BACHELOR OF SCIENCE (PHYSICS)

VISION

To nurture the young minds with unique proficiency in Physics to meet the global challenges.

MISSION

- To offer quality education in Physics by providing scientific inquiry and innovation.
- To kindle research interest by providing an excellent scientific ambience

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO 1 : To import basic knowledge in theoretical, applied and experimental physics.

PEO 2: To improve analytical skills, logical thinking and problem solving ability through the concept of physics to equip them to face global challenges.

PEO 3: To develop wisdom of fundamental laws governing the universe.

PROGRAMME OUTCOMES (PO)

After completion of the programme, the graduates will be able to

PO 1 : State mathematical concepts needed for a proper understanding of physics.

PO 2 : Obtain the core knowledge in physics, including the interdisciplinary area of sciences.

PO 3 : Apply the knowledge to analyze a broad range of physical phenomena.

PO 4 : Think critically and work independently for understanding the logical connection between ideas.

PO 5 : Use research based knowledge for creating new ideas and methods in the field of modern physics.

PROGRAMME SPECIFIC OUTCOMES (PSO)

After completion of the programme, the graduates will be able to

PSO 1 : Obtain the basic concepts, fundamental principles and the scientific theories related to the nature of physical phenomena and their relevancies in day-to-day life.

PSO 2 : Comprehend the fundamental concepts in domain knowledge and its linkages with related areas.

PSO 3 : Familiarize the theories and models in various areas of physical science.

PSO 4 : Identify and apply appropriate physical principles and methodologies to solve wide range of problems associated with Physics.

PSO 5 : Formulate an interdisciplinary knowledge for performing experiments, interpreting data and gaining the information to pursue research as a career.

REGULATIONS

ELIGIBILITY

Candidates seeking admission to first year of the Bachelor of Science – Physics shall be required to have passed the Higher secondary examination with Mathematics, Physics and Chemistry conducted by the Government of Tamil Nadu or an examination accepted as equivalent there to by the Syndicate subject to the conditions as may be prescribed there to are permitted to appear and qualify for **B.Sc., (Physics) degree examination** of Periyar University after a course of study of three academic years.

DURATION OF THE COURSE

The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

MAXIMUM DURATION FOR THE COMPLETION OF THE UG PROGRAMME

The maximum duration for completion of the UG Programme shall not exceed 12 semesters.

SCHEME OF EXAMINATION

Subject Code	Subject	Hrs of Instruction	Exam Duration (Hrs)	Max Marks			Credit Points
				CA	CE	Total	
First Semester							
Part I							
18UTALA101/ 18UHILA101/ 18UFRLA101	Tamil I / Hindi I / French I	5	3	25	75	100	3
Part II							
18UENLA101	Foundation English I	5	3	25	75	100	3
Part III							
18UPHM101	Core I: Properties of Matter and Sound	5	3	25	75	100	5
18UPHM102	Core II: Thermal Physics	5	3	25	75	100	4
18UMAPHA101	Allied I: Algebra and Differential Calculus	5	3	25	75	100	4
18UPHMP101	Core Practical I: Practical Physics I	3	3	40	60	100	2
Part IV							
18UVE101	Value Education I:Yoga	2	3	25	75	100	2
	Total	**30**				**700**	**23**
Second Semester							
Part I							
18UTALA201/ 18UHILA201/ 18UFRLA201	Tamil II/ Hindi II/ French II	5	3	25	75	100	3
Part II							
18UENLA201	Foundation English II	5	3	25	75	100	3
Part III							
18UPHM201	Core III: Mechanics	5	3	25	75	100	5
18UPHM202	Core IV: Optics	5	3	25	75	100	4
18UMAPHA201	Allied II: Integral Calculus and Vector Calculus	5	3	25	75	100	4
18UPHMP201	Core Practical II: Practical Physics II	3	3	40	60	100	2
Part IV							
18UVE201	Value Education II: Environmental Studies	2	3	25	75	100	2
	Total	**30**				**700**	**23**

Subject Code	Subject	Hrs of Instruction	Exam Duration (Hrs)	Max Marks			Credit Points
				CA	CE	Total	
Third Semester							
Part I							
18UTALA301/ 18UHILA301/ 18UFRLA301	Tamil III / Hindi III / French III	5	3	25	75	100	3
Part II							
18UENLA301	Foundation English III	5	3	25	75	100	3
Part III							
18UPHM301	Core V: Atomic Physics	5	3	25	75	100	5
18UCSPHA301	Allied III: Programming in C	3	3	25	75	100	2
18UPHMP301	Core Practical III: Practical Physics III	3	3	40	60	100	2
18UCSPHAP301	Allied Practical I: Programming in C	2	3	40	60	100	2
Part IV							
18UPHSB301	SBC I: Instrumentation	2	3	25	75	100	2
	NMEC I	2	3	25	75	100	2
Non Credit							
18ULS301	Career Competency Skills I	1	-	-	-	-	-
	Add-on Course	2	-	-	-	-	-
	Total	**30**				**800**	**21**
Fourth Semester							
Part I							
18UTALA401/ 18UHILA401/ 18UFRLA401	Tamil IV/ Hindi IV/ French IV	5	3	25	75	100	3
Part II							
18UENLA401	Foundation English IV	5	3	25	75	100	3
Part III							
18UPHM401	Core VI: Basic Electronics	5	3	25	75	100	5
18UCHPHA401	Allied IV: Chemistry	3	3	25	75	100	2
18UPHMP401	Core Practical IV: Practical Physics IV	3	3	40	60	100	2
18UCHPHAP401	Allied Practical II: Chemistry	2	3	40	60	100	2
Part IV							
18UPHSB401	SBC II: Laser Physics	2	3	25	75	100	2
	NMEC II	2	3	25	75	100	2
Non Credit							
18ULS401	Career Competency Skills II	1	-	-	-	-	-
	Add-on Course	2	-	-	-	-	-
	Total	**30**				**800**	**21**

Subject Code	Subject	Hrs of Instruction	Exam Duration (Hrs)	Max Marks			Credit Points
				CA	CE	Total	
Fifth Semester							
			Part III				
18UPHM501	Core VII: Electricity and Electromagnetism	6	3	25	75	100	5
18UPHM502	Core VIII: Solid State Physics	5	3	25	75	100	5
18UPHM503	Core IX: Mathematical Physics (Fifth Unit Self-Study)	5	3	25	75	100	4
18UPHM504	Core X: Electronics and Communication	4	3	25	75	100	4
18UPHEL501	Elective I: Energy Physics	4	3	25	75	100	4
18UPHEL502	Elective I: Geophysics						
18UPHMP501	Core Practical V: Practical Physics - V	3	3	40	60	100	2
			Part IV				
18UPHSB401	SBC III: Spectrophysics	2	3	25	75	100	2
			Part V				
18UPHE501	Extension Activity	-	-	-	-	-	2
			Non Credit				
18ULS501	Career Competency Skills III	1	-	-	-	-	-
	Total	**30**				**700**	**28**
Sixth Semester							
			Part III				
18UPHM601	Core XI: Quantum Mechanics and Relativity	6	3	25	75	100	5
18UPHM602	Core XII: Nuclear Physics	6	3	25	75	100	5
18UPHM603	Core XIII: Digital Electronics and Microprocessor	5	3	25	75	100	4
18UPHEL601	Elective II: Nanoscience	4	3	25	75	100	4
18UPHEL602	Elective II: Biomedical Instrumentation						
18UPHMP601	Core Practical VI: Practical Physics -VI	3	3	40	60	100	2
18UPHPR601	Project & Viva - Voce	3	3	40	60	100	2
			Part IV				
18UPHSB601	SBC IV: Materials and Processing	2	3	25	75	100	2
			Non Credit				
18ULS601	Career Competency Skills IV	1	-	-	-	-	-
	Total	**30**				**700**	**24**
			Grand Total			**4400**	**140**

NON MAJOR ELECTIVE COURSE

The department offers the following two subjects as Non-Major Elective Course for other than Physics students for third and fourth semester.

S.No	Subject code	Semester	Subject
1	18UPHNM301	III	Laser and its Applications
2	18UPHNM401	IV	Applied Physics

ADD-ON COURSE

The department offers the following two subjects as Add-on Course for third and fourth semester.

S.No	Subject code	Semester	Subject
1	18UPHAC301	III	Fundamentals of Astrophysics
2	18UPHAC401	IV	Astronomical Techniques

Advanced Learners Course

The department offers the following subject as Advanced Learner's Course for fourth and fifth semester.

S.No	Subject code	Semester	Subject
1	18UPHAL401	IV	Plasma Physics
2	18UPHAL501	V	Spintronics

ELECTIVE I

Students shall choose any one subject as an elective from the following subjects in the fifth semester.

S.No	Subject code	Subject
1	18UPHEL501	Elective I: Energy Physics
2	18UPHEL502	Elective I: Geophysics

ELECTIVE II

Students shall choose any one subject as an elective from the following subjects in the sixth semester.

S.No	Subject code	Subject
1	18UPHEL601	Elective II: Nanoscience
2	18UPHEL602	Elective II: Biomedical Instrumentation

FOR COURSE COMPLETION

Students should complete

- Language subjects (Tamil/Hindi/French, English) in I, II, III and IV semesters.
- Value Education Yoga and Environmental Studies in I and II semesters respectively.
- Allied subjects in I, II, III and IV semesters.
- Need based Elective Courses in III and IV semesters.
- Skill based Courses in III, IV, V and VI semesters.
- Extension activity in V semester.
- Project & Viva – Voce in VI semester.

TOTAL CREDIT DISTRIBUTION

S.NO.	COMPONENTS	MARKS	CREDITS	CUMULATIVE CREDITS
1.	**PART I :**			12
	Tamil/ Hindi/ French	4×100=400	4×3=12	
2.	**PART II :**			12
	Foundation English	4×100=400	4×3=12	
3.	**PART III :**			98
	Core Theory	13×100=1300	5×4=20 8×5=40	
	Elective	2×100=200	2×4=08	
	Core Practical	6×100=600	6×2=12	
	Allied Theory	4×100=400	2×4=08 2×2=04	
	Allied Practical	2×100=200	2×2=04	
	Project & Viva - Voce	1×100=100	1×2=02	
4.	**PART IV :**			16
	Skill Based Courses	4×100=400	4×2=08	
	Value Education	2×100=200	2×2=04	
	NMEC	2×100=200	2×2=04	
5.	**PART V:**			02
	Extension Activity	-	1×2=02	
	Total (44 Papers)	**4400**	**-**	**140**

18UTALA101	**TAMIL – I: கவிதைகளும் கதைகளும்**	**பருவம் - I**

இப்பாடத்திட்டத்தின் நோக்கங்களாவன:

- தற்காலத்தமிழ் இலக்கியவகைகளைமாணவர்களுக்குக் கற்பித்தல்.
- காலந்தோறும் தமிழ்க் கவிதைவளர்ச்சிநிலைகளைஅறிமுகப்படுத்துதல்.
- அடிப்படைத் தமிழ் இலக்கணத்தைக் கற்பித்துஅரசுப்போட்டித் தேர்வுகளுக்கு ஆயத்தப்படுத்துதல்.

Credits: 3 **Total Hours: 50**

UNIT	CONTENTS	Hrs.	CO
I	**மரபுக் கவிதைகள்** அ. பாரதியார் - பாரததேசம் ஆ பாரதிதாசன - தமிழின் இனிமை இ. நாமக்கல் கவிஞர் - கவிதைஎன்றால் என்ன? ஈ. முடியரசன - நல்லஉலகமடா!	10	CO 1
II	**புதுக்கவிதைகள்** அ.வைரமுத்து - ரத்ததானம் - தண்ணீர் பிச்சை ஆ.வெ.இறையன்பு - பூபாளத்திற்கொருபுல்லாங்குழல் - பனித்துளியில் பாற்கடல் இ. தீபா - மழைக்குஒருமடல் - பாரதியார்,வறுமை ஈ. சிற்பி - ஒருகிராமத்துநதி–ஒருகிராமத்துநதி	10	CO 2
III	**சிறுகதைகள்** அ.அறிஞர் அண்ணா - செவ்வாழை ஆ. கிருத்திகா - உழவுமாடுகள் இ.வள்ளி.வ. - தணல் துண்டாய்...சிலதருணங்கள் ஈ.தி.ஜானகிராமன - முள்முடி	10	CO 3
IV	**இலக்கியவரலாறு** அ. மரபுக்கவிதையின் தோற்றமும் வளர்ச்சியும் ஆ. புதுக்கவிதையின் தோற்றமும் வளர்ச்சியும் இ. சிறுகதையின் தோற்றமும் வளர்ச்சியும் ஈ. நாடகத்தின் தோற்றமும் வளர்ச்சியும்	10	CO 4
V	**அடிப்படை இலக்கணம்** அ.முதலெழுத்துகள் மற்றும் சார்பெழுத்துகள் (நன்னூல் விதிப்படிவிளக்கம்) ஆ.வல்லினம் மிகும் மிகா இடங்கள். இ. மரபுப் பெயர்கள் - இளமைப் பெயர்கள்	10	CO 5

Text Book

1. தமிழ்த்துறை வெளியீடு, கே.எஸ்.ரங்கசாமி கலை அறிவியல் கல்லூரி (தன்னாட்சி), திருச்செங்கோடு.

COURSE OUTCOMES (CO)

இப்பாடத்தைக் கற்பதன் வாயிலாக மாணவர்கள் பெறும் பயன்களாவன:

CO 1	மரபுக்கவிதைகளின் வடிவங்களைஅறிதல்.
CO 2	புதுக்கவிதைகளின் வடிவங்கள் மற்றும் பாடுபொருள் தன்மையையஅறிதல்.
CO 3	சிறுகதைகளின் உருவம்,உள்ளடக்கங்களைஅறிதல்
CO 4	காலந்தோறும் மாறும் இலக்கியவளர்ச்சியைஅறிதல்
CO 5	எழுத்துகளின் வகைகளைஅறிதல்.

