atomic and Nuclear Physics	22UPH5CC7	6	6	3	25	75	100
		Core Course – VIII (CC)	Analog Electronics	22UPH5CC8	6	6	3	25	75	100
		Discipline Specific Elective – I (DSE)	A. Materials Science	22UPH5DSE1A	5	4	3	25	75	100
			B. Laser Physics	22UPH5DSE1B						
			C. Astrophysics and Cosmology	22UPH5DSE1C						
	IV	Ability Enhancement Compulsory Course-IV(AECC)	UGC Jeevan Kaushal - Professional Skills	22UGPS	2	2	-	100	-	100
		Skill Enhancement Course – II (SEC)	Physics Concepts Through Animation (P)	22UPH5SEC2P	2	2	3	40	60	100
		Extra Credit Course	SWAYAM		As per UGC Recommendation					
		Total			**30**	**29**				**700**
VI	III	Core Course – IX (CC)	Fundamentals of Microprocessor	22UPH6CC9	6	6	3	25	75	100
		Core Course – X (CC)	Classical and Quantum Physics	22UPH6CC10	5	5	3	25	75	100
		Core Practical –VI (CP)	Electronics and Microprocessor (P)	22UPH6CC6P	3	3	3	40	60	100
		Core Course – XI (CC)	Cyber Security	22UGCS	5	4	3	25	75	100
		Discipline Specific Elective – II (DSE)	A. Communication Physics	22UPH6DSE2A	5	4	3	25	75	100
			B. Computational Physics	22UPH6DSE2B						
			C. Medical Physics	22UPH6DSE2C						
		Project	Project Work	22UPH6PW	5	4	-	-	100	100
	V	Gender Studies	Gender Studies	22UGGS	1	1	-	100	-	100
		Extension activity		22UGEA	0	1	0	-	-	-
		Total			**30**	**28**				**700**
		Grand Total			**180**	**150**				**4400**

Project Work: 100 Marks

   i.   Internal Component – 40 Marks

        Review-I- 20 Marks

        Review-II- 20 Marks

  ii.   External Components - 60 Marks

        Report Valuation - 40 Marks

        Viva -Voce - 20 Marks

Core Papers : 11

Core Practical: 06

Project Work : 01

Internship   : 01

List of Allied Courses:

      First Allied Course – Mathematics

      Second Allied Course – Chemistry

List of Generic Elective Courses:

      Generic Elective Course -I

          Physics in Everyday Life

      Generic Elective Course -II

          Photography and Videography

List of Skill Enhancement Courses:

      Skill Enhancement Course - I

          Web Designing (P)

      Skill Enhancement Course - II

          Physics Concepts Through Animation (P)

List of Major Based Electives:

      Discipline Specific Elective -I

          Materials Science/Laser Physics/Astrophysics and Cosmology

      Discipline Specific Elective -II

          Communication Physics/Computational Physics/Medical Physics

Extra Credit Course: Swayam Online Course

The Internal and external marks for theory and practical papers are as follows:

Subject	Internal Marks	External Marks
Theory	25	75
Practical	40	60

For Theory:

a) The passing minimum for CIA shall be 40% out of 25 marks (i.e. 10 marks)
b) The passing minimum for End Semester Examinations shall be 40% out of 75 marks (i.e.30 marks)

For Practical:

a) The passing minimum for CIA shall be 40% out of 40 marks (i.e. 16 marks)
b) The passing minimum for End Semester Examinations shall be 40% out of 60 marks (i.e.24 marks)

Internal Component (Theory)

Component	Marks
Library	5
Assignment	5
Seminar	5
CIA I &II	10
	25

Internal Component (Practical)

Component	Marks
Observation	5
Record	10
Continuous Performance in Practical	10
Model	15
	40

Internship Component

Internal Component	Marks	External Component	Marks
Communication Skill	5	Regularity	10
Presentation Skill	10	Problem Solving	10
		Participation and Hands-on training	20
Report Evaluation	10	Professional Attitude	15
		Report Writing	20
	25		**75**

Part	Course	No. of Courses	Credits	Total Credits
I	Tamil/ Other Language	4	12	12
II	English	4	12	12
III	Core (Theory& Practical)	17	77	
	Project Work	1	4	
	Internship	1	2	109
	First Allied	3	9	
	Second Allied	3	9	
	DSE	2	8	
IV	GEC	2	4	
	SEC	2	4	
	AECC-I -Universal Human Values	1	2	
	AECC-II-Environmental Studies	1	2	15
	AECC-III-Innovation and Entrepreneurship	1	1	
	AECC-IV Professional Skills	1	2	
V	Gender Studies	1	1	02
	Extension Activities	_	1	
		44		**150**

Semester I	Internal Marks: 25		External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**
22UPH1CC1	**PROPERTIES OF MATTER, WAVES AND ACOUSTICS**	**CC-I**	**5**	**5**

Course Objectives

- To build the conceptual understanding of materials with mathematical skills and reviews the prior knowledge of properties of matter.
- To study the basics of bending of beams and its applications.
- To study the concepts of viscosity and surface tension.
- To study concepts of waves and understand the acoustical phenomena.

Pre-requisites

- Knowledge about the concepts of elasticity and bending moment
- Fundamental knowledge of capillarity, viscosity of various liquids
- Develop the idea of formula, frequency of vibration and factors affecting the architectural acoustics

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the Course, the Student will be able to	Cognitive Level
CO 1	Understand the basic ideas of Physical properties of different states of matter and sound	K1, K2
CO 2	Analyze the characteristics of elasticity, Simple Harmonic motion, viscosity, surface tension and the requisites of good acoustics	K3
CO 3	Evaluate the ideas of elasticity, Harmonic oscillations and excess pressure of surface tension in fluids and analyze the capillarity nature in liquids	K4
CO 4	Apply the concepts of moduli of elasticity, surface tension, viscosity, waves and acoustics	K3, K5
CO 5	Develop the idea of bending of beams, composition of Harmonic oscillation, empirical relations between surface tension and temperature, stokes formula, frequency of vibration of strings and factors affecting the architectural acoustics	K4

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	3	2	1	3	2	3	2	1
CO 2	3	3	2	3	1	3	2	3	2	2
CO 3	3	3	2	1	1	3	3	2	2	1
CO 4	3	3	3	2	2	3	3	2	3	1
CO 5	3	3	3	2	1	3	3	2	2	1