18UENLA101	**FOUNDATION ENGLISH – I**	**SEMESTER – I**

Course Objectives

The course aims

- To enable the students to develop their comprehensive skill.
- To introduce the students to know about English poetry.
- To introduce the students to know about English short stories.

Credits: 3 **Total Hours: 50**

UNIT	CONTENTS	Hrs.	CO
I & II	**POETRY** William Wordsworth - The Solitary Reaper Margaret Atwood - This Is a Photograph of Me **SHORT STORY** A. J. Cronin - Two Gentlemen of Verona **GRAMMAR** Parts Of Speech Articles **COMPOSITION** Letter Writing – Formal **COMMUNICATION SKILLS** Greeting and Introducing Inviting a Person	20	CO1 & CO2
III & IV	**POETRY** Robert Frost - The Road Not Taken **SHORT STORIES** Pearl S. Buck - The Refugees C. Rajagopalachary – Tree Speaks **GRAMMAR** Kinds of Sentences **COMPOSITION** Dialogue Writing **COMMUNICATION SKILLS** Seeking Permission Offering a Suggestion and Giving an Advice	20	CO3 & CO4
V	**SHORT STORY** R. K. Narayan - The Axe	10	CO5

	GRAMMAR Question Tag **COMPOSITION** Reading Comprehension **COMMUNICATION SKILLS** Persuading		

Text Books

1. *G.Damodar, D.Venkateshwarlu, M.Narendra, M.SaratBabu, G.M.Sundaravalli.* 2009. **English For Empowerment**. Published by Orient Blackswan Private Limited. Hyderabad.
2. *M.M.Lukose*. 2010. **Images, A hand book of Stories.** Macmillan Publishers Indian Limited. Chennai.
3. *Dr.A.Shanmugakani,* M.A., Ph.d, **Prose for Communication**. Manimekala Publishing House, Madurai.
4. *SasiKumar V and Syamala V*. 2006. **Form and Function A Communicative Grammar for Colleges.** Emerald Publishers. Chennai.
5. *T.M.Farhathullah.* 2006. **Communication Skills For Undergraduates**. Publishers-RBA Publications. Chennai.

Reference Book

1. *Thomas, A.J and Martinet, A.V.* 1994. **A Practical English Grammar.** Oxford University Press. Delhi.

COURSE OUTCOMES (CO)

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

CO 1	Know the different parts of genres in English.
CO 2	Trace the famous authors of English.
CO 3	Enrich grammar knowledge.
CO 4	Stimulate their writing skills.
CO 5	Deserve appreciation for their communication.

18UPHM101	**CORE I: PROPERTIES OF MATTER AND SOUND**	**SEMESTER – I**

Course Objectives

The course aims

- To inculcate the concepts of various properties of matter.
- To impart knowledge about acoustics and properties of materials used in the construction of buildings.
- To provide the basic physics of ultrasound.

Credits: 5 **Total Hours: 50**

UNIT	CONTENTS	Hrs.	CO
I	**Elasticity:** Elastic limit - Hooke's law - Young's modulus - Bulk modulus - Rigidity modulus - Yield point - Elastic fatigue - Poisson's ratio - Work done in stretching and twisting a wire - Expression for couple per unit twist - Torsion Pendulum - Bending of beams - Bending moment - Expression for internal bending moment - Cantilever - Theory and Experiment - Uniform and Nonuniform bending - Theory and Experiment I section of girders.	10	CO 1
II	**Viscosity:** Viscosity - Co-efficient of viscosity - Stream line flow and turbulent flow - Expression for critical velocity - Reynold's number - Poiseuille's formula - Determination of co-efficient of viscosity by capillary flow method – Stoke's method for co-efficient of viscosity of highly viscous liquid - Variation of viscosity with temperature and pressure - Viscosity of gases - Meyer's formula for the rate of flow of a gas through a capillary tube.	10	CO 2
III	**Surface Tension:** Surface tension - Definition - Surface energy - Pressure difference across a spherical surface - Angle of contact - Determination (Mercury in glass and water in glass) - Determination of surface tension of water by drop weight method - Quincke's method of determining surface tension and angle of contact of mercury - Vapour pressure over flat and curved surface - Effect of curvature on evaporation and condensation.	10	CO 3
IV	**Sound:** Intensity and loudness of sound – Decible – Intensity levels – Musical notes – Musical scale - Determination of	10	CO 4

	frequency using Melde's apparatus and Sonometer apparatus. **Acoustics:** Reverberation and time of reverberation – Absorption co-efficient – Sabine's formula – Measurement of reverberation time – Acoustics of buildings – Factors affecting acoustics of building.		
V	**Ultrasonics:** Ultrasonics – Production - Piezo electric method - Magnetostriction method – Detection – Properties – Behaviour – Focusing – Stationary waves and resonance Attenuation – Diffraction – Applications - Ultrasound and animals - Ultrasonic waves in industrial and medicine.	10	CO 5

Text Books

1. *Murugeshan, R.* 2005. **Properties of Matter and Acoustics.** [Third Edition]. S. Chand & Co Pvt. Ltd. New Delhi.
2. *Mathur, D.S.* 2010. **Elements of Properties of Matter.** [Eleventh Edition]. Shyamlal Charitable Trust, New Delhi.

Reference Books

1. *Brij Lal and Subramaniyam, N.* 1995**. Textbook of Sound.** [First Edition]. Vikas Publishing House, New Delhi.
2. *Brij Lal and Subramaniyam, N.* 2000. **Waves and Oscillations.** [First Edition]. Vikas Publishing House, New Delhi.
3. *Mary Jones, Geoff Jones and Philip Marchingston.* 1999. **Physics.** [Second Edition]. Cambridge University Press, New Delhi.

Web Reference:

1. http://www.nptel.ac.in

COURSE OUTCOMES (CO)

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

CO 1	Obtain the knowledge of properties of matter to explain natural physical processes and related technological advances.
CO 2	Use elementary mathematics along with physical principles to effectively study in viscosity of liquid and gases.
CO 3	Demonstrate the basic principle relevant to the experimental methods for surface tensions of liquids.
CO 4	Obtain knowledge of sound propagation, sound perception, acoustic regulation and sound absorbents.
CO 5	Comprehend the physical properties of the ultrasound and its applications in various fields.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	M	L
CO 2	H	H	M	M	L
CO 3	L	L	H	H	M
CO 4	H	H	M	L	H
CO 5	H	M	H	M	L

H-High; M-Medium; L-Low

18UPHM102	**CORE II: THERMAL PHYSICS**	**SEMESTER – I**

Course Objectives:

The course aims

- To enhance the student's skills in basic concepts of heat like temperature measurement and specific heat measurement.
- To study the liquefaction of gases, their applications, principles of heat conduction and radiation.
- It also aims at imparting knowledge on basic laws of thermodynamics and working of heat engines.

Credits: 4 **Total Hours: 50**

UNIT	CONTENTS	Hrs.	CO
I	**Thermometry and Calorimetry:** Thermometry - Types of thermometers - Platinum resistance thermometer - Calendar and Griffith's bridge - Seebeck effect - Thermoelectric thermometer - Calorimetry – Copper black calorimeter - Specific heat capacity of liquid by Newton's law of cooling - Specific heat capacity of gases - Meyer's relation between Cp and Cv – Determination of Cv by Joly's differential steam calorimeter and Cp by Regnault's method.	10	CO 1
II	**Low temperature physics:** Kinetic theory of gases - Vander Waal's equation- Derivation of critical constants – Joule-Thomson effect - Porous plug experiment - Liquefaction of gases – Regenerative cooling - Liquefaction of Helium – Properties of Helium I and II - Practical applications of low temperature – Air conditioning machine – Refrigerating mechanism.	10	CO 2
III	**Conduction and Radiation:** Definition of thermal conductivity – Rectilinear flow of heat along a bar - Thermal conductivity of a metal by Forbe's method - Thermal conductivity of bad conductor by Lee's disc method - Radiation - Black body radiation - Wien's law - Rayleigh-Jean's law and Planck's law (only statement no derivation) - Solar constant – Angstrom pyrheliometer - Temperature of sun.	10	CO 3
IV	**Thermodynamics:** Zeroth, first law of thermodynamics – Isothermal - Adiabatic processes - Heat engines – Carnot's, petrol and diesel engines and their efficiencies - Second law of thermodynamics - Entropy- Change of entropy in reversible and irreversible processes - Temperature -Entropy diagram.	10	CO 4

V	**Maxwell's Thermodynamic Relation:** Third law of thermodynamics - Derivation of Maxwell's Thermodynamic relations – Applications – Clausius Clapeyron's latent heat equation – Specific heat relations - Adiabatic demagnetization.	10	CO 5

Text Books

1. *Murugeshan, R. and Kiruthiga Sivaprasat.* 2008. **Thermal Physics.** S. Chand & Co, New Delhi.
2. *Brijal* and *Subramaniyam, N. 2012*. **Heat Thermodynamics and Statistical Physics**. [Sixteenth Edition]. S. Chand & Company, New Delhi.

Reference Books

1. *Mathur, D.S. 1991.* **Heat and Thermodynamics**. *Sultan Chand & Sons, New Delhi.*
2. *Brijal and Subrahmaniyam, N. 2010.* **Heat and Thermodynamics and Statistical Physics**. *S.Chand & Company, New Delhi.*

Web References:

1. http://www.nptel.ac.in
2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO 1	Understand the workings principles of various types of thermometers and the nature of Calorimetry by specific heat of state of mater.
CO 2	Gain knowledge on various ways matter can change phase: Condensation/evaporation, melting/freezing and sublimation for suitable theory.
CO 3	Analyze theoretical and experimental concepts of thermal conductivity for solid and gas medium.
CO 4	Apply the state thermodynamics law and its implication.
CO 5	Formulate the nature of thermodynamic properties like internal energy, Enthalpy and specific heat relations.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	H	M	L
CO 2	H	H	M	M	L
CO 3	M	L	H	H	M
CO 4	H	H	M	L	H
CO 5	H	M	H	M	L

H-High; M-Medium; L-Low

18UMAPHA101	**ALLIED I: ALGEBRA AND DIFFERENTIAL CALCULUS**	**SEMESTER – I**

Note: Proof of the theorem and proof of examples are excluded.

Course Objectives:

The course aims

- To get knowledge about matrices and various method of solving algebraic equations.
- To learn basic concepts of differentiation which is instrumental in constructing many of mathematical concepts and also applied in all sciences and social sciences.

Credits: 4 **Total Hours: 50**

UNIT	**CONTENTS**	**Hrs.**	**CO**
I	Characteristics equation of a matrix – Eigen values and Eigen vectors – Cayley-Hamilton Theorem (Statement only) and its problems – Rank of a matrix – Problems.	10	CO 1
II	Polynomial Equations - Imaginary and Irrational roots - Relation between roots and coefficients – Transformation of equations – Descarte's rule of signs – Problems.	10	CO 2
III	Successive Differentiation – nth derivative – Leibnitz formula for nth derivative – problems.	10	CO 3
IV	Partial differentiation – Partial derivatives of higher orders – Homogeneous functions – Problems.	10	CO 4
V	Radius of Curvature in Cartesian and polar coordinates – Pedal equation of a curve – Radius of curvature in p-r coordinates.	10	CO 5

Text Book

1. *Vittal, P.R.* 2002. **Allied Mathematics.** [Third Edition]. Margham Publications, Chennai.

Reference Books

1. *Manicavachagam Pillay, T.K. and Narayanan, S.* 2004. **Algebra – Vol II.** Vijay Nicole Imprints Private Limited, Chennai.
2. *Singaravelu. A.* 2002. **Allied Mathematics.** Meenakshi Publishers, Chennai.

COURSE OUTCOMES (CO)

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

CO 1	Calculate Eigen values and Rank of a matrix.
CO 2	Solve algebraic equations.
CO 3	Understand the variations in variables.
CO 4	Understand the difference between partial and total differentiation.
CO 5	Find the curvature and radius of curvature of a curve.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	M	H	M	H
CO 2	H	H	M	M	L
CO 3	L	L	H	H	M
CO 4	H	H	M	L	H
CO 5	H	M	H	M	L

H-High; M-Medium; L-Low

18UPHMP101	**CORE PRACTICAL I: PRACTICAL PHYSICS - I**	**SEMESTER – I**

Course Objectives:

The course aims

- To enhance the basic skills of the students in taking measurements using microscope, telescope, spectrometer, potentiometer etc.,
- To impart knowledge in properties of matter and mechanics.

Credits: 2 **Total Hours: 30**

Ex.No	**LIST OF EXPERIMENTS**	**Hrs.**	**CO**
1.	Measurements of length, breadth and diameter using Vernier Calipers, Screw Gauge and Travelling Microscope.	3	CO 1
2.	Young's modulus – Nonuniform bending – Pin and Microscope.	3	
3.	Young's modulus – Uniform bending – Scale and Telescope.	3	
4.	Torsion pendulum – Rigidity modulus - with masses.	3	
5.	Surface tension and interfacial tension – Drop weight method.	3	CO 2
6.	Specific heat capacity by Newton's law of cooling.	3	
7.	Lee's disc method – Coefficient of thermal conductivity of a bad conductor.	3	
8.	Coefficient of Viscosity – Poiseuille's method.		
9.	Sonometer – Frequency of a fork and measure unknown mass.	3	CO 3
10.	Determination of frequency – Melde's apparatus.	3	

Text Book

1. *Srinivasan, M.N, Balasubramanian, S* and *Ranganathan, R.* 2004. **A Book for Study of Practical Physics**. S. Chand & Co. New Delhi.