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation

"3" – Substantial (High) Correlation   "-" indicates there is no correlation

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**ELASTICITYANDBENDING OF BEAMS** Elasticity–Basic ideas-Work done in a strain- Relation between elastic constants and Poisson's ratio-Twisting couple on a cylinder-Torsional pendulum (with and without weights)- Determination of rigidity modulus and moment of inertia -Bending of Beams-Bending moment- Depression for loaded end of a cantilever-Measurement of Young 's modulus- Non-uniform bending (pin and microscope method)- Uniform bending (mirror and telescope method)- Non-uniform and uniform bending of a beam-Koenig 's method.	22	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	**HARMONIC OSCILLATIONS** Periodic Motion- Simple Harmonic Motion and Harmonic Oscillator- Energy of a Harmonic Oscillator- Composition of Two Simple Harmonic Motions of Equal Periods in a Straight Line - Lissajous Figures - Damping Force- Damped Harmonic Oscillator-Examples of Damped Harmonic Oscillator-Power Dissipation-Quality Factor-Forced Harmonic Oscillator.	13	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**SURFACE TENSION** Surface tension – Definition – Molecular forces – Measurement of angle of contact -Explanation of surface tension on kinetic theory –Excess pressure inside a curved liquid surface – Measurement of surface tension: capillary rise method - drop weight method - surface tension of solids and gases - empirical relations between surface tension and temperature.	10	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**VISCOSITY** Newtonian and non-Newtonian fluids - critical velocity and Reynolds Number - Viscosity – Streamlined and turbulent motion – Poiseuille's formula and its correction–Terminal velocity-Stokes formula-Stoke's method for coefficient of viscosity-Searle's viscometer-Viscosity of gas- Meyer's formula.	10	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	**WAVES AND ACOUSTICS** Wave Motion- Plane Progressive Harmonic Wave-Intensity of a Wave-Transverse Waves in Stretched Strings- Modes of Transverse Vibrations of Strings-Longitudinal Waves in Rods and Gases -Wave Velocity and Group Velocity**-**Intensity of sound-Decibel and Bel-Loudness of sound- Reverberation - Factors affecting the architectural acoustics and their remedy-Sound distribution in auditorium-Requisites for good acoustics- Noise and its measurement- Noise reduction sound insulation.	20	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

VI	**SELFSTUDY FOR ENRICHMENT:** **(Not to be included for External Examination)** Elasticity of rubber-like materials-An Harmonic Oscillator-Surface tension of polymeric liquids - Viscosity of Nano fluids and highly viscous liquids-Water Waves: Ripple and Gravity Waves.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Books

1. Murugeshan, R., (2012). *Properties of Matter and Acoustics.* (3rdedition) S.Chand& Co, New Delhi.
2. Newman, F.H., & Searle, V.H. L., (1961). *The General Properties of Matter.* (5thedition) E.Arnold, London.
3. Mathur, D.S., (2010). *Elements of Properties of Matter*. (1stedition) S. Chand & Company, New Delhi.
4. Khanna, D.R., &Bedi, R.S., (1969). *Textbook of Sound*. (7thedition) Atmaram and sons, New Delhi.
5. Subrahmanyam, N., & BrijLal., (2015). *Textbook of Sound.* (2nd edition) Vikas Publishing House, Chennai.

Reference Books

1. Murugeshan, R., &KiruthigaSivaprasath, (2012). *Properties of Matter and Acoustics.* (3rd edition) S.Chand & Co, New Delhi.
2. Gulati, H.R., (1982). *Fundamentals of General Properties of Matter.* (1st edition) S.Chand& Co, New Delhi.
3. Saighal, R.L., (1998). *Text Book of Sound.* (2nd edition), S. Chand & Company, New Delhi.
4. Brown, R.C., (2005). *Mechanics and Properties of Matter.* (1st edition) Longmans Green and company, London.
5. David Halliday, Robert Resnick., (2013). *Fundamentals of physics*. (11th edition) Wiley Plus, United Kingdom.

Web References

1. https://www.insula.com.au/physics/1279/L7.html
2. https://www.insula.com.au/physics/1279/L7.html
3. https://www.youtube.com/watch?v=CQGlgu-8dmA
4. https://hyperphysics.phy-astr.gsu.edu/hbase/pbuoy.html
5. https://kanchiuniv.ac.in/coursematerials/Physics%20book_Final%20(1).pdf

Pedagogy

Chalk and Talk, Assignment, Group discussion and Quiz

Course Designer

Dr.S.Gowri

Semester I	Internal Marks: 40			External Marks: 60	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**	
22UPH1CC1P	**PROPERTIES OF MATTER, WAVES AND ACOUSTICS (P)**	**CP-I**	**3**	**3**	

Course Objectives

- To help students to enhance their experimental skills.
- To gain hands-on experience with a variety of techniques.
- To learn the basic principles and procedures of laboratory work.

Pre-requisites

- Basic knowledge on usage of scientific apparatus.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the Course, the Student will be able to	Cognitive Level
CO 1	Select the equipment and get the necessary accessories.	K1
CO 2	Demonstrate the use of equipment for various measures.	K2
CO 3	Construct the experiment by arranging and assembling the equipment.	K3
CO 4	Solve the physical quantity using the relevant formula after gathering accurate data through observations. Keep a detailed record of all laboratory activities.	K3
CO 5	Apply experimental approaches to correlate with physics theory to develop practical understanding.	K3

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	1	1	1	2	1	3	2	1	2	1
CO 2	2	3	2	2	2	3	3	1	2	1
CO 3	1	1	2	3	1	3	2	1	3	1
CO 4	2	3	3	3	2	1	3	1	3	2
CO 5	3	2	3	3	3	1	3	2	3	2

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation

"3" – Substantial (High) Correlation   "-" indicates there is no correlation

Syllabus

LIST OF EXPERIMENTS (Any 8)	HOURS	COs	COGNITIVE LEVEL
1. Young's modulus – Uniform bending (Pin and Microscope). 2. Young's modulus – Cantilever depression (scale and telescope). 3. Static Torsion: Determination of the Rigidity Modulus [N] of a material. 4. Rigidity modulus – Dynamic method. 5. Comparison of the co-efficient of viscosities of two liquids using the Burette method. 6. Surface Tension and Interfacial Surface Tension – Drop weight method. 7. Coefficient of viscosity of liquid – Variable pressure head. 8. Surface Tension – Capillary rise method. 9. Viscosity of liquid – Stoke's method. 10. Sonometer – determination of frequency of tuning fork. 11. Long focus convex lens - f, R, refractive index-determination. 12. Air wedge – thickness of thin wire.	3 Hrs/Week	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6

Text Book

1. Ouseph, C.C., Rao, U.J., Vijayendran, V., (2016). *Practical Physics and Electronics*. S.Viswanathan, Printers & Publishers Pvt Ltd., Chennai.