Reference Books

1. *Usha Rani, Subbarayan, A* and *Somasundaram.* 2007. **Practical Physics**. APSARA Publication, Trichy.
2. *Arora, C.L.* 1995**. B.Sc., Practical Physics.** S. Chand & Co. New Delhi.
3. B.Sc., Physics Laboratory Manual of the year 2018 – 2019.

COURSE OUTCOMES (CO)

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

CO 1	Analyze the various physical properties of the various materials.
CO 2	Determine the thermal property and viscosity of the materials.
CO 3	Obtain basic concept of resonance effect and frequency of the vibrating bodes.

18UVE101	**VALUE EDUCATION I: YOGA**	**SEMESTER – I**

Course Objectives:

The course aims

- To understand physical body and health concepts.
- To have the basic knowledge on simplified Physical Exercises and ASANAS and Meditation.
- To introspect and improve the behaviors.
- To inculcate cultural behavioral patterns.

Credits: 2 **Total Hours: 30**

UNIT	CONTENTS	Hrs.	CO
I	**Yoga and Physical Health:** Health - Meaning and Definition - Physical Structure - Three bodies - Five limitations - Simplified Physical Exercises - Hand, Leg, Breathing, Eye exercises - Kapalabathi, Makarasana 1, 2 , Massage, Acu pressure, Relaxation exercises - Yogasanas – Surya namaskar - Padmasana - Vajrasana - Ardha katti Chakrasana - Viruchasana - Yogamudra - Patchimothasana - Ustrasana - Vakkarasana – Salabasana.	6	CO 1
II	**Greatness of Life Force and Mind :** Maintaining youthfulness - Postponing the ageing process - Sex and spirituality - Significance of sexual vital fluid - Married life - Chastity - Development of mind in stages - Mental Frequencies - Methods for Concentration - Meditation and its Benefits.	6	CO 2
III	**Personality Development – Sublimation :** Purpose and Philosophy of Life - Introspection - Analysis of Thought - Moralization of Desire - Analysis and practice - Neutralization of Anger - Strengthening of will-power.	6	CO 3
IV	**Human Resources Development:** Eradication of Worries - Analysis and Eradication practice - Benefits of Blessings – Effect of good vibrations - Greatness of Friendship - Guidance for good Friendship – Individual Peace and world peace - Good cultural behavioral patterns.	6	CO 4
V	**Law of Nature:** Unified force - Cause and effect system - Purity of thought deed and Genetic Centre – Love and Compassion - Gratitude - Cultural Education - Fivefold culture.	6	CO 5

Text Book
1. Value Education - World Community Service Centre, Vethathiri Publications, Erode.
Reference Books
1. *Vethathiri Maharishi*, 2011. **Journey of Consciousness**. Vethathiri Publications, Erode. 2. *Vethathiri Maharishi,* 2014. **Simplified Physical Exercises.** Vethathiri Publications, Erode. 3. *Vethathiri Maharishi,* 2004. **Unified force.** Vethathiri Publications, Erode. 4. Yoga for Modern age - Thathuvagnani Vethathiri Maharishi 5. Chandrasekaran, K. 1999**. Sound Health Through Yoga.** Kalyan Publications, Madurai. 6. Light on yoga - BKS. Lyenger. 7. Thathuvagnani Vethathiri Maharishi – Kayakalpa yoga – First Edition 2009 Vethathiri Publications, Erode. 8. Environmental Studies - Bharathidasan University Publication Division.

COURSE OUTCOMES (CO)

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

CO 1	Understand the physical structure and simplified physical exercises.
CO 2	Nurture the life force and mind.
CO 3	Introspect and improve the moral values.
CO 4	Realize the importance of human resources development.
CO 5	Enhance purity of thought and deed.

18UTALA201	**Tamil – II: சமய இலக்கியங்கள்**	**பருவம் - II**

இப்பாடத்திட்டத்தின் நோக்கங்களாவன:

- தற்காலத்தமிழ் இலக்கியவகைகளைமாணவர்களுக்குக் கற்பித்தல்.
- காலந்தோறும் தமிழ்க் கவிதைவளர்ச்சிநிலைகளைஅறிமுகப்படுத்துதல்.
- அடிப்படைத் தமிழ் இலக்கணத்தைக் கற்பித்துஅரசுப்போட்டித் தேர்வுகளுக்கு ஆயத்தப்படுத்துதல்.

Credits: 3 **Total Hours: 50**

UNIT	CONTENTS	Hrs.	CO
I	**சைவ,வைணவ இலக்கியங்கள்** அ. சம்பந்தர் தேவாரம் - திருக்கொடிமாடச்செங்குன்றூர்- **(முதல் ஐந்துபாடல்கள்)** ஆ. மாணிக்கவாசகர் - திருவம்மானை - **(முதல் ஐந்துபாடல்கள்)** இ. பெரியாழ்வார் - திருப்பல்லாண்டு **(முதல் ஐந்துபாடல்கள்)** ஈ. ஆண்டாள் - திருமணக் கனவு **(முதல் ஐந்துபாடல்கள்)**	10	CO 1
II	**கிறித்துவ, இசுலாமிய இலக்கியங்கள்** அ. இரட்சணியயாத்திரிகம் - சிலுவைப்பாடு **(முதல் பத்துப்பாடல்கள்)** ஆ. நாயகம் ஒருகாவியம்–பாம்பின் நேசமும் தோழரின் பாசமும் **(முதல் பத்துப்பாடல்கள்)**	10	CO 2
III	**சமயச் சான்றோர் வரலாறு** அ. **சைவசமயச் சான்றோர்கள்** 1. திருஞானசம்பந்தர், 2. திருநாவுக்கரசர், 3. சுந்தரர், 4. மாணிக்கவாசகர் 5. சேக்கிழார் ஆ. **வைணவசமயச் சான்றோர்கள்** 1. முதலாழ்வார்கள் 2. திருமங்கையாழ்வார் 3.ஆண்டாள் 4. நாதமுனிகள்	12	CO 3
IV	**சமய இலக்கியவரலாறு** அ.பன்னிருதிருமுறைகள் ஆ. பதினெண்சித்தர்கள் இ. நாலாயிரதிவ்யபிரபந்தம் ஈ. சைவசித்தாந்தசாத்திரங்கள்	08	CO 4
V	**இலக்கணமும் மொழித்திறனும்** அ. ஆகுபெயர் ஆ. தொகைச்சொற்கள் இ. மயங்கொலிச்சொற்கள் (ர,ற வேறுபாடுகள்) ஈ. நேர்காணல்	10	CO 5

Text Book

1. தமிழ்த்துறை வெளியீடு, கே.எஸ்.ரங்கசாமி கலை அறிவியல் கல்லூரி (தன்னாட்சி), திருச்செங்கோடு.

COURSE OUTCOMES (CO)

இப்பாடத்தைக் கற்பதன் வாயிலாக மாணவர்கள் பெறும் பயன்களாவன:

CO 1	தேவார,திவ்யபிரபந்தச் சிறப்பினைஉணர்தல்.
CO 2	கிறித்துவ, இசுலாமிய காவியங்களின் சிறப்பினை உணர்தல்.
CO 3	சைவசமய, வைணவசமயச் சான்றோர் சிறப்புக்களை உணர்தல்.
CO 4	சமயவளர்ச்சி, இலக்கியவளர்ச்சி ஆகியவற்றை உணர்தல்.
CO 5	ஆகுபெயர் வகைகளை உணர்தல், மொழித்திறன் பெறுதல்.

18UENLA201	**FOUNDATION ENGLISH – II**	**SEMESTER – I**

Course Objectives

The course aims

- To enable the students to develop their comprehensive skill.
- To introduce the students to know about English poetry and short stories.

Credits: 3 **Total Hours: 50**

UNIT	CONTENTS	Hrs.	CO
I & II	**POETRY** Langston Hughes - I, Too **SHORT STORIES** Vsevolod M. Garshin - The Signal W. Somerset Maugham - The Man with the Scar **GRAMMAR** Tenses (Present, Past & Future) **COMPOSITION** E-mail -SMS **COMMUNICATION SKILLS** Asking Questions	20	CO1 & CO2
III & IV	**POETRY** Chinua Achebe - Refugee Mother and Child Nissim Ezekiel - Goodbye Party for Miss Pushpa T. S **SHORT STORY** H. G. Wells - The Stolen Bacillus **GRAMMAR** Voices (Active and Passive) **COMPOSITION** Note Making, Note Taking **COMMUNICATION SKILLS** Praising and Complimenting Complaining and Apologizing	20	CO3 & CO4
V	**POETRY** Tripuraneni Srinivas - I Will Embrace only the Sun **SHORT STORY** O. Henry - One Thousand Dollars **COMPOSITION** Discourse Pattern	10	CO5

	COMMUNICATION SKILLS Expressing Sympathy Phoning		

Text Books

1. *G.Damodar, DVenkateshwarlu, M.Narendra, M.SaratBabu, G.M.Sundaravalli.* 2009. **English For Empowerment**. Published by Orient Blackswan Private Limited. Hyderabad –500 029.
2. *M.M.Lukose*. 2010. **Images, A hand book of Stories.** Macmillan Publishers Indian Limited. Chennai–600 041.
3. *SasiKumarV and SyamalaV*. 2006. **Form and Function A Communicative Grammar for Colleges.** Emerald Publishers. Chennai–600 008.
4. *T.M.Farhathullah.* 2006. **Communication Skills For Undergraduates**. Publishers-RBA Publications. Chennai–600 015.

Reference Books

1. *Thomas, A.J and Martinet, A.V.* 1994. **A Practical English Grammar.** Oxford University Press. Delhi.
2. *Martin Hewings.* 1999. **Advanced English Grammar.** Cambridge University Press. New Delhi.

COURSE OUTCOMES (CO)

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

CO 1	Know the different parts of genres in English.
CO 2	Identify the famous authors of English.
CO 3	Enrich their grammar knowledge.
CO 4	Stimulate their writing skills.
CO 5	Deserve appreciation for their communication.

18UPHM201	**CORE III: MECHANICS**	**SEMESTER – II**

Course Objectives:

The course aims

- To develop the knowledge in basic concepts of forces acting on a static body and forces acting on a body in motion.
- It also imparts knowledge about forces acting on fluids at rest and also in motion.

Credits: 5 **Total Hours: 50**

UNIT	CONTENTS	Hrs.	CO
I	**Projectile:** Range up and down an inclined plane – Maximum range – Two directions of projections for a given velocity range. **Impact:** Laws of impact – Coefficient of restitution - Impact of a smooth sphere on a fixed smooth plane – Direct impact between two smooth spheres – Oblique impact between two smooth spheres – Loss in kinetic energy.	10	CO 1
II	**Simple Harmonic Motion (SHM):** Composition of two SHM's of same period along a straight line and at the right angles to each other – Lissajous figures. **Dynamics of Rigid Bodies:** Compound pendulum – Condition for minimum period interchangeability of suspension and center of oscillation – Determination of g using compound pendulum – Kater's pendulum – Bessel's modification – Bifilar pendulum (parallel threads).	10	CO 2
III	**Center of Gravity:** Center of gravity of a solid cone, hemisphere, hollow hemisphere and a tetrahedron. **Friction:** Laws of friction – Angle of friction – Resultant reaction – Cone of friction – Equilibrium of a body on an inclined plane under the action of a force.	10	CO 3
IV	**Hydrostatics:** Center of pressure – Definition – Center of pressure of a rectangular lamina and triangular lamina – Floating bodies – Laws of flotation – Stability of floating bodies – Determination of the Meta centric height of ship. **Hydrodynamics:** Equation of continuity of flow – Bernoulli's theorem – Applications – Venturimeter – Pitot tube – Filter pump.	10	CO 4

V	**Classical Mechanics:** System of particles - Conservation theorem for generalized momentum – Conservation theorem for energy – Constraints – Classification of Constraints – Degrees of freedom - Generalized coordinates – Cyclic coordinates – Transformation equations – Principle of virtual work – D'Alembert's principle – Lagrange's equation of motion from D'Alembert's principle – Application of simple pendulum.	10	CO 5

Text Book

1. *Murugesan, R.* 2005. **Mechanics and Mathematical Methods**. [Second Edition]. S. Chand and Company, New Delhi.

Reference Books

1. *Mathur, D. S.* 2006. **Mechanics**. [Nineteenth Edition]. S. Chand & Company, New Delhi.
2. *Brijlal and Subramanyam, N and Jivan Seshan.* 2008. **Mechanics an Electrodynamics**. [Seventh Edition]. S. Chand & Company, New Delhi.

Web Reference:

1. http://www.nptel.ac.in

COURSE OUTCOMES (CO)

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

CO 1	Understand the motion of projectile in various range and collision between them with suitable law.
CO 2	Study the basic concepts of simple harmonic motion of the rigid bodies through the various methods.
CO 3	Comprehend the center of gravity for different shaped materials and its frictional forces.
CO 4	Obtain the knowledge about the hydrostatics and hydrodynamics.
CO 5	Understand the concepts of motion of macroscopic particles with suitable laws.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	M	M
CO 2	H	H	M	M	L
CO 3	M	M	H	H	M
CO 4	M	H	M	L	H
CO 5	L	M	H	M	L

H-High; M-Medium; L-Low

18UPHM202	**CORE IV: OPTICS**	**SEMESTER – II**

Course Objectives:

The course aims

- To provide a good foundation in optics.
- To inspire interest for the knowledge of concepts is physical and Geometrical optics.
- To provide knowledge about optical instruments.