Reference Book

1. Prof.Namboodirippad, M.N., Prof..Daniel, P.A., (1982). *B.Sc., Practical Physics*. G.B.C. Publications, Cochin.

Web References

1. https://vlab.amrita.edu/?sub=1&brch=280&sim=550&cnt=1
2. https://vlab.amrita.edu/index.php?sub=1&brch=280&sim=1518&cnt=4
3. http://amrita.olabs.edu.in/?sub=1&brch=5&sim=225&cnt=4
4. http://www.olabs.edu.in/?sub=1&brch=5&sim=224&cnt=2

Pedagogy

Demonstration, practical sessions and viva voce

Course Designer

Ms.N.Manopradha

FIRST ALLIED COURSE-I (AC)

CALCULUS AND FOURIER SERIES

(For B.Sc Physics & Chemistry)

(2022-2023 and Onwards)

Semester I	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs / Week	CREDITS
22UPH1AC1/ 22UCH1AC1	CALCULUS AND FOURIER SERIES	ALLIED	4	3

Course Objective

- Explore the students with mathematical methods formatted for their major concepts and train them in basic Integrations.
- Analyze mathematical statements and expressions.
- Evaluate the fundamental concepts of Differentiation and Integration.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, students will be able to	Cognitive Level
CO1	Explain the concepts of Calculus and Fourier series	K1,K2
CO2	Classify the problem models in the respective area.	K3
CO3	Solve various types of problems in the corresponding stream.	K3
CO4	Identify the properties of solutions in the core area.	K3
CO5	Discover the applications of Calculus and Fourier series.	K4

Mapping of CO with PO and PSO

os	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	2	2	3	2	2	2	2
CO2	3	2	2	2	2	3	2	2	2	2
CO3	3	2	2	2	2	3	2	2	2	2
CO4	3	2	2	2	2	3	2	2	2	2
CO5	3	2	2	2	2	3	2	2	2	2

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation   "-" indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Successive Differentiation:** The nth derivative – Standard results – Method of splitting the fractional expressions into partial fractions - Trigonometrical transformation – Formation of equations involving derivatives – Leibnitz formula for the nth derivative of a product(proof not needed) – A complete formal proof by induction (proof not needed) - Curvature- Circle, radius and center of curvature - Cartesian formula for the radius of curvature–Simple problems in all these.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	**Evaluation of integrals:** Integration of Rational algebraic functions– Rule (a) – Rule (b) Integration of the form $\int \frac{lx+m}{ax^2+bx+c}dx$ – Rule (c)- Integration of Irrational functions : Integration of the form $\int \frac{px+q}{\sqrt{ax^2+bx+c}}dx$ – Integration of the form $\int \frac{dx}{(x+p)\sqrt{ax^2+bx+c}}$ - Integration of the form $\int \frac{dx}{a+b\cos x}$.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	**Reduction Formula:** Properties of definite integrals –Reduction formula (when n is a positive integer) for 1] $\int e^{ax}x^n dx$ 2] $\int x^n \cos ax dx$ 3] $\int \sin^n x dx$ 4] $\int_0^{\frac{\pi}{2}} \sin^n x \cos^m dx$ (without proof) and illustrations.	13	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	**Double and Triple Integrals:** Definition of the double integral-Evaluation of Double integral (Problems Only)- Change of order and evaluation of the double integral (Problems only).	10	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	**Fourier Series:** Definition of Fourier Series – Finding the Fourier Coefficients for a given periodic function with period 2π - Even and Odd functions –Half range Fourier series.	10	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
VI	Self-Study for Enrichment: (Not to be included for External examination) **Radius of curvature when the curve is in Polar co-ordinates** - **(i)** $\int \frac{dx}{ax^2+bx+c}$ **(ii)** $\int \frac{dx}{\sqrt{ax^2+bx+c}}$ - **(1)** $\int \cos^n x dx$ **(2)** $\int_0^{\frac{\pi}{2}} \cos^n dx$ **-Triple Integrals in simple cases(Problems Only)- Development in cosine series - Development in sine series.**	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Books

1. Narayanan, S & Manichavasagam Pillai, T.K. (2015). *Calculus Volume I.* S. Viswanathan Pvt Limited.
2. Narayanan, S & Manichavasagam Pillai, T.K. (2015). *Calculus Volume II.* S. Viswanathan Pvt Limited.
3. Narayanan, S & Manichavasagam Pillai, T.K. (2015). *Calculus Volume III.* S. Viswanathan Pvt Limited.

UNIT–I	Chapter 3:Sections 1.1 to 1.6,2.1,2.2[1]
	Chapter 10:Sections 2.1 to 2.3 [1]
UNIT-II	Chapter 1:Sections 7.1,7.3,7.4,8(CASE II, CASE V), 9 [2]
UNIT-III	Chapter 1:Sections 11,13.1 to 13.5 [2]
UNIT-IV	Chapter 5:Sections 2.1,2.2,4 [2]
UNIT-V	Chapter 6:Sections 1to 4[3]

Reference Books

1. Sankarappan, S. Arulmozhi,G. (2006). Vector Calculus, Fourier series and Fourier Transforms. Vijay Nicole Imprints Private Limited.
2. Vittal, P.R. (2014). Allied Mathematics. Margham Publications.
3. Singaravelu, A. (2003). Differential Calculus and Trigonometry. R Publication.

Web Links

1. https://www.youtube.com/watch?v=tBtF3Lr-VLk&t=64s

2. https://www.youtube.com/watch?v=Z4oSGuAZrZM

3. https://www.youtube.com/watch?v=w6llnAQX_f8

4. https://www.youtube.com/watch?v=LMcj8o0ERNE

5. https://www.youtube.com/watch?v=_GAwQGCyWy0

6. https://www.youtube.com/watch?v=9X3gqehcFII

Pedagogy

Power point presentations, Group Discussions, Seminar, Quiz, Assignment.

Course Designers

1. Dr. P. Saranya

2. Ms.L.Mahalakshmi

3. Ms.P.Geethanjali

FIRST ALLIED COURSE-II (AC)

ALGEBRA, ANALYTICAL GEOMETRY OF 3D & TRIGONOMETRY

(For B.Sc Physics & Chemistry)

(2022-2023 and Onwards)

Semester I	Internal Marks: 25		External Marks:75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**Hrs / Week**	**CREDITS**
22UPH1AC2/ 22UCH1AC2	ALGEBRA, ANALYTICAL GEOMETRY OF 3D & TRIGONOMETRY	**ALLIED**	**4**	**3**

Course Objective

- Analyze the mathematical methods formatted for their major concepts.

- Evaluate the problems in Algebra and Trigonometry.

- Explain the basics of Three-Dimensional geometry.

Course Outcomes
Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, students will be able to	Cognitive Level
CO1	Explain various notions in Algebra, Analytical Geometry of 3D & Trigonometry.	K1,K2
CO2	Identify the problem models.	K3
CO3	Apply the concepts of Algebra, Analytical Geometry of 3D & Trigonometry.	K3
CO4	Solve the given problems in the respective stream.	K3
CO5	Analyze the applications of the core area.	K4

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	2	2	2	3	2	3	2	2	2	2
CO2	2	2	2	3	2	3	2	2	2	2
CO3	2	2	2	3	2	3	2	2	2	2
CO4	2	2	2	3	2	3	2	2	2	2
CO5	2	2	2	3	2	3	2	2	2	2

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation   "-" indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Series Expansion:** Application of Binomial Theorem to summation of series – Approximate values – Summation of series by Exponential series - Summation of series by Logarithmic series (Formulae only).	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4.
II	**Matrices:** Matrix-Special types of Matrices –Scalar multiplication of a matrix-Equality of matrices-Addition of matrices-Subtraction of matrices-Symmetric matrix-Skew symmetric matrix-Hermitian and Skew Hermitian matrix –Multiplication of matrix – Inverse matrix-Inner product-Solution of simultaneous equations-Rank of a matrix-Elementary transformation of a matrix-A system of m homogeneous linear equations in n unknowns-Linear dependence and independence of vectors-System of non-homogeneous linear equations - Eigen values and Eigenvectors.(Applications only)	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4.
III	**Three-Dimensional Geometry:** The Sphere – Definition- The equation of a sphere when the center and radius are given-The equation of a sphere to find its center and radius- The length of the Tangent Plane from a point to the sphere – The Plane Section of a sphere – Equation of a circle on a sphere – Intersection of two spheres in a circle.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4.
IV	**Expansion of Trigonometric functions:** Expansions of $\cos n\theta$ and $\sin n\theta$ - Expansion of $\tan(A + B + C + ...)$ (omitting examples on formation of equations) –Powers of sines and cosines of θ in terms of functions of multiples of θ – Expansions of $\cos^n \theta$ when n is a positive integer – Expansions of $\sin^n \theta$ when n is a positive integer – Expansions of $\sin \theta$ and $\cos \theta$ in a series of ascending powers of θ - The expansions of $\sin \theta$ and $\cos \theta$ to find the limits of certain expressions.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4.

V	**Hyperbolic functions:** Hyperbolic functions – Relation between hyperbolic functions – Relations between hyperbolic functions and circular functions - Inverse hyperbolic functions.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4.
VI	Self-Study for Enrichment : (Not to be included for External examination) Series which can be summed up by the Logarithmic series - Simple applications of Matrices- The equation of the tangent plane to the sphere at a point. (Only problems) - Expansion of $\tan\theta$ in terms of powers of θ - Separation of real and imaginary parts of tanh(x+iy).	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4.

Text Books

1. Manichavasagam Pillai, T.K. Natarajan,T.& Ganapathy, K.S.(2015). *Algebra, Volume I.* S. Viswanathan Pvt Limited.
2. Manichavasagam Pillai, T.K. (2015). *Algebra, Volume II.* S.Viswanathan Pvt Limited.
3. Manichavasagam Pillai, T.K. & Natarajan,T. (2016). *A Text book of Analytical Geometry Part-II 3D.* New Gamma Publishers.
4. Manichavasagam Pillai, T.K. & Narayanan,S.(2013). *Trigonometry.* S. Viswanathan Pvt Limited.

UNIT–I   Chapter 3:Sections 10,14[1]
                Chapter 4:Sections 3,7,9 [1]
UNIT-II   Chapter 2:Sections 1 to 16 [2]
UNIT-III   Chapter 4:Sections 1-5,6,6.1,7,8 [3]
UNIT-IV   Chapter 3:Sections 1 to 4, 4.1,5,5.1[4]
UNIT-V   Chapter 4:Sections 1,2,2.1 to 2.3[4]

Reference Books

1. Arumugam,S.Issac,A. (2017). Analytical Geometry 3D and Vector calculus. New Gamma Publishing house.
2. Pandey, H.D. Khan, M.Q. & Gupta, B.N. (2011). A Text Book of Analytical Geometry and Vector Analysis. Wisdom Press.
3. Singaravelu, A. (2003). Differential Calculus and Trigonometry. R Publication.

Web Links
1. **https://www.youtube.com/watch?v=JayFh5EJHcU**
2. **https://www.youtube.com/watch?v=h5urBuE4Xhg**
3. **https://www.youtube.com/watch?v=59z6eBynJuw**
4. **https://www.youtube.com/watch?v=9DyPyJb2N9g**
5. **https://www.youtube.com/watch?v=HOk2XLeFPDk**
6. **https://www.youtube.com/watch?v=G1C1Z5aTZSQ**

Pedagogy
Power point presentations, Group Discussions, Seminar, Quiz, Assignment.

Course Designers
1. Dr. P. Saranya
2. Dr.L.Mahalakshmi
3. Ms.P.Geethanjali

Semester I	Internal Marks: 25		External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**Hours/Week**	**CREDITS**
22UGVE	**UNIVERSAL HUMAN VALUES**	**Part IV**	**2**	**2**

COURSE OBJECTIVES

1. To enable the learners to learn the values of love and compassion.
2. To foster the values of righteousness and service among the learners.
3. To enhance the morale of the learners by inculcating the values renunciation and peace.
4. To inspire the learners to practice the basic human values so as to make them become responsible citizens of the Nation.