Credits: 4 **Total Hours: 50**

UNIT	CONTENTS	Hrs.	CO
I	**Lens Aberrations:** Spherical aberration of a thin lens – Methods of reducing spherical aberration – Coma – Astigmatism – Curvature of the field – Distortion-chromatic aberrations in a lens – Condition for Achromatism of two thin lenses separated by a finite distances.	10	CO 1
II	**Interference:** Fresnel's biprism – Interference – Interference in thin film due to reflected light – Fringes due to wedge shaped thin film – Determination of diameter of a thin wire by air wedge – Michelson's Interferometer – Theory – Applications – Thickness of thin transparent material and resolution of spectral lines - Fabry Perot interferometer.	10	CO 2
III	**Diffraction:** Fresnel's and Fraunhofer diffraction – Fresnel's half period zones – Area of the half period zones – Zone plate – Comparison of zone plate with convex lens – Fraunhoffer diffraction pattern with N slits (diffraction grating) – Normal and oblique incidence – Absent and overlapping spectra of diffraction grating.	10	CO 3
IV	**Polarization:** Polarization – Nicol prism as polarizer and analyzer – Dichroic polarizer's – Huygens theory of double refraction in uniaxial crystals – Double image polarizing prisms – Quarter wave plate, Half-wave plate – Babinet's compensator – Production and detection of Plane, elliptically and circularly polarized light.	10	CO 4
V	**Photoelasticity:** Stress birefringence – Theory of photoelasticity – Stress-Optic law – Effect of a stressed model in a plane polariscope – Photo-Elastic bench – Application of photoelasticity.	10	CO 5

Text Books
1. *Subramaniam, N, Brij Lal* and *Avadhanula, M.N.* 2006. **A Book for study of Optics,** [First Edition]. S. Chand & Co. Pvt. Ltd., New Delhi. 2. *Palanisamy, P.K,* 2015. **Physics of Materials**, Scitech Publications Pvt. LtD, India.
Reference Books
1. *Murugeshan, R. and Kiruthiga Sivaprasath.* 2012. **Optics and Spectroscopy.** [Eighth Edition]. S. Chand & Co. Pvt. Ltd., New Delhi. 2. *Francis A Jenkins and Harvey E White.* 2011. **Fundamentals of Optics.** [Fourth Edition]. TMH, New Delhi. 3. *Ajay Ghatak.* 1998. **Optics.** Tata McGraw-Hill Publishing Co. Ltd., New Delhi.
Web References:
1. http://www.nptel.ac.in 2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO 1	Study about the aberrations takes place in different types of lenses.
CO 2	Comprehend the phenomenon of light can constructively and destructively in interference.
CO 3	Know about the basic concepts of diffractions of lights with experimental evidence.
CO 4	Obtain the characteristics of light waves in polarization phenomena.
CO 5	Know about the photoelasticity and its applications.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	M	M
CO 2	H	H	M	M	L
CO 3	M	L	H	H	M
CO 4	H	H	M	L	H
CO 5	H	M	H	M	L

H-High; M-Medium; L-Low

18UMAPHA201	**ALLIED II: INTEGRAL CALCULUS AND VECTOR CALCULUS**	**SEMESTER – II**

Course Objectives:

The course aims

- To learn the concepts about integration.
- To introduce the concept of Fourier series.
- To Study in detail about vector differentiation and vector integration.

Credits: 4 **Total Hours: 50**

UNIT	**CONTENTS**	**Hrs.**	**CO**
I	**Integral Calculus**: Integration by parts - $\int_0^{\pi/2} \sin^n x\,dx$; $\int_0^{\pi/2} \cos^n x\,dx$; $\int_0^{\pi/2} \tan^n x\,dx$ - Definite integrals – Properties – Reduction formula – Problems.	10	CO 1
II	**Fourier Series:** Definition – To find Fourier coefficients of Periodic functions with period 2π - Even and odd functions – Half range series – Problems.	10	CO 2
III	**Vector Differentiation:** Definition of gradient of a scalar point function – Directional derivative of a vector point function – Unit normal vector. **Vector Point Function:** Divergent and curl of a vector point function – Definitions – Solenoidal and irrorational vector – Problems.	10	CO 3
IV	Line integrals – Surface integrals and volume integrals - Problems.	10	CO 4
V	Gauss Divergence theorem – Stoke's theorem – Green's theorem (Statement only) - Problems.	10	CO 5

Text Book

1. Vittal, P.R. *2002. **Allied Mathematics**. Margham Publications, Chennai.*

Reference Books

1. *Manickavasagam Pillai, T.K. and Narayana, S*. 2004. **Algebra - Vol – II**. Vijay Nicole Imprints Pvt. Ltd., Chennai.
2. *Singaravelu, A*. 2002**. Allied Mathematics**. Meenakshi Publishers, Chennai.

COURSE OUTCOMES (CO)

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

CO 1	Integrate trigonometric functions and integrations involving more than one factor.
CO 2	Expand a given function in terms of Fourier series.
CO 3	Identify conservative field and solenoidal vector.
CO 4	Find workdone by the force, area and volume of different regions.
CO 5	Discuss the relations between line integral, surface integral and volume integral.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	M	M
CO 2	H	H	M	M	L
CO 3	M	L	H	H	M
CO 4	H	H	M	L	H
CO 5	H	M	H	M	L

H-High; M-Medium; L-Low

18UPHMP201	**CORE PRACTICAL II: PRACTICAL PHYSICS - II**	**SEMESTER – II**

Course Objectives:

The course aims

- To enhance the experimental skills of the students in taking measurements using microscope, telescope, spectrometer, etc.,
- To impart knowledge in properties of optics and mechanics.

Credits: 2 **Total Hours: 30**

Ex.No.	**LIST OF EXPERIMENTS**	**Hrs.**	**CO**
1.	Young's modulus – Koenig's method – Non-uniform bending.	3	CO 1
2.	Young's modulus – Koenig's method – Uniform bending.	3	
3.	Compound pendulum – Gravity and radius of gyration.	3	
4.	Bifilar pendulum – Momenta inertia of the rectangular disc.	3	
5.	Air wedge – Thickness of wire and insulation.	3	
6.	Spectrometer – Grating – Normal incidence method.	3	CO 2
7.	Spectrometer – Grating – Minimum deviation.	3	
8.	Newton's Rings – Refractive index of liquid.	3	
9.	Spectrometer – Dispersive power of a prism.	3	
10.	One dimensional elastic collision using two hanging spheres.	3	CO 3

Text Book

1. *Srinivasan, M.N, Balasubramanian, S* and *Ranganathan, R.* 2004. **A Book for Study of Practical Physics**. S. Chand & Co. New Delhi.

Reference Books

1. *Usha Rani, Subbarayan, A* and *Somasundaram.* 2007. **Practical Physics**. APSARA Publication, Trichy.
2. *Arora, C.L.* 1995**. B.Sc., Practical Physics.** S. Chand & Co. New Delhi.
3. B.Sc., Physics Laboratory Manual of the year 2018 – 2019.

COURSE OUTCOMES (CO)

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

CO 1	Know the concept of parameters, such as stress, strain and elastic limit needed to achieve a given amount of deformation in the given material through uniform and non-uniform bending by Koenig's method.
CO 2	Comprehend the law of light through a spectrometer and Newton's rings method
CO 3	Apply and verify the concepts of conservation law of energy and momentum.

18UVE201	**VALUE EDUCATION II: ENVIRONMENTAL STUDIES**	**SEMESTER – II**

Course Objectives:

The course aims

- To enable the students acquire knowledge, values, attitudes, commitment and skills needed to protect and improve the environment.
- To implicate awareness among young minds for safeguarding environment from manmade disasters.

Credits: 2 **Total Hours: 30**

UNIT	CONTENTS	Hrs.	CO
I	**Environment**: Definition – Scope – Structure and function of ecosystems - producers, consumers and decomposers - Energy flow in the ecosystem - Ecological succession – food chain, food webs and ecological pyramids – Concept of sustainable development.	6	CO 1
II	**Natural Resources:** Renewable - air, water, soil, land and wildlife resources. Non–renewable – Mineral coal, oil and gas. Environmental problems related to the extraction and use of natural resources.	6	CO 2
III	**Biodiversity:** Definition – Values – Consumption use, productive social, ethical, aesthetic and option values threats to bio diversity – hotspots of bio diversity – conservation of bio-diversity: in – situ Ex–situ - Bio– wealth - National and Global level.	6	CO 3
IV	**Environmental Pollution:** Definition – causes, effects and mitigation measures – Air pollution, Water pollution, Soil pollution, Noise pollution, Thermal pollution – Nuclear hazards – Solid wastes acid rain – Climate change and global warming environmental laws and regulations in India – Earth summit.	6	CO 4
V	**Population and environment:** Population explosion – Environment and human health – HIV/AIDS – Women and Child welfare – Disaster Management - Resettlement and Rehabilitation of people, Role of information technology in environmental health – Environmental awareness.	6	CO 5

Text Book
1. Department of Biochemistry. Environmental Studies (Study Material). Published by K.S. Rangasamy College of Arts & Science (Autonomous). Tiruchengode.
Reference Book
1. *Erach Bharucha*. 2005. **Textbook of Environmental studies**. Universities press. PVT. Ltd.

COURSE OUTCOMES (CO)

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

CO1	Know about the types of ecosystem and concepts in sustainable development.
CO2	Understand the natural resources and environmental problems in usage of natural resources.
CO3	Be aware of biodiversity, hot spots of biodiversity and its conservation.
CO4	Be conscious on the effects of pollution, population explosion.
CO5	Implement the preventive measures for environmental issues.

18UTALA301	**Tamil – III: காப்பியம் - சிற்றிலக்கியம்**	**பருவம் - III**

இப்பாடத்திட்டத்தின் நோக்கங்களாவன:

- தமிழ்க் காப்பியங்கள் தோற்றத்தையும்,காப்பிய இலக்கணத்தையும் காப்பியவகைகளையும் அறிமுகம் செய்தல்.
- சிற்றிலக்கியங்கள் தோற்றம்,வளர்ச்சிநிலைகளையும்,சிற்றிலக்கியங்களையும் அறிமுகம் செய்தல்.
- பகுபதஉறுப்புக்களைக் கற்பித்தல்.

Credits: 3 **Total Hours: 50**

UNIT	CONTENTS	Hrs.	CO
I	காப்பியங்கள் - சிலப்பதிகாரம் - வழக்குரைகாதை மணிமேகலை - மலர்வனம் புக்ககாதை.	10	CO 1
II	பிறகாப்பியங்கள் - கம்பராமாயணம் - குகப் படலம் பெரியபுராணம் - இளையான்குடிமாறநாயனார் புராணம்.	10	CO 2
III	சிற்றிலக்கியங்கள் - குற்றாலக் குறவஞ்சி– வசந்தவல்லியின் காதல் **(1-10 பாடல்)** கலிங்கத்துப் பரணி - பேய்களைப் பாடியது.	10	CO 3
IV	இலக்கியவரலாறு - காப்பியங்கள் - ஐம்பெருங்காப்பியங்கள் - ஐஞ்சிறுகாப்பியங்கள் -புராணங்கள் - சிற்றிலக்கியங்கள்.	10	CO 4
V	இலக்கணமும் மொழிப்பயிற்சியும் - பகுபதஉறுப்பிலக்கணம் - சீர் வகைகள் - வழுஉச் சொற்கள் - கடிதம் எழுதுதல்.	10	CO 5

Text Book

1. தமிழ்த்துறை வெளியீடு, கே.எஸ்.ரங்கசாமி கலை அறிவியல் கல்லூரி (தன்னாட்சி), திருச்செங்கோடு.

COURSE OUTCOMES (CO)

இப்பாடத்தைக் கற்பதன் வாயிலாக மாணவர்கள் பெறும் பயன்களாவன:

CO 1	இரட்டைக் காப்பியங்களின் மேன்மைநிலையை உணர்தல்.
CO 2	காப்பியக்காலகுடிகளின் நிலையை,உரிமையைஉணர்தல்.
CO 3	சிற்றிலக்கியங்களின் சிறப்பை உணர்தல்.
CO 4	காப்பிய,சிற்றிலக்கியங்களின் வரலாறு குறித்த செய்திகளைஅறிதல்.
CO 5	இலக்கணம் மற்றும் மொழிப்பயிற்சியின் அமைப்பை உணர்தல்.

18UENLA301	**FOUNDATION ENGLISH – III**	**SEMESTER – III**

Course Objectives

The course aims

- To enable the students to develop their comprehensive skill.
- To promote language skills through literature.

Credits: 3 **Total Hours: 50**

UNIT	CONTENTS	Hrs.	CO
I & II	**ONE ACT PLAY** A. Ball - The Seven Slaves **PROSE** Somerset Maugham - Mr. Know –All **GRAMMAR** Degrees of Comparison **COMPOSITION** Advertisement **COMMUNICATION SKILLS** Speaking About Oneself The Media	**20**	**CO1 & CO2**
III & IV	**ONE ACT PLAY** R.H. Wood - Post Early for Christmas **PROSE** Satyajit Ray - Film Making **GRAMMAR** Determiners **COMPOSITION** Resume Writing **COMMUNICATION SKILLS** Imagining Context specific expression - Master of Ceremonies	**20**	**CO3 & CO4**
V	**PROSE** Isai Tobolsky - Not Just Oranges **GRAMMAR** Reported Speech **COMPOSITION** Precise Writing **COMMUNICATION SKILLS** Inviting Personalities.	**10**	**CO5**

Text Books
1. *G.Damodar, D.Venkateshwarlu, M.Narendra, M.SaratBabu, G.M.Sundaravalli.* 2009. **English For Empowerment**. Published by Orient Blackswan Private Limited. Hyderabad –500 029. 2. *K.S.Ramamurthy, 1984.* **Seven-Act Plays**. Published in India by Oxford University. New Delhi–110 001. 3. *V. Sasi Kumar and V. Syamala*. 2006. **Form and Function - A Communicative Grammar for Colleges.** Emerald Publishers. Chennai–600 008. 4. *T.M.Farhathullah.* 2006. **Communication Skills For Undergraduates**. Publishers-RBA Publications. Chennai–600 015.
Reference Book
1. *Raymond Murphy*. 1994. **Intermediate English Grammar.** Cambridge University India Pvt. Ltd, Delhi.