COURSE OUTCOMES AND COGNITIVE LEVEL MAPPING

CO Number	CO Statement On the successful completion of this course, the students will able to	Cognitive Level
CO1	Define the values of Love and Compassion	**K1**
CO2	Understand the value of Truth and **Non – Violence**	**K2**
CO3	Explain the value of **Righteousness and Service**	**K3**
CO4	Practice the values of **Renunciation (sacrifice) & Peace**	**K4**
CO5	Prioritize Human Values in their day today life	**K5**

Syllabus

Unit I: (6 Hours)
Love and Compassion
- **Introduction:** what is love? Forms of love for self, parent's family friend, spouse community, nation, humanity and other beings both for living and non-living.
- Love and Compassion and Inter-relatedness
- Love, compassion, empathy, sympathy and nonviolence
- Individuals who are remembered in history for practicing compassion and love.
- Narratives and anecdotes from history, literature including local folklore

Unit II: (7 Hours)
Truth and Non - Violence
- **Introduction**: what is truth? Universal truth, truth as value, truth as fact (veracity. sincerity, honesty among others)
- Individuals who are remembered in history for practicing this value
- Narratives and anecdotes from history, literature including local folklore
- **Introduction**: what is non-violence? Its need. Love, compassion, empathy sympathy for others as pre-requisites for non-violence
- Ahimsa as non -violence and non- killing.
- Individuals and organisations that are known for their commitment to non - violence
- Narratives and anecdotes about non - violence from history and literature including local folklore

Unit III: (6 Hours)
Righteousness and Service
- **Introduction:** What is Righteousness and service?
- Righteousness and dharma, Righteousness and Propriety
- Forms of service for self, parents, family, friend, spouse, community, nation, humanity and other beings-living and non-living persons in distress for disaster.
- Individuals who are remembered in history for practicing Righteousness and Service
- Narratives and anecdotes dealing with instances of Righteousness and Service from history, literature, including local folklore

Unit IV: (6 Hours)
Renunciation (sacrifice) & Peace
- Introduction: what is renunciation? Renunciation and sacrifice. Self restraint and ways of overcoming greed. Renunciation with action as true renunciation. What is peace? It's needs, relation with harmony and balance.
- Individuals who are recommended in history for practicing Renunciation and sacrifice. Individuals and organisations that are known for their commitment to peace.
- Narratives and anecdotes from history and literature including local folklore about individuals who are remembered for their renunciation and sacrifice. Narratives and anecdotes about peace from history and literature including local folklore practicing peace

Unit V: (5 Hours) Practicing human values
- What will learners learn/gain if they practice human values? What will learners lose if they Don't Practice human values?
- Sharing learner's individual and/ or group experience(s)
- Simulated situations
- Case studies

Pedagogy: Chalk & Talk, Seminar, PPT Presentation, Group Discussion, Blended Method, and Case Study.

Course Designer: Dr.G.Mettilda Buvaneswari

Semester II	Internal Marks: 25			External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**		**CREDITS**
22UPH2CC2	**MECHANICS AND RELATIVITY**	**CC-II**	**5**		**5**

Course Objectives

- To find the time of flight and impact velocity of a projectile that lands at a different height from that of launch.
- To explain motion along curved path.
- To illustrate the motion of rigid bodies and outline laws of gravitation.
- To make use of the ideas of frames of reference.

Pre-requisites

- A solid understanding of scalars and vectors.
- Fundamental concepts of physics.
- Basic understanding of Newtonian mechanics.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the Course, the Student will be able to	Cognitive Level
CO 1	Define the effects of a change in the position of any physical object or event.	K1
CO 2	Demonstrate laws and principles in physics.	K2
CO 3	Apply the mathematical tools in understanding physics.	K3
CO 4	Make use of simple concepts of mechanics in daily life.	K3
CO 5	Analyse the principles behind the mechanics of objects travelling at relativistic speeds.	K4

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	2	3	3	3	3	3	3	2	2	3
CO 2	2	3	3	3	3	3	3	2	2	3
CO 3	2	3	3	3	3	3	3	2	3	3
CO 4	2	3	3	2	3	3	2	2	2	3
CO 5	2	3	3	2	3	3	2	2	2	3

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation

"3" – Substantial (High) Correlation   "-" indicates there is no correlation

Syllabus

UNIT	CONTENT	HOURS	Cos	COGNITIVE LEVEL
I	**PROJECTILE, IMPACT AND FRICTION:** Projectile – Path of a projectile is a parabola – Range of horizontal and inclined plane – Impulse of a force – Impulsive force – Impact between two smooth bodies – Laws of impact – Direct and oblique impacts – Impact of a smooth sphere on a smooth horizontal plane – Loss in kinetic energy due to direct and oblique impacts – Friction – Laws of friction – Angle of friction.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	**MOTION ON A PLANE CURVE:** Centripetal and centrifugal forces – Hodograph – Expression for normal acceleration by the hodograph method – Motion of cyclist along a curved path – Motion of a railway carriage round a curved track – Upsetting of a carriage on a curved level track – Motion of a carriage on a banked-up curve – Effect of the Earth's rotation on the value of the acceleration due to gravity – Variation of g with altitude.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	**DYNAMICS OF RIGID BODIES AND GRAVITATION:** Moment of Inertia - Kinetic energy and angular momentum of rotating body - Theorems of perpendicular and parallel axes – Acceleration of a body rolling down an inclined plane without slipping – Oscillations of a small sphere on a large concave smooth surface – Compound pendulum – Centre of suspension and centre of oscillation – Centre of percussion – Minimum period of a compound pendulum – Kater's pendulum. Newton's laws of gravitation – Kepler's laws of planetary motion – Deduction of Newton's law of gravitation – Determination of G – Boy's method.	25	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	**FRAMES OF REFERENCE:** Frames of reference: Inertial and Non-Inertial – Galilean Transformation: Transformation of position, length, velocity and acceleration – Galilean invariance: Newton's law of motion, law of conservation of momentum and energy – Transformation equation for one frame of reference rotating with its axis with respect to an inertial frame – Coriolis force – Foucault's pendulum.	10	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

V	**SPECIAL THEORY OF RELATIVITY:** Michelson-Morley experiment - concept of ether - Einstein's special theory of relativity - Lorentz transformation - time dilation - length contraction – proper length and proper time - simultaneity - relativistic mass, momentum, force and acceleration - equivalence of mass and energy ($E = mc^2$).	10	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
VI	**SELF STUDY FOR ENRICHMENT:** (**Not to be included for External Examination**) Angular acceleration – Relation between the torque and angular acceleration of a rigid body – Conservation of energy – Conical pendulum – Moment of Inertia of a flywheel – Torsion pendulum.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Books

1. Narayanamurthi, M., and Nagarathinam, N., (2008). *Dynamics.* (8th edition) The National Publishing Company, Chennai.

2. Mathur, D.S., and Hemne, P.S., (2015). *Mechanics.* (Revised edition) S. Chand & Company Ltd., New Delhi.

Reference Books

1. Narayanamurthi, M., and Nagarathinam, N., (2002). *Statics, Hydrostatics and Hydrodynamics.* (3rd edition) The National Publishing Company, Chennai.