COURSE OUTCOMES (CO)

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

CO 1	Know the different parts of genres in English.
CO 2	Trace the famous authors of English.
CO 3	Enrich their grammar knowledge.
CO 4	Stimulate their writing skills.
CO 5	Deserve appreciation for their communication.

18UPHM301	**CORE V: ATOMIC PHYSICS**	**SEMESTER – III**

Course Objectives

The course aims

- To impart knowledge on the basic principles of mass spectrograph, photo electricity and atom models.
- To provide basic concepts regarding spectral lines, fine structure and Zeeman Effect.

Credits: 5 **Total Hours: 50**

UNIT	CONTENTS	Hrs.	CO
I	**Positive Ray Analysis:** Positive rays – Discovery – Properties – Positive ray analysis – Thomson's Parabola method – Action of Electric and Magnetic fields – Determination of e/m – Determination of mass – Discovery of stable isotopes – Limitations – Dempster's mass spectrograph – Aston's mass spectrograph - Mass defect and packing fraction – polarization of X rays – Scattering of X rays (Thomson's formula).	10	CO 1
II	**Rutherford's, Bohr and Sommerfeld Atom Models:** Rutherford's α-particle scattering - Atom model – Drawbacks - Nature of privileged quantum orbits - Bohr's correspondence principle – Effect of motion of nucleus – Evidences in favour of Bohr's theory – Determination of critical potential – Davis and Goucher's method – Sommerfeld's relativistic atom model.	10	CO 2
III	**Vector Atom Model:** Vector atom model - Various quantum numbers – L-S and j-j coupling - Pauli's exclusion principle - Electronic configuration of elements and periodic classification - Magnetic dipole moment of electron due to orbital and spin motion - Bohr magnetron - Spatial quantization - Stern and Gerlach experiment.	10	CO 3
IV	**Photoelectricity :** Photoelectric emission - Laws - Lenard's experiment - Richardson and Compton experiment – Relation between photo electric effect and retarding potential – Relation between velocity of photo electrons and frequency of light – Failure of electromagnetic theory – Einstein's light quantum hypothesis- Einstein's photoelectric equation - Experimental verification of Einstein's photoelectric equation by Millikan's experiment - Photoelectric cells.	10	CO 4

V	**Fine Structure of Spectral Lines:** Spectral terms and notations - Selection rules - Intensity rule and interval rule – Fine structure of sodium D lines - Zeeman Effect - Larmor's theorem - Debye's explanation of normal Zeeman effect - Anamalous Zeeman effect - Theoretical explanation- Lande's 'g' factor and Explanation of splitting of D_1 and D_2 lines of sodium – Stark effect – Paschen Back effect.	10	CO 5

Text Books

1. *Murugesan, R.* 2007. **Modern Physics.** [Eighteenth Edition], S. Chand & Company, New Delhi.
2. *Evgeny G. Drukarev and Mikhailov, A.I.* 2016. **High-Energy Atomic Physics.** Springer.

Reference Books

1. *Rajam, J. B.* 2004. **Atomic Physics.** [5th Edition], S. Chand & Company, New Delhi.
2. *Ghoshal, S.N.* 2007. **Atomic Physics**, S. Chand & Company, New Delhi.
3. *Wehr, M.R, Richards, J.A and Adair, T.*W. 2002. **Physics of the Atom**, [Fourth Edition], Narosa Publishing House, New Delhi.

Web Reference:

1. http://www.nptel.ac.in

COURSE OUTCOMES (CO)

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

CO 1	Describe the properties of positive rays and analyses its basic characteristics through the atomic spectroscopic techniques.
CO 2	Explain the effect of motion of nucleus done with Rutherford's, Bohr and Sommerfeld atom models.
CO 3	Realize the physical significance of motion of electrons.
CO 4	Demonstrate the photoelectricity through the quantum hypothesis.
CO 5	Formulate the selection rules for the interaction of electric dipole radiation and fine structure of atoms.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	M	L
CO 2	H	H	M	M	L
CO 3	L	L	H	H	M
CO 4	H	H	M	L	H
CO 5	H	M	H	M	L

H-High; M-Medium; L-Low

18UCSPHA301	**ALLIED III: PROGRAMMING IN C (For the students of B.Sc., Physics)**	**SEMESTER – III**

Course Objectives:

The course aims

- To understand the basic principles of Programming.
- To develop logical thinking that helps to create programs.

Credits: 2 **Total Hours: 50**

UNIT	CONTENTS	Hrs.	CO
I	**Overview of C:** History of C – Importance of C–Sample Programs – Basic Structure of C Programs – Executing a 'C' program. **Constants, Variables, and Data Types:** Introduction – Character Set - C Tokens – Keywords and Identifiers - Constants - Variables – Data Types – Declaration of Variables– Declaration of Storage Class - Defining Symbolic Constants - Overflow and Underflow of Data. **Operators and Expressions:** Arithmetic Operators – Relational Operators - Logical Operators - Assignment Operators - Increment and Decrement Operators - Conditional Operator - Bitwise Operators – Special Operators – Arithmetic Expressions - Evaluation of Expressions - Precedence of Arithmetic Operators - Type Conversions in Expressions.	10	CO 1
II	**Managing Input and Output Operations:** Reading a Character – Writing a Character - Formatted Input - Formatted Output. **Decision Making and Branching:** Decision making with IF statement – Simple IF statement – The IF…..ELSE statement – Nesting of IF…..ELSE statements– The ELSE IF Ladder – The Switch Statement– The?: Operator – The GOTO Statement. **Decision Making and Looping:** The WHILE statement–The DO statement – The FOR statement – Jumps in LOOPS.	10	CO 2
III	**Arrays:** Introduction – One – Dimensional Arrays – Declaration of One – Dimensional Arrays - Initialization of One – Dimensional Arrays– Two – Dimensional Arrays - Initializing Two – Dimensional Arrays–Multi – Dimensional Arrays – Dynamic Arrays. **Character Arrays and Strings:** Declaring and Initializing String Variables - Reading Strings from Terminal – Writing Strings	10	CO 3

	to Screen - Arithmetic Operations on Characters – Putting Strings Together - Comparison of Two Strings – String Handling Functions.		
IV	**User - defined Functions:** Need for User - Defined Function - A Multi - Function Program - Elements of User - Defined Function - Definition of Functions - Return Values and their Types - Function Calls - Function Declaration - Category of Functions - No Arguments and No Return Values – Arguments but No Return Values– Arguments with Return Values–No Arguments but Returns a Value– Functions that Return Multiple Values – Nesting of Functions - Recursion - Passing Arrays to Functions - Passing Strings to Functions – The Scope, Visibility and Life time of Variables. **Structures and Unions:** Defining Structure - Declaring Structure Variables Accessing Structure Members - Structure Initialization – Copying and Comparing Structure Variables – Operations on Individual Members - Array of Structures - Arrays within Structures – Structures within Structures - Structures and Functions - Unions - Size of Structures - Bit Fields.	10	CO 4
V	**Pointers:** Introduction- Understanding Pointers- Declaring Pointer Variable- Initialization of Pointer Variables- Accessing a Variable through its Pointer- Pointers and Arrays- Pointers as Function Arguments- Pointers and Structures. **File Management in C:** Introduction– Defining and Opening a File – Closing a File - Input/output Operations on Files - Error Handling During I/O Operations - Random Access to Files – Command Line Arguments.	10	CO 5

Text Book

1. *Balagurusamy, E*. 2009. **Programming in ANSI C.** [Fourth Edition]. Tata Mc-Graw Hill, New Delhi.

Reference Books

1. *Yashavant P.Kanenetkar*.2012. **Let Us C**. [12th Revised and Updated Edition],BPB Publications, New Delhi
2. *Dr.S.Ramasamy and P. Radha Ganesan.* 2014. *[Second Edition]* **Programming in C**. Sci Tech Publications, India Pvt. Limited.

3. *J.B.Dixit. 2011. [First Edition].* **Basics of C Programming**. Laxmi Publications Pvt. Limited.
4. *Sukhendu Dey Debobrata Duffa.* 2013. **Complete Knowledge in C**. [Second Reprint], Narosa Publishing House Pvt. Limited.

Web References:

1. https://www.tutorialspoint.com
2. https://www.w3schools.in/c-tutorial
3. https://studytonight.com
4. https://programming simplified.com
5. https://cprogramming.com

COURSE OUTCOMES (CO)

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

CO 1	Know the basic terminology of C Programming
CO 2	Develop programs using control structures
CO 3	Understand the Arrays and String handling functions
CO 4	Understand the various categories of functions and structures with its usage
CO 5	Develop the program using file concepts

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	M	M	M	H	H
CO 2	M	M	M	H	H
CO 3	M	M	M	H	H
CO 4	M	M	M	H	H
CO 5	M	M	M	H	H

H-High; M-Medium; L-Low

18UPHMP301	**CORE PRACTICAL III: PRACTICAL PHYSICS - III**	**SEMESTER – III**

Course Objectives:

The course aims

- To enhance the experimental skills of the students in taking measurements using telescope, spectrometer, potentiometer, magnetometers, etc.,
- To impart knowledge on heat, light and electricity.

Credits: 2 **Total Hours: 30**

Ex.No.	**LIST OF EXPERIMENTS**	**Hrs.**	**CO**
1.	Determination of *e/m* by Thomson's method.	3	CO 1
2.	Copper voltameter – determination of B_H.	3	
3.	Field along the axis of the coil – Vibration magnetometer.	3	
4.	Determination of m and B_H – Tan C position.	3	
5.	Field along the axis of the coil – deflection magnetometer.	3	
6.	Post Office Box – Temperature Co-efficient of Thermistor.	3	
7.	Absorption spectra of iodine vapour – determination of dissociation energy.	3	CO 2
8.	Solar spectrum – determination of absorption lines.	3	
9.	Spectrometer – Hartmann's interpolation formula.	3	
10.	VI Characteristics of Solar cell.	3	CO 3

Text Book

1. *Srinivasan, M.N, Balasubramanian, S* and *Ranganathan, R.* 2004. **A Book for Study of Practical Physics**. S. Chand & Co. New Delhi.

Reference Books

1. *Usha Rani, Subbarayan, A* and *Somasundaram.* 2007. **Practical Physics**. APSARA Publication, Trichy.
2. B.Sc., Physics Laboratory Manual of the year 2018 – 2019.

COURSE OUTCOMES (CO)

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

CO 1	Determine the various physical parameters such as temperature coefficient, dislocation of energy in molecules, specific charge of the electron, Earth magnetic field and magnetic induction etc.,
CO 2	Examine the Hartmann's theory and measure the wavelength of spectral lines from natural light source.
CO 3	Apply the knowledge of semiconductor thin films in conversion of energies.

18UCSPHAP301	**ALLIED PRACTICAL III: PROGRAMMING IN C (For the students of B.Sc. Physics)**	**SEMESTER – III**

Course Objectives:

The course aims

- To acquire the knowledge of C language.
- To develop basic programming skills.

Credits: 2 **Total Hours: 24**

Ex.No.	CONTENTS	Hrs.	CO
1.	Program to Find the Sum of N Natural Numbers.	2	CO 1
2.	Program to Check whether a Given Number is Prime or Not.	2	CO 2
3.	Program to Find the Roots of Quadratic Equation.	2	CO 2
4.	Program to Reverse the Given Number	2	CO 3
5.	Program to Sort the Given Numbers in Ascending or Descending Order.	2	CO 3
6.	Program to Generate Fibonacci Series.	2	CO 3
7.	**Matrix Manipulation** a. Program to Perform Matrix Addition. b. P r o g r a m to Perform Matrix Subtraction. c. Program to Perform Matrix Multiplication. d. Program to Perform Matrix Transpose.	2	CO 3
8.	**String Handling** a. Program to Reverse a Given String. b. Program to Check whether the Given String is Palindrome or Not.	2	CO 4
9.	Program to Find the Factorial using Recursion.	2	CO 4
10.	Program to Implement the Concept of Structures.	2	CO 4
11.	Program to Implement the Concept of Union.	2	CO 4
12.	Program for Random File Organization.	2	CO 5

Web References:

1. https://www.tutorialspoint.com
2. https://www.w3schools.in/c-tutorial
3. https://studytonight.com
4. https://programming simplified.com
5. https://cprogramming.com

COURSE OUTCOMES (CO)

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

CO 1	Develop simple programs.
CO 2	Implement various control structures.
CO 3	Develop program using Arrays.
CO 4	Implement Function, Structure and Union concepts.
CO 5	Develop program using files.