2. Murugesan, R., (2016). *Mechanics and Mathematical Physics.* (3rd edition) S. Chand & Company Ltd., New Delhi.

3. Brijilal Subramaniam, (1990). *Mechanics and Relativity.* (1st edition), Margham Publications.

4. Murugesan, R., and Kiruthiga Sivaprasath, (2016). *Modern Physics.* (18th edition) S. Chand & Company Ltd., New Delhi.

Web References

1. https://courses.lumenlearning.com/suny-osuniversityphysics/chapter/4-3-projectile-motion/

2. http://www.jbsw.shikshamandal.org/wp-content/uploads/2016/07/2-Gravitation.pdf

3. https://vlab.amrita.edu/?sub=1&brch=280&sim=518&cnt=1

4. https://www.youtube.com/watch?v=wD7C4V9smG4

5. https://www.youtube.com/watch?v=TgH9KXEQ0YU

Pedagogy

Chalk and Talk, Assignment, Group discussion and Quiz

Course Designer

Dr.N.Manopradha

Semester II	Internal Marks: 40			External Marks: 60	
COURSE CODE	**COURSE TITLE**		**CATEGORY**	**HRS/WEEK**	**CREDITS**
22UPH2CC2P	**MECHANICS AND DIGITAL ELECTRONICS (P)**		**CP-II**	**3**	**3**

Course Objectives

- To give students a foundational understanding of how to measure various physical quantities.
- To use scientific equipment to estimate various physical properties.
- To investigate the basic idea behind digital technology.
- To construct basic logic gates using distinct components.

Pre-requisites

- Basic knowledge on usage of scientific apparatus.

Course Learning Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the Course, the Student will be able to	Cognitive Level
CO1	Select the equipment and get the necessary accessories.	K1
CO2	Explain the experiment's fundamental concepts.	K2
CO3	Make use of fundamental principles and experiment circumstances.	K3
CO4	Experiment with the laboratory norms.	K3
CO5	Examine the applications.	K4

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	1	1	1	2	1	3	2	1	2	1
CO2	2	3	2	2	2	3	3	1	2	1
CO3	1	1	2	3	1	3	2	1	3	1
CO4	2	3	3	3	2	1	3	1	3	2
CO5	3	2	3	3	3	1	3	2	3	2

"1" – Slight (Low) Correlation "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation "-" indicates there is no correlation

Syllabus

LIST OF EXPERIMENTS (Any 8)	HOURS	Cos	COGNITIVE LEVEL
1. CRO – Study of wave forms – Lissajous figures. 2. Compound pendulum – g and k. 3. Moment of Inertia – Torsional Pendulum. 4. Young's modulus – Non-Uniform bending (Pin and Microscope). 5. Young's modulus – Uniform bending (Optic lever). 6. Verification of Laws of Transverse Vibrations [I & II laws] in a stretched string using a sonometer. 7. Verification of Logic gates. 8. Construction of Half and Full adder. 9. NAND as UBB. 10. NOR as UBB. 11. Spectrometer – μ of solid prism. 12. Concave lens – Focal length determination.	3 Hrs/Week	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Book

1. Ouseph, C.C., Rao, U.J., Vijayendran, V., (2016). *Practical Physics and Electronics*. S.Viswanathan, Printers & Publishers Pvt Ltd., Chennai.

Reference Book

1. Prof.Namboodirippad, M.N., Prof.Daniel, P.A., (1982). *B.Sc., Practical Physics*. G.B.C. Publications, Cochin.

Web References

1. https://vlab.amrita.edu/?sub=1&brch=280&sim=210&cnt=2
2. https://vlab.amrita.edu/?sub=1&brch=280&sim=1509&cnt=1
3. https://de-iitr.vlabs.ac.in/exp/truth-table-gates/simulation.html
4. https://amrita.olabs.edu.in/?sub=1&brch=6&sim=244&cnt=4

Pedagogy

Demonstration, practical sessions and viva voce

Course Designer

Dr.N.Manopradha

Semester II	Internal Marks: 25		External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**
22UPH2CC3	**INTRODUCTION TO DIGITAL ELECTRONICS**	**CC-III**	**3**	**3**

Course Objectives

- To learn different numbers systems and their conversion from one to another.
- To understand the working of logic gates and to use Boolean equations and Karnaugh maps to simplify and check the output of logic circuits.
- To know the uses of encoders, decoders, multiplexers and demultiplexers.
- To understand the working of flip-flops and to analyze sequential circuits.

Pre-requisites

- Basic knowledge on binary number system.
- Fundamental ideas on logic gates.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the Course, the Student will be able to	Cognitive Level
CO 1	Define number system and convert one number system to other number systems and to select the most suitable one for specific application.	K1
CO 2	Interpret logic circuits and thereby develop equivalent circuits.	K2
CO 3	Develop combinational logic circuits.	K3
CO 4	Examine different arithmetic and logic functions with appropriate selection of inputs and check the possible outputs for arithmetic and logic circuits.	K4
CO 5	Simplify Boolean expressions and design logic circuits.	K4

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	3	2	2	3	3	2	2	2
CO 2	2	2	2	2	2	3	3	2	3	3
CO 3	2	3	3	2	2	3	3	3	3	3
CO 4	2	2	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation

"3" – Substantial (High) Correlation   "-" indicates there is no correlation

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**NUMBER SYSTEMS AND CODE:** Binary number system – Binary to decimal conversion – Decimal to binary conversion – Octal numbers –Conversion of octal numbers – Hexadecimal numbers –Conversion of hexadecimal numbers – The ASCII code –The Gray code.	10	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	**ARITHMETIC CIRCUITS:** Binary addition – Binary subtraction – Unsigned binary numbers – Sign – Magnitude numbers – 2's complement representation – 2's complement arithmetic – Half and Full adder – Half and Full subtractor.	8	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	**DIGITAL LOGIC AND LOGIC CIRCUITS:** Basic gates – NOT, OR, AND – EX-OR gates – Universal logic gates – NOR, NAND – Boolean laws and Demorgan's theorems – Sum-of-Products method – Truth table to Karnaugh map – Pairs, Quads, and Octets – Karnaugh map simplifications – Don't- care conditions.	11	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	**COMBINATIONAL LOGIC CIRCUITS:** Multiplexer – 4 to 1 multiplexer – Demultiplexer – 1 to 4 demultiplexer – Decoder – 2 to 4 decoder – BCD to seven segment decoder – Encoders – Decimal to BCD encoder.	8	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	**FLIP – FLOPS:** RS flip-flops – Clocked RS flip-flops – Edge-triggered RS flip flops –JK flip – D flip-flops – T flip flops – Applications of flip-flops.	8	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
VI	**SELF STUDY FOR ENRICHMENT:** (**Not to be included for External Examination**) BCD code – Subtraction by l's and 2's complement method – Solving Boolean Expressions using Karnaugh Map (2,3 and 4 variables) – 4-bit adder/subtractor – Introduction to shift registers – Basic Shift Register Operations.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Books

1. Donald P Leach, Albert Paul Malvino, Goutam Saha, (2011). *Digital Principles and Applications*. (7th edition) Tata McGraw – Hill Publishing Company Limited, New Delhi.