18UPHSBC301	**SBC I: INSTRUMENTATION**	**SEMESTER – III**

Course Objectives:

The course aims

- To provide a fundamental knowledge in measurements.
- To impart a knowledge on the functioning of the instruments

Credits: 2 **Total Hours: 25**

UNIT	CONTENTS	Hrs.	CO
I	**Basic Concept of Measurement:** Introduction – System configuration – Problem Analysis – Basic Characteristics of measuring devices – Calibration.	5	CO 1
II	**Measurement of Physical Quantities:** Force – Measuring Sensor – Pressure – Radiations – Load cell – Column – Type – Devices – Cantilever Beam – Torque Measurement – Absorption Type – Transmission Type – Stress Type – Deflection Type.	5	CO 2
III	**Input/Output Devices and Displays :** Introduction – Analog display and recorder – Graphic recorder – Optical oscillograph – Digital input – output devices – Punched card – Bar code – Line printer – Ink-Jet printer – Digital tape recording.	5	CO 3
IV	**Basic Meter Movements:** Permanent magnetic moving coil movements – Practical PMMC movements – Taut band instrument **Display Devices:** Light Emitting Diodes (LED) – Liquid Crystal Display (LCD) – Gas discharge Plasma displays – Segmental display LED's.	5	CO 4
V	**Digital Instruments:** Introduction – Digital Multi meter – Digital panel meters – Digital measurement of time – Universal counter – Digital pH Meter.	5	CO 5

Text Book

1. *C. S. Rangan, G. R. Sharma, V. S. V. Mani*. 2008. **Instrumentation Devices and Systems**, Tata McGraw-Hill Publishing Company Ltd, New Delhi.

Reference Books

1. *H. S. Kalsi*. 1995. **Electronic Instrumentation**, Tata McGraw-Hill Publishing Company Ltd, New Delhi.
2. *Anderson, Norman. A.* 2010. **Instrumentation for Process Management and Control**. [Third edition], CRC Press, Florida.

Web References:
1. http://www.nptel.ac.in 2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO 1	Obtain the basic knowledge of instrumentations and its troubleshooting problems.
CO 2	Describe the physical quantities of measurements.
CO 3	Identify the various types of basic functions of input; output based analog, digital and optical recording display devices.
CO 4	Explain about magnetic based moving coil instruments and light display diode devices.
CO 5	Operate modern electrical and electronic instruments and find faults and test various instrument.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	M	L
CO 2	H	H	M	M	L
CO 3	L	L	H	H	M
CO 4	H	H	M	L	H
CO 5	H	M	H	M	L

H-High; M-Medium; L-Low

18ULS301	CAREER COMPETENCY SKILLS – I	SEMESTER – III

Course Objectives:

The course aims

- To understand the basic needs of Communication.
- To utilize the communication skills for achieving at the time of Interview.

Credits: - **Total Hours: 15**

UNIT	CONTENTS	Hrs.	CO
I	Basic Grammar – Usage of English – Listening and Speaking (Level-1) Tenses and Voices (Present, Past and Future)	3	CO 1
II	Sentence Correction – Sentence Pattern - Reading Comprehension (Level -1)	3	CO 2
III	Expansion of Proverbs – Closet Test (Level -1)	3	CO 3
IV	Sentence Improvement (Essay Writing, Now- a –Days Vocabulary), Story Writing	3	CO 4
V	E-Mail Building (Sending call letters), Letters (Formal and Informal)	3	CO 5

Text Books

1. *Anne Seaton, Mew Y. H.* **Basic English Grammar for English-Book 1.** Learners Saddle point Publishers.
2. *Mark Newson.* **Basic English Syntax with Exercises.** (E-Copy)

Reference Book

1. *Chand S, Agarwal R. S.* **Objective General English.** Arihant Publications (India) Limited.

COURSE OUTCOMES (CO)

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

CO 1	Recall the basic grammar in English.
CO 2	Concentrate on Sentence Correction.
CO 3	Understand Paragraph Writing.
CO 4	Improve the ability of Sentence Construction and Story Writing.
CO 5	Format Web Writing and Formal Writing of letters.

18UTALA401	**Tamil – IV: சங்க இலக்கியம் - நீதி இலக்கியம்**	**பருவம் - IV**

இப்பாடத்திட்டத்தின் நோக்கங்களாவன:

- சங்க இலக்கியம், அற இலக்கியங்களின் சிறப்பைஉணர்த்துதல்.
- இலக்கண நூல்களைகாலவரிசைப்படிஅறியச் செய்தல்.
- அணி இலக்கணத்தின் சிறப்பைஉணரச் செய்தல்.

Credits: 3 **Total Hours: 50**

UNIT	CONTENTS	Hrs.	CO
I	**எட்டுத்தொகை** அ. நற்றிணை–அன்னாய் வாழிப்பத்து (பாடல் எண். 208, 209, 210) ஆ.குறுந்தொகை–யாயும் ஞாயும் (பாடல் எண்.40) இ. கலித்தொகை–ஆற்றுதல் என்பதொன். (பாடல் எண்.103) ஈ. புறநானூறு–பல்சான்றீரேபல்சான்றீரே (பாடல் எண்.195)	10	CO 1
II	**பத்துப் பாட்டு** அ. குறிஞ்சிப்பாட்டு (1 முதல் 106 அடிகள் வரை) -கபிலர்	12	CO 2
III	**அற இலக்கியங்கள்** அ. நாலடியார் -பாடல் எண் (35,59,94,141,333) ஆ.நான்மணிக்கடிகை - பாடல் எண் (04,09,59,69,80) இ. பழமொழி-பாடல் எண் (05,21,120,149,361) ஈ. சிறுபஞ்சமூலம் - பாடல் எண் (05,17,48,83,99)	10	CO 3
IV	**இலக்கியவரலாறு** அ. சங்க இலக்கிய நூல்கள் அறிமுகம் ஆ.முச்சங்கவரலாறு இ. தமிழ் இலக்கண நூல்கள் அறிமுகம் ஈ. அற இலக்கியங்கள் அறிமுகம்	10	CO 4
V	**இலக்கணம்** அ. அணி இலக்கணம் 1. உவமைஅணி 2. உருவகஅணி 3. வேற்றுமைஅணி 4. வஞ்சப்புகழ்ச்சிஅணி ஆ.அகத்திணைகள்,புறத்திணைகள் - விளக்கம்	8	CO 5

Text Book

1. தமிழ்த்துறை வெளியீடு, கே.எஸ்.ரங்கசாமி கலை அறிவியல் கல்லூரி (தன்னாட்சி), திருச்செங்கோடு.

COURSE OUTCOMES (CO)

இப்பாடத்தைக் கற்பதன் வாயிலாக மாணவர்கள் பெறும் பயன்களாவன:

CO 1: எட்டுத்தொகை நூல்களின் சிறப்பை அறிதல்
CO 2: பத்துப்பாட்டு நூல்களின் சுவை அறிதல்
CO 3: அற இலக்கியங்கள் பற்றிஅறிதல்.
CO 4: இலக்கியங்கள் தோற்றமுறையை அறிதல்
CO 5: அணி இலக்கணத்தின் பயன் பற்றிஅறிதல்.

18UENLA401	**FOUNDATION ENGLISH – IV**	**SEMESTER – IV**

Course Objectives

The course aims

- To promote communication skills through literature.
- To enhance the language learning through activities.

Credits: 3 **Total Hours: 50**

UNIT	CONTENTS	Hrs.	CO
I & II	**ONE ACT PLAY** Monica Thorne - The King Who Limped **PROSE** A.G. Gardiner - On Shaking Hands **GRAMMAR** Punctuation **COMPOSITION** Hints Development **COMMUNICATION SKILLS** Breaking the Law Honoring the Person	**20**	**CO1 & CO2**
III & IV	**ONE ACT PLAY** Ella Adkins – The Unexpected **PROSE** Minoo Masani - No Man is an Island **GRAMMAR** Conditional Clause **COMPOSITION** Report Writing **COMMUNICATION SKILLS** Brain Storming	**20**	**CO3 & CO4**
V	**PROSE** Arnold Toynbee - India's Contribution to World Unity **GRAMMAR** Simple, Compound and Complex Sentences **COMPOSITION** Jumbled Sentences **COMMUNICATION SKILLS** Role-Play	**10**	**CO5**

Text Books
1. *K.S. Ramamurthy*. 1984. **Seven-Act Plays**. Published in India by Oxford University. New Delhi–110 001. 2. *G. Damodar, D. Venkateshwarlu, M. Narendra, M. SaratBabu, G.M. Sundaravalli. 2009*. **English For Empowerment**. Published by Orient Blackswan Private Limited. Hyderabad –500 029. 3. *V. SasiKumar, V. Syamala*. 2006. **Form and Function - A Communicative Grammar for Colleges.** Emerald Publishers. Chennai–600 008. 4. *T.M. Farhathullah.* 2006. **Communication Skills for Undergraduates**. RBA Publications. Chennai–600 015.
Reference Book
1. *Raymond Murphy.* 1994. **Intermediate English Grammar.** Cambridge University India Pvt. New Delhi.

COURSE OUTCOMES (CO)

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

CO 1	Understand the text on the basis of close reading analytically and critical views.
CO 2	Ability to construct a sustained sophisticated and original argument on a specific topic.
CO 3	Acquire language skills through composition.
CO 4	Acquire both composition and communication skills.
CO 5	Apply basic communication skills.

18UPHM401	**CORE VI: BASIC ELECTRONICS**	**SEMESTER – IV**

Course Objectives:

The course aims

- To provide fundamental knowledge regarding semiconductors, diodes, rectifiers, transistor and amplifiers.
- To provide basic concepts regarding oscillators, Special semiconductor devices and operational amplifiers.

Credits: 5 **Total Hours: 50**

UNIT	CONTENTS	Hrs.	CO
I	**Semiconductors and diodes:** Classification of solids in terms of forbidden energy gap – Intrinsic and extrinsic semiconductor – PN junction diode – Biasing of PN junction – VI Characteristics of diode – Rectifiers – Half wave – full wave and bridge rectifiers – Break down mechanisms – Zener diode characteristics of Zener diode – Zener diode as voltage regulator.	10	CO 1
II	**Transistors:** Transistor Types - different modes of operation - Characteristics in CE - CC and CB modes - Transistor biasing - Base bias - Emitter bias - Voltage divider bias - Emitter follower. **Transistor Amplifier:** Two port representations of a transistor - h-parameters - RC coupled amplifier - Frequency response - Classification of amplifiers - Class A power amplifier – Push pull - Class B power amplifier.	10	CO 2
III	**Feedback and Oscillators:** Theory Feedback in amplifier - Effect of negative feedback - Concept of feedback oscillators – Hartley - Colpitt's - Phase shift and Wein bridge oscillators - Expressions for frequency of oscillation and condition for oscillation in each case	10	CO 3
IV	**Special Semiconductor Devices:** Light Emitting Diode (LED) and its applications - Photo diode - Characteristic of photodiode – Applications - Field Effect Transistor (FET) – Types - JFET – Working principle of JFET - JFET parameters - Comparison between JFET and Transistor – Applications of JFET - MOSFET – Working principle of MOSFET.	10	CO 4
V	**Operational Amplifiers:** Introduction - Characteristics of an ideal Op-Amp - Differential amplifier - Common mode rejection ratio – Virtual ground – Inverting amplifier – Noninverting amplifier – Adder – Substractor – Integrator – Differentiator.	10	CO 5

Text Book
1. *Metha, V.K. and Shalu Metha.* 2006. **Principles of Electronics**. [Tenth Edition]. S. Chand, New Delhi.
Reference Books
1. *Millman Halkias and Parikh*. 2011. **Integrated Electronics.** [Second Edition]. Tata McGraw Hill Ltd. 2. *Robert*, L. Boylestad, Louis Nashelsky 2009. **Electronic Devices and Circuit Theory**. Dorling Kinderslay (India) Private Limited. 3. *Sedha, R.S.* 2013. **A Textbook of Digital Electronics**. [Fifth Edition]. S. Chand, New Delhi. 4. *Theraja ,B.L.* 2005. **Basic Electronics**. [Fifth Edition]. S. Chand, New Delhi.
Web References:
1. http://www.nptel.ac.in 2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO1	Comprehend the operating principles of special semiconductor devices and optoelectronic devices.
CO2	Describe the basic principle and characterization of transistors of for current and voltage amplification process.
CO3	Know the concept of feedback amplification process and various oscillator circuits.
CO4	Demonstrate the switching and amplification application of the semiconductor devices.
CO5	Describe the ideal and practical operational amplifier their electrical parameters, need for op-amp. Explain different application circuits using op- amp.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	M	M
CO 2	H	H	M	M	L
CO 3	M	M	H	H	M
CO 4	H	H	M	L	H
CO 5	H	M	H	M	L

H-High; M-Medium; L-Low

18UCHPHA401	**ALLIED IV: CHEMISTRY**	**SEMESTER – IV**

Course Objectives:

The course aims

- To understand the basic concepts about the bonding in chemicals.
- To empathize the reaction mechanism in organic compounds.
- To analyze the types of coordination compounds and its applications.
- To infer basic knowledge about volumetric analysis.
- To understand the basic concepts of cells and batteries.

Credits: 2 **Total Hours: 30**

UNIT	CONTENTS	Hrs.	CO
I	**Chemical Bonding:** Types of bonding – Examples - Ionic bond - Covalent bond - Co-ordinate bond – Hybridization - Elementary ideas – Examples - Hydrogen bond – Types – Examples - Consequences of Hydrogen bonding - Molecular orbital theory - Types of Molecular orbitals - Basic ideas - M.O.diagram of Hydrogen molecule - Helium molecule.	6	CO 1
II	**Reaction and Mechanism:** Aliphatic nucleophilic substitution reaction - Mechanism of SN^1 and SN^2 reaction – Aromatic compounds – Aromaticity - Huckel's rule - Electrophilic substitution reaction in Benzene - Mechanism of nitration, halogenation, sulphonation, Friedel-craft alkylation and Friedel-craft acylation.	6	CO 2
III	**Co-ordination Chemistry:** Definition – classification of ligands - Werner's theory - Sidgwick's theory - Effective atomic number - Pauling's theory (VB theory) – Chelation - Chelate effect – Hemoglobin - definition and biological role – Chlorophyll - definition and biological role – EDTA - its applications.	6	CO 3
IV	**Volumetric Analysis:** Important terminologies - Basic requirements of a titration reaction - Expressing concentration of solution - Primary standard - Acid base titration - Their indicators - Statistical Evaluation – Error - Types of error - Methods of minimizing error - Normal error curve – Accuracy – Precision - Significant figure.	6	CO 4
V	**Electrochemistry:** Kohlrausch's law - measurment of conductance - determination of pH - Conductometric titration - Hydrolysis of salts - Elementary ideas – Examples - Galvanic	6	CO 5

	cell - Galvanic cell – EMF - Standard electrode potential - Electrochemical series - its applications - Principal of electroplating – Corrosion - Corrosion prevention.		

Text Books

1. *Madan.R.L.*2010 **Chemistry for Degree Students**. S. Chand and company Ltd, New Delhi.
2. *Puri.B.R. Sharma.L.R. and Pathania. M.S.*1998. **Principles of Physical Chemistry**, Thirty seventh Edition, Shoban Lal Nagin Chand and Co. Jalandar.

Reference Books

1. *Lee J.D.* 1996 **A New Concise Inorganic Chemistry**, Fifth Edition, Chapmann and Hall, London.
2. *Morrison R.T. and Boyd.R.N.*1992. **Organic Chemistry**, Sixth Edition, Prentice-Hall of India (P) Ltd, New Delhi.
3. *Mukherjee.S.M. Singh.S.P. and Kapoor.R.P.* 1985. **Organic Chemistry**, First Edition, New Age International (P) Ltd, New Delhi.

Web References:

1. http://www.nptel.ac.in
2. https://ocw.mit.edu/courses/chemistry/

COURSE OUTCOMES (CO)

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

CO 1	Acquire knowledge about the theories and types of chemical bonding.
CO 2	Evaluate the basic principles of reaction mechanism in organic compounds.
CO 3	Recall inorganic concepts of ligands and the theory behind the applications.
CO 4	Revise the basic concepts of quantum chemistry and utilize the principles of quantum chemistry.
CO 5	Formulate the laboratory techniques and prepare solutions for practicals.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	M	M	H	L
CO 2	L	H	M	M	M
CO 3	M	L	H	H	L
CO 4	L	L	L	L	L
CO 5	M	H	H	H	H

H-High; M-Medium; L-Low

18UPHMP401	**CORE PRACTICAL IV: PRACTICAL PHYSICS - IV**	**SEMESTER – IV**

Course Objectives:

The course aims

- To provide basic skill to the students in constructing circuits.
- To impart knowledge on basic electronics**.**

Credits: 2 **Total Hours: 30**

Ex.No.	**LIST OF EXPERIMENTS**	**Hrs.**	**CO**
1.	Zener diode – VI–Characteristics, Breakdown voltage and voltage regulator.	3	CO 1
2.	Bridge rectifier with voltage regulator.	3	
3.	Characteristics of FET.	3	
4.	Characteristics of transistor.	3	
5.	Inverting and Non-Inverting Amplifier Basics using OP-AMP	3	CO 2
6.	Addition and subtraction using Op-Amp.	3	
7.	Carey Foster's bridge – Resistance and Specific resistance of coil.	3	CO 3
8.	Potentiometer - EMF of a thermocouple.	3	
9.	Figure of merit – Table Galvanometer.	3	
10.	Hartley oscillator – frequency of the wave.	3	

Text Book

1. *Srinivasan, M.N, Balasubramanian, S* and *Ranganathan, R.* 2004. **A Book for Study of Practical Physics**. S. Chand & Co. New Delhi.

Reference Books

1. *Usha Rani, Subbarayan, A* and *Somasundaram.* 2007. **Practical Physics**. APSARA Publication, Trichy.
2. *Arora, C.L.* 1995**. B.Sc., Practical Physics.** S. Chand & Co. New Delhi.
3. *Ouseph.C.C, Rao.U.J, Vijayendran, S.* 2009. **Practical Physics and Electronics.** Viswanathan, S., Printers & Publishers Pvt Ltd, Chennai.
4. B.Sc., Physics Laboratory Manual of the year 2018 – 2019.

COURSE OUTCOMES (CO)

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

CO 1	Analyze the basic characterization of semiconductor devices.
CO 2	Examine the arithmetic and logical operations through the digital circuits.
CO 3	Determine the specific resistance, electro motive force, voltage and current sensitiveness of the circuits.

18UCHPHAP401	**ALLIED PRACTICAL IV: CHEMISTRY (For B.Sc., Physics)**	**SEMESTER – IV**

Course Objectives:

The course aims

- To enable the students to acquire the quantitative skills in volumetric analysis.

Credits: 2 **Total Hours: 30**

No. Exp.	**CONTENTS**	**Hrs.**	**CO**
	Titrimetric Quantitative Analysis		
1.	Estimation of Sodium Hydroxide using standard sodium carbonate.	3	
2.	Estimation of HCl using standard oxalic acid.	3	
3.	Estimation of Borax using standard sodium carbonate.	3	
4.	Estimation of Ferrous sulphate using Mohr's salt.	3	
5.	Estimation of Oxalic acid using standard oxalic acid	3	
6.	Estimation of Potassium permanganate using standard oxalic acid.	3	CO1
7.	Estimation of Ferrous ion using Diphenylamine as internal indicator.	3	
8.	Estimation of copper sulphate using standard potassium dichromate.	3	
9.	Estimation of hardness of water using standard sodium carbonate.	3	
10.	Estimation of calcium using EDTA method.	3	

Text Books

1. *Venkateswaran V, Veeraswamy R., Kulandaivelu A.R.*, 1997. **Basic Principles of Practical Chemistry**, New Delhi, Second edition, Sultan Chand & Sons, New Delhi.
2. *Kamboj, P.C.* 1999. **University Practical Chemistry**. Vishal Publications, Jalandar, Punjab.

COURSE OUTCOMES (CO)

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

CO 1	Analyse quantitatively by titration techniques.

18UPHSBC401	**SBC II: LASER PHYSICS**	**SEMESTER – IV**

Course Objectives:

The course aims

- To provide a fundamental knowledge in LASERs.
- To impart a knowledge working of various LASERs and its applications.

Credits: 2 **Total Hours: 25**

UNIT	CONTENTS	Hrs.	CO
I	**Fundamentals of LASER:** Spontaneous emission – Stimulated emission – Meta stable state – Population inversion – Pumping – Laser Characteristics – Einstein's relation.	5	CO 1
II	**Production of LASER:** Helium – Neon Laser – Ruby Laser – CO_2 Laser– Semiconductor Laser.	5	CO 2
III	**Industrial Applications of LASER:** Laser cutting – Welding – Drilling - Printing – Scanning – Holography – Recording and reconstruction of hologram.	5	CO 3
IV	**Lasers in Communication:** Optic fibre communication – Optical fibre and its types – Block diagram of fibre optic communication system – Advantages of fibre optic communication.	5	CO 4
V	**LASER in Medicine:** Lasers in Surgery – Lasers in ophthalmology – Lasers in cancer treatment – Imaging - laser safety and hazard.	5	CO 5

Text Book

1. *Avadhanulu, M. N. and Hemne P.S.* 2012. **An introduction to LASERS Theory and Applications**. [Second Edition]. S. Chand & Company, New Delhi.

Reference Books

1. *Silfvas,* ***W.*** 1996. **Laser Fundamentals**. [Second Edition], Cambridge University Press, London.
2. Thyagarajan K. and Ghatak. A.K.1939. **LASER Theory and Application.** Macmillan, India Ltd.

Web References:

1. http://www.nptel.ac.in
2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO 1	Explain the basic principle of laser emission.
CO 2	Comprehend and explain the principles and design considerations of various (solid state and gas) lasers, modes of their operation.
CO 3	Describe the applications of laser in industries.
CO 4	Obtain the knowledge on applications of laser in medical field.
CO 5	Know the significance of modern lasers in communication networking system.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	M	L
CO 2	H	H	M	M	L
CO 3	H	L	H	H	M
CO 4	H	H	M	L	H
CO 5	H	M	H	M	H

H-High; M-Medium; L-Low

18ULS401	CAREER COMPETENCY SKILLS – II	SEMESTER – IV

Course Objectives:

The course aims

- To impart knowledge on the aptitude skills.
- To enhance employability skills and to develop career competency.

Credits: - **Total Hours: 15**

UNIT	CONTENTS	Hrs.	CO
I	Aptitude: Speed Maths - Multiplication of Numbers - Simplification - Squaring of numbers - Square roots and cube roots – HCF & LCM –Decimals - Averages, Powers and Roots.	3	CO 1
II	Aptitude: Problems on Numbers – Problems on Ages – Surds & Indices – Percentage – Profit & Loss – Ratio & Proportion – Partnership – Chain Rule.	3	CO 2
III	Aptitude: Simple & Compound Interest – Alligation or Mixture - Permutation and Combination.	3	CO 3
IV	Aptitude: Probability – Missing Number series – Wrong Number Series – Races & Games of Skill.	3	CO 4
V	Aptitude: Time & Work – Pipes & Cistern – Time & Distance – Problems on Trains – Boats and Streams.	3	CO 5

Text Book

1. *R.S. Aggarwal.* 2017. **Quantitative Aptitude**, *S Chand and Company Limited, New Delhi.*

Reference Book

1. *Abhijith Guha.* 2015. **Quantitative Aptitude for Competitive Examinations**, *5th Edition, Tata McGraw Hill, New Delhi.*

COURSE OUTCOMES (CO)

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

CO 1	Carry out mathematical calculations using shortcuts.
CO 2	Calculate problems on age, surds and indices with shortcuts.
CO 3	Understand the core concepts of SI and CI, Permutation and Combination.
CO 4	Obtain knowledge on shortcuts to calculate number series.
CO 5	Perform new methods for aptitude calculations.

NMEC OFFERED BY THE DEPARTMENT

18UPHNM301	**NMEC I: LASER AND ITS APPLICATIONS**	**SEMESTER – III**

Course Objectives:

The course aims

- To provide a fundamental knowledge in LASERs.
- To impart a knowledge working of various LASERs and its applications.

Credits: 2 **Total Hours: 25**

UNIT	CONTENTS	Hrs.	CO
I	**Fundamentals of LASER:** Spontaneous emission – Stimulated emission – Meta stable state – Population inversion – Pumping – Laser Characteristics – Einstein's relation.	5	CO 1
II	**Production of LASER:** Helium – Neon Laser – Ruby Laser – CO_2 Laser– Semiconductor Laser.	5	CO 2
III	**Industrial Applications of LASER:** Laser cutting – Welding – Drilling - Printing – Scanning – Holography – Recording and reconstruction of hologram.	5	CO 3
IV	**Lasers in Communication:** Optic fibre communication – Optical fibre and its types – Block diagram of fibre optic communication system – Advantages of fibre optic communication.	5	CO 4
V	**LASER in Medicine:** Lasers in Surgery – Lasers in ophthalmology – Lasers in cancer treatment – Imaging - laser safety and hazard.	5	CO 5

Text Book

1. *Avadhanulu, M.N.* and *Hemne, P.S.* 2012. **An Introduction to LASERS Theory and Applications,** [Second Edition], S. Chand & Company, New Delhi.

Reference Books

1. Silfvas, W. 1996. **Laser Fundamentals**, [Second Edition], Cambridge University Press, London.
2. Thyagarajan, K. and Ghatak, A.K. 2002. **LASER Theory and Application**, Mac-Millan Ltd. India.

Web References:

1. http://www.nptel.ac.in
2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO 1	Explain the basic principle of laser emission.
CO 2	Comprehend and explain the principles and design considerations of various (solid state and gas) lasers, modes of their operation.
CO 3	Describe the applications of laser in industries.
CO 4	Obtain the knowledge on applications of laser in medical field.
CO 5	Know the significance of modern lasers in communication networking system.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	M	L
CO 2	H	H	M	M	L
CO 3	H	L	H	H	M
CO 4	H	H	M	L	H
CO 5	H	M	H	M	H

H-High; M-Medium; L-Low

18UPHNM401	**NMEC II: APPLIED PHYSICS**	**SEMESTER – IV**

Course Objectives:

The course aims

- To provide the basic knowledge on Applied Physics.
- To impart knowledge on the real time application of Physics.

Credits: 2 **Total Hours: 25**

UNIT	CONTENTS	Hrs.	CO
I	**Acoustics:** Origin of sound - Reflection of sound - Transmission of sound –Reverberant - Acoustics properties of auditorium - Optimum reverberation -Acoustics recording in studio.	5	CO 1
II	**Ultrasonics:** Ultrasonic waves - Piezoelectric effect - Ultrasound and animals -Detection and applications of ultrasonic waves in industrial and medical – Non-destructive testing applications.	5	CO 2
III	**Laser:** An Introduction - Spontaneous emission - Stimulated emission - Stimulated absorbance - Population inversion - Ruby laser – CO_2 laser – Semiconductor laser – Characteristics of laser - Applications of Laser -Holography.	5	CO 3
IV	**Fibre Optics:** Introduction-optical fibre – classification of optical fibre - Advantages of optical fibre cables over metallic based cables - Applications of optical fibre.	5	CO 4
V	**Electromagnetic Induction:** Faraday's law – Induced EMF and current – Lenz's law – Self-induction – Mutual induction - AC generator – Eddy current - Applications – Transformer.	5	CO 5

Text Books

1. *Neeraj Mehta,* 2011, **Applied Physics for Engineers, PHI learning Private Limited,** New Delhi. (Unit – I,II,III,V).
2. *Murugeshan. R.* 1995. **Electricity and Magnetism.** [First Edition]. S. Chand & Co, New Delhi. (Unit – IV)

Reference Books

1. *Francis A Jenkins* and *Harvey E White*. 2011. **Fundamentals of Optics.** [Fourth Edition].TMH,New Delhi.
2. *Ajay Ghatak*, 1998. **Optics** , Tata McGraw-Hill publishing Co. Ltd., New Delhi.
3. *Avadhanula, M.N.* 2001. **An Introduction to Laser Theory and Application.** S. Chand & Company, New Delhi.
4. *Murugesan, R.* 2007. **Modern Physics.** S. Chand & Company Limited, New Delhi.
5. *Murugesan, R.* Revised 2012. **Properties of Matter** S. Chand & Company Limited, New Delhi.