2. Jain,R.P, (2009). *Modern Digital Electronics*. (4th edition) Tata McGraw Hill Education Private Limited, Noida.

3. Vijayendran, V, (2003). *Digital fundamentals*. (1st edition) S. Viswanathan Printers and Publishers Pvt. Ltd, Chennai.

4. Virendra Kumar, (2007). *Digital electronics Theory and Experiments*. (2nd edition) New Age International Publishers, Chennai.

Reference Books

1. James W. Bignel, (2007). *Digital Electronics*. (5th edition) Cengage learnings, Uttar Pradesh.

2. MandalS.K, (2017). *Digital Electronics Principles & Applications*. (1st edition) McGraw Hill Education, Karnataka.

3. Thomas L. Floyd, (2015). *Digital Fundamentals*. (11th edition) Pearson Education, Bengaluru.

4. Kothari,D.P., J.S. Dhillon, (2016). *Digital Circuits and Design*. (1st edition) Pearson Education, Bengaluru.

Web References

1. https://circuitglobe.com/rs-flip-flop.html
2. http://hyperPhysics.phy-astr.gsu.edu/hbase/Electronic/jkflipflop.html
3. https://circuitglobe.com/half-adder-and-full-adder-circuit.html
4. https://programmerbay.com/construct-4-to-1-multiplexer-using-logic-gates/
5. https://www.electronicshub.org/demultiplexerdemux/
6. https://www.elprocus.com/designing-of-2-to-4-line-decoder/
7. https://www.electricaltechnology.org/2018/05/bcd-to-7-segment-display-decoder.html

Pedagogy

Chalk and Talk, Assignment, Group discussion and quiz

Course Designer

Ms.D.Devi

ALLIED COURSE – III

(For Physics)

ODE, PDE, LAPLACE TRANSFORMS AND VECTOR ANALYSIS

(2022-2023 Onwards)

Semester II	Internal Marks: 25		ExternalMarks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
22UPH2AC3	ODE, PDE, LAPLACE TRANSFORMS AND VECTOR ANALYSIS	ALLIED	4	3

Course Objective

- Explain the basics of Ordinary Differential Equations.
- Emphasize in the field of Partial Differential Equations.
- Explore the mathematical methods formatted for major concepts.

CourseOutcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Knowledge Level
CO1	Explain various notions in ODE, PDE, Laplace transforms & Vector Analysis.	K1, K2
CO2	Classify the problem models in the respective area.	K3
CO3	Identify the properties of solutions in the core area.	K3
CO4	Solve various types of problems in the corresponding stream.	K3
CO5	Analyze the applications of the core area.	K4

Mapping of COwithPO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	2	2	2	3	2	3	3
CO2	3	2	2	2	2	2	3	2	3	3
CO3	3	2	2	2	2	2	3	2	3	3
CO4	3	2	2	2	2	2	3	2	3	3
CO5	3	2	2	2	2	2	3	2	3	3

"1" – Slight (Low) Correlation   "2" – Moderate (Medium) Correlation

"3" – Substantial (High) Correlation   "-" indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Ordinary Differential Equations:** Eqautions of the first order but of higher degree – Type A: Equations solvable for $\frac{dy}{dx}$ - Type B: Equations solvable for y - Equations solvable for x -Clairaut's Form (simple cases only). **Linear equations with constant coefficients:** Definitions – The operator D- Complementary function of a linear equation with constant co-efficients - Particular integral: General method of finding P.I- Special methods for finding P.I.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	**Partial differential equations:** Classification of integrals–Derivation of Partial differential equations: By elimination of constants - By elimination of arbitrary function-Lagrange's method of solving the linear equation-Special methods –Standard forms-I,II,III,IV(Geometrical Meaning is not needed)-(only problems in all the above) – (No proof needed for any formula).	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	**Laplace Transforms:** Laplace Transforms – Definition -Sufficient conditions for the existence of Laplace transform-Basic results-Laplace transform of periodic functions-Some general theorems-Evaluation of integrals using Laplace transform.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	**Inverse Laplace Transform:** The Inverse Transform –Modification of results obtained in finding Laplace transforms to get the inverse transforms of functions- Laplace Transforms to solve ordinary differential equations with constant co-efficients.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	**Vector Differentiation:** Limit of a vector function-continuity of vector functions-Derivative of a vector function-Some Standard Results-Geometrical significance of vector differentiation-Physical application of derivatives of vectors - partial derivative of a vector function. **Gradient, Curl and Divergence:** Scalar and Vector point functions – Gradient of a scalar point function-Directional derivative of a scalar point function-Equations of tangent plane and normal line to a level surface. **Divergence and curl of a vector point function:** Definition- Curl of a vector point function- irrotational vector.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
VI	**Self -Study for Enrichment:** **(Not included for End Semester Examination)** Equations that do not contain x and y for explicitly-Equations reducible to the standard form - Piecewise continuity - Laplace Transforms to solve ordinary differential equations with variable co-efficients - Physical interpretation of divergence of a vector - Physical interpretation of curl of a vector-Vector identity.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Book

1. Narayanan. S**,** Manicavachagam Pillai. T. K. (2016). *Differential Equations and its applications.* S. Viswanathan Pvt Limited.
2. Vittal. P. R, Malini. V. (2016). *Vector Analysis*. Margham Publications.

Chapters and Sections

UNIT-I Chapter 4: Sections 1-3 [1]

        Chapter 5: Sections 1-4 [1]

UNIT-II Chapter 12: Sections 1-5.4 [1]

UNIT-III Chapter 9: Sections 1-5 [1]

UNIT- IV Chapter 9: Sections 6-8 [1]

UNIT- V Chapter 1: Pages (1-24,26-35) [2]

Reference Books

1. Narayanan. S, Manicavachagam Pillai. T. K. (2003). *Calculus, Vol. III.* S.Viswanathan Pvt Limited.

2. Arumugam Isaac. (2014). *Differential Equations and Applications*. New Gamma Publishing House.

3. Sankarappan. S, Arulmozhi. G. (2006). *Vector Calculus, Fourier Series and Fourier Transforms*. Vijay Nicole Imprints Private Limited.

Web References

1. https://www.youtube.com/watch?v=OM01KTc0_9w

2. https://youtu.be/zlfsh1SyH58

3. https://www.youtube.com/watch?v=dCVBZbebl8Y

4. https://www.youtube.com/watch?v=Y8GXpS31CGI

5. https://www.youtube.com/watch?v=IVJjm5FE4x8

6. https://www.youtube.com/watch?v=FXTt6Sa79mI

7. https://www.academia.edu/35399426/CHAPTER_1_VECTOR_DIFFERENTIATION

Pedagogy

Power point presentation, Group Discussion, Seminar, Assignment.

Course Designer

1. Dr.L.Mahalakshmi

Semester:II	InternalMarks:100			
COURSECODE	COURSETITLE	CATEGORY	HRS/ WEEK	CREDI TS
22UGEVS	ENVIRONMENTAL STUDIES	ABILITY ENHANCEMENTCOMP ULSORYCOURSE	2	2

Course Objective

To train the students to get awareness about total environment and its related problems and to make them to participate in the improvement and protection of the environment.

Course Outcome and Cognitive Level Mapping

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

CO Number	CO Statement	Cognitive Level
CO1	Outline the nature and scope of environmental studies	K2
CO2	Illustrate the various types of natural resources and its importance.	K2
CO3	Classification of various types of ecosystem with its structure and function.	K2
CO4	Develop an understanding of various types of pollution and biodiversity.	K3
CO5	List out the various types of social issues related with environment.	K4

MappingofCO withPO andPSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	2	2	2	3	3	2	2	3	2	3
CO2	3	3	2	3	3	3	2	3	3	3
CO3	2	3	3	2	3	3	3	3	3	2
CO4	2	3	3	3	2	3	2	3	3	3
CO5	3	3	2	3	3	3	3	2	3	3

"1"–Slight (Low) Correlation   **"2" – Moderate (Medium)**

Correlation "3"–Substantial (High)Correlation   **"-"indicates there is no correlation**

UNIT	CONTENT	HOURS	COS	COGNITIVE LEVEL
I	Introduction to environmental studies Definition, scope and importance. Need for public awareness	06	CO1, CO2, CO3, CO4	K1, K2, K3, K4
II	**Natural Resources: Renewable and non-renewable resources:** a. Forest resources: use andover-exploitation,deforestation,casestudies.Timber extraction,mining,dams andtheir effects on forests and tribal people. b. Water resources: Use and over-utilization of surface and ground water,floods,drought,conflictsoverwater,damsbenefits and problems. c. Mineral resources:Use and exploitation,environmental effects of extracting and using mineral resources. d. Food resources:World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. e. Energy resources:Growing energy needs,renewable and non-renewable energy sources,use of alternate energy sources.Case studies. f. Land resources:Landas resources,land degradation,maninduced Landslides,soil erosion and desertification. g. Role of an individual in conservation of natural resources.	06	CO1, CO2, CO3, CO4	K1, K2, K3, K4
III	**Ecosystems** Concept,Structure and function of an ecosystem.Producers,consumers and decomposers Energy flow in the ecosystem and Ecological succession. Food chains, food webs and ecological pyramids Introduction,types,characteristic features,structure and function of the following ecosystem:-Forest ecosystem,Grassland ecosystem and Desert ecosystem, Aquatic ecosystems,(ponds,streams,lakes,rivers,oceans, nestuaries)	06	CO1, CO2, CO3, CO4	K1, K2, K3, K4

IV	**Bio diversity and Environmental Pollution** Introduction,types and value of biodiversity.India as a mega diversity nation. Hot-spots of biodiversity.Threatsto biodiversity:habitatloss,poaching of wildlife,man-wildlife conflicts.Endangered and endemic species of India.Conservation of biodiversity:In-situand Ex-situ conservation of biodiversity.Definition,Causes,effects and control measures of :Air Pollution, Water Pollution, Soil Pollution, Noise pollution,Nuclear hazards,Solid waste Management:Causes,effects and control measures of urban and industrial wastes. E-Waste Management:Sources and Types of E-waste.Effect of E-waste on environment and humanbody.Disposal of E-waste,Advantages of Recycling E-waste.Role of an individual inprevention of pollution.Disastermanagement:floods,earthquake, cyclone and landslides.	06	CO1, CO2, CO3, CO4	K1, K2, K3, K4
V	**Social Issues and the Environment** Water conservation,rain water harvesting,water shedmanagement. Climate change,global warming, acid rain,ozone layer depletion, Waste land reclamation. **Environment Protection Act** Wildlife Protection Act. Forest Conservation Act. Population explosion–Family Welfare Programmes Human Rights-Value Education.HIV/ AIDS- Women and Child Welfare. Role of Information Technology in Environment and human health.	06	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

References

1. Agarwal,K.C.2001 EnvironmentalBiology,Nidi PublicLtdBikaner.
2. BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt Ltd, Ahamedabad – 380013,India, E-mail: mapin@icenet.net(R)
3. BrunnerR.C.1989,HazardousWaste Incineration,McGraw HillInc480p
4. ClarkR.S.MarinePollution,ClandersonPressOxford(TB)
5. Cunningham,W.P.Cooper,T.H.GorhaniE&Hepworth,M.T.2001.
6. DeA.K.EnvironmentalChemistry, WileyEasternLtd
7. DowntoEarth, Centre for Science and Environment(R)
8. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security.StockholmEnv. InstituteOxford University, Press 473p.
9. Hawkins,R.E.EncyclopediaofIndia NaturalHistory,BombayNaturalHistorySociety,Bombay.
10. Heywood, V.H & Watson, R.T. 1995. Global Biodiversity Assessment. Cambridge UniversityPress1140 p.
11. Jadhav,H&Bhosale,V.M. 1995.EnvironmentalProtectionand LawsHimalayaPub.

Pedagogy

Chalkand talk,PPT, Discussion,Assignment, Quiz, Seminar

CourseDesigner

Dr.B.Thamilmaraiselvi