Web References:
1. http://www.nptel.ac.in 2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO 1	Know the acoustic properties of sound.
CO 2	Acquire the knowledge on ultrasonic waves and its applications.
CO 3	Know about working and applications of lasers.
CO 4	Comprehend the application of laser in optical fibre communication.
CO 5	Apply the electromagnetic induction and its applications.

MAPPING

PSO / CO	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO 1	H	H	M	M	M
CO 2	H	H	M	M	L
CO 3	M	M	H	H	M
CO 4	H	H	M	L	H
CO 5	H	M	H	M	H

H-High; M-Medium; L-Low

ADD-ON COURSE OFFERED BY THE DEPARTMENT

18UPHAC301	**ADD-ON COURSE I: FUNDAMENTALS OF ASTROPHYSICS**		**SEMESTER – III**
Course Objectives: The course aims • To enhance the basic knowledge in astrophysics and astronomical developments.			
Non-Credit			**Total Hours: 25**
UNIT	**CONTENTS**	**Hrs.**	**CO**
I	**Introductory Astronomy:** History of Astronomy: Overview of the major constituents of the Universe: Solar system, Planets – Laws of motion of planets, Inner planets, Outer planets – Black body radiation.	5	CO 1
II	**Galactic Astronomy:** Milky way - Hubble classification of galaxies – Spiral galaxies, Elliptical galaxies, Irregular galaxies, Dwarf galaxies; Masses of galaxies – Rotation curves of galaxies; Dark matter.	5	CO 2
III	**Cosmology:** Distances – Direct distances – Trigonometric parallax: Indirect distances –Expansion of the Universe – Hubbles law, red shift: Newtonian cosmology; Microwave Background, Early universe.	5	CO 3
IV	**Interstellar Medium:** Discovery of interstellar gas and dust – Galactic distribution of ISM – Phases of ISM, Pressure equilibrium – Models of the ISM: Thermal stability and equilibrium.	5	CO 4
V	**Solar System:** The sun – Physical and Orbital data - Photosphere – Chromo sphere – Corona – Solar prominences – Sunspot – Solar flare - Mass and temperature of the sun – Solar constant– Source of solar energy - Solar wind – Others members of the solar system – Moon Bode's law – Asteroids - Comets – Meteors.	5	CO 5
Text Books			
1. *Spitzer,* L. 1998. **Physical Processes in the Interstellar Medium**, John Wiley and Sons, Switzerland. 2. *Baidyanath Basu.* 2001. **An Introduction to Astrophysics**, [second Printing], Prentice – Hall of India Private Limited, New Delhi.			

Reference Books
1. *Shu* F., 1982. **The Physical Universe**. Wiley. University of California. 2. *Harwit Martin* M. 2006**. Astrophysical concepts.** [Fourth Edition]. America. 3. *Rybicki, G. B* and *Lightman, A. P.* 1985. **Radiative Processes in Astrophysics**. California.
Web References:
1. http://www.nptel.ac.in 2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO 1	Explain fundamental concepts in astrophysics.
CO 2	Know about the main features and formation theories of the various types of observed galaxies, in particular the milkyway.
CO 3	Describe basic cosmological models to predict the age and structure of the universe for various geometries.
CO 4	Explain about interstellar matter in the milkyway and its typical density.
CO 5	Acquire knowledge on features of objects in the solar system.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	M	L
CO 2	H	H	M	M	M
CO 3	L	L	H	H	M
CO 4	H	H	M	L	H
CO 5	H	M	H	M	L

H-High; M-Medium; L-Low

18UPHAC401	**ADD-ON COURSE II: ASTRONOMICAL TECHNIQUES**	**SEMESTER – IV**

Course Objectives:

The course aims

- To enhance the basic knowledge in astronomical techniques.

Non-credit **Total Hours: 25**

UNIT	CONTENTS	Hrs.	CO
I	**Stellar Evolution and Stars:** Birth and death of the star – Chandrasekhar limit – Wide dwarfs – Neutron stars – Black holes – Quasars – Nebulae – Super nova binary stars – Origin of binary stars. Variable stars – Cepheid variables – RV Tauri variables – Flare stars.	5	CO 1
II	**Magnitudes, Distance and Spectral Classification of Stars:** Magnitude and brightness – Relation – Apparent and absolute magnitude of stars– Luminosities of stars – Measurement of stellar distance - Distance from red shift measurement – HR diagram – Pogson's relation	5	CO 2
III	**Detectors:** Photo detection (photo electric effect, photo sensitive elements), Photo multiplier tube, detectors at different wavelength and their properties (CCD, CMOS, ICCD, L3CCD, Photon – counting system), spectral response, Noise, Background, signal to noise ratio, sensitivity, Quantum efficiency.	5	CO 3
IV	**Telescopic Techniques:** Different telescope designs (Refracting and reflecting telescope) – Astrometry, Photometry, imaging spectroscopy – Calibration polarimetry – High resolution technique – Atmospheric effects on optical imaging – Aperture synthesis with single telescope.	5	CO 4
V	**High Resolution Techniques:** Atmospheric effects on optical imaging, speckle interferometery, aperture synthesis with single telescope, image reconstruction techniques, adaptive optics - Michelson stellar interferometery and intensity interferometery, long baseline optical interferometery.	5	CO 5

Text Books

1. *Baidyanath Basu*. 2001. **An Introduction to Astrophysics**, [Second Printing], Prentice – Hall of India private limited, New Delhi.
2. *Bradley, W.C.* and *Ostlie Dale, A*. 2006. **An Introduction to Modern Astrophysics.** [Second Edition], USA.

Reference Books
1. *Smart, W.M.* 1977. **Spherical Astronomy,** [Sixth Edition], Cambridge University Press, California. 2. *Shu,* F. 1982. **The Physical Universe**. Wiley. University of California.
Web References:
1. http://www.nptel.ac.in 2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO 1	Know about the stellar evolution, including red giants, supernovas, neutron stars, white dwarfs and black holes, using evidence and presently accepted theories.
CO 2	Know fundamental theories that explain star properties, distance and magnitudes and evolution of the universe and planetary systems.
CO 3	Demonstrate the detection of stars and planets through modern astrophysical observation.
CO 4	Explain astronomical features and observations obtained via telescopic observations and data prediction.
CO 5	Predict the phases of neighboring planets based on their relative positions and the location using high resolution telescopic techniques.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	M	M
CO 2	H	H	M	M	M
CO 3	M	L	H	H	M
CO 4	H	H	M	M	H
CO 5	H	M	H	M	L

H-High; M-Medium; L-Low

ADVANCED LEARNERS COURSE OFFERED BY THE DEPARTMENT

18UPHAL401	**ADVANCED LEARNERS COURSE I: PLASMA PHYSICS**	**SEMESTER – IV**

Course Objectives:

The course aims

- To provide fundamental knowledge on plasma state of the system.
- To provide a knowledge on applications of plasma

Credits: 4 **Total Hours: -**

UNIT	CONTENTS	Hrs.	CO
I	**Basics of Plasmas:** Breakdown mechanism of gases - Gaseous discharge - Characteristic of dc Glow discharge - Positive column - Cathode sheath - Negative glow - Negative glow and Faraday dark space.	-	CO 1
II	**Plasma Parameters:** Definition of plasma - Electron and ion temperature - Plasma potential - Sheath formation and floating substrate - Debye shielding - Contact Potential - Sheath formation and Bohm criterion - Cathode sheath – Plasma oscillations.	-	CO 2
III	**Plasma Production**: Limitations of dc glow discharges - RF discharges - Inductive discharges - Power transfer efficiency - Matching network – Electron - Cyclotron resonance discharges - - Characteristics and application of respective discharges - Hollow cathode discharge.	-	CO 3
IV	**Controlled Fusion:** Fission - Fusion and energy needs - Lawson criterion - Magnetic confinement fusion devices - Plasma as a fluid - Plasma heating - Current drive - Low hybrid current drive (LHCD) - Ion Cyclotron Resonance Heating (ICRH) - Laser and heavy ion beams fusion.	-	CO 4
V	**Plasma Applications:** Medium and short wave communication - Plasma processing of materials - Laser ablation - Laser driven fusion - Magnetic fusion.	-	CO 5

Text Book

1. *Lieberman, M.A. and Lichtenberg, A.J.* 2005. **Principles of Plasma Discharges and Material Processing.** John Wiley & Sons, New Jersey.

Reference Books

1. *John P.I.* 2005. **Plasma Science and the Creation of Wealth.** Tata McGrow-Hills, New Delhi.

2. *Chen F.F.* 1984. **Plasma Physics and Controlled Fusion**. *Plenum Press, New York.*

Web References:

1. http://www.nptel.ac.in
2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO 1	Know the basic concepts of plasma physics.
CO 2	Realizes the physics behind plasma and various forms of plasma
CO 3	Acquires knowledge of the various plasma diagnostics technique.
CO 4	Comprehends the physics of modeling plasmas as fluid and plasma fusion.
CO 5	Acquires knowledge of the wave propagation in plasmas

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	M	L
CO 2	H	H	M	M	L
CO 3	M	L	H	H	M
CO 4	M	H	M	L	H
CO 5	L	M	H	H	H

H-High; M-Medium; L-Low

GUIDELINES
MARK DISTRIBUTION

1. SUBMISSION OF RECORD NOTE BOOKS AND PROJECT DISSERTATION:

Candidates appearing for Practical and Project & Viva-Voce Examinations shall submit Bonafide Record Note Books/ Dissertation prescribed for Practical/ Project Viva-Voce Examinations, otherwise the candidates will not be permitted to appear for the Practical/ Project Viva-Voce Examinations.

2. PASSING MINIMUM AND INTERNAL MARK DISTRIBUTION (Theory, Practical and Project)

(i) THEORY: The candidate shall be declared to have passed the Examination, if the candidate secure not less than 40 marks put together out of 100 in the Comprehensive Examination in each Theory paper with a passing minimum of 30 marks in External out of 75.

Internal Marks Distribution [CA - Total Marks: 25]

Attendance	:	05 Marks
Assignment (3 Assignments)	:	05 Marks
Internal Examinations	:	15 Marks
Total	**:**	**25 Marks**

(ii) PRACTICAL: The candidate shall be declared to have passed the Examination, if the candidate secure not less than 40 marks put together out of 100 in the Comprehensive Examination in each Practical paper with a passing minimum of 24 marks in External out of 60.

Internal Marks Distribution [CA - Total Marks: 40]

Experiments	:	10 Marks
Attendance	:	05 Marks
Record Submission	:	05 Marks
Internal Examinations	:	20 Marks
Total	:	**40 Marks**

External Marks distribution [CE - Total Marks: 60]

Formula, symbol representation	:	10 Marks
Circuit , model graph	:	10 Marks
Observation	:	20 Marks
Calculation	:	10 Marks
Viva-Voce	:	05 Marks

Result	: 05 Marks
Total	**: 60 Marks**

(iii) **CAREER COMPETENCY SKILLS (CCS)**

CCS – I : Viva Voce – Semester III

- The student has to come in proper dress code and he/she should bring 2 copies of resume for the Viva Voce
- The student may be asked to
  - Give Self introduction
  - Submit the resume to the examiner(s) and answer the questions based on it.
  - Speak on any given topic for at least two minutes.
  - Give a presentation for 10 minutes on a topic of their choice.
  - Sit with other students in a group for a discussion.

CCS – II : On Line Objective Examination (Multiple Choice Questions) – Semester IV

- 100 questions-100 minutes
- Twenty questions from each UNIT.
- On line examination will be conducted at the end of I Semester.

3. QUESTION PAPER PATTERN: (Theory: for 75 Marks)

1. PART – A (10 x 2 = 20 Marks)
   - Answer ALL questions.
   - Two questions from each UNIT.
2. PART – B (5 x 5 = 25 Marks)
   - Answer ALL questions.
   - One question from each UNIT with Internal choice.
3. PART – C (3 x 10 = 30 Marks)
   - Answer ANY THREE questions
   - Open Choice – 3 out of 5 questions
   - One question from each UNIT

ALLIED COURSE OFFERED BY THE DEPARTMENT

18UPHMAA101	**ALLIED I: PHYSICS I** **(For B.Sc., Mathematics Students)**		**SEMESTER – I**
Course Objectives: The course aims • To impart knowledge on the basic principles of Mechanics. • To inculcate the concepts of various properties of matter.			
Credits: 2			**Total Hours: 40**
UNIT	**CONTENTS**	**Hrs.**	**CO**
I	**Mechanics:** Projectile - Range up and down an inclined plane - Maximum range - Impulse and impact - Laws of impact - Coefficient of restitution - Direct impact between two spheres - Compound pendulum – Theory – Determination of acceleration due to gravity.	8	CO 1
II	**Properties of Matter:** Newton's law of gravitation – Determination of gravitational constant – Boy's method – Bending of beams – Expressions for bending moment – Theory of uniform and nonuniform bending - Torsion expression for couple per unit twist - Torsion pendulum – Theory - Surface tension and interfacial surface tension by drop weight method.	8	CO 2
III	**Heat:** Postulates of kinetic theory of gases – Vander Waal's equation - Derivation of critical constants in terms of Vander Waal's constants – Expressions for Vander Waal's constants - Thermal conductivity of a bad conductor - Lee's disc method – Joule-Thomson effect - Porous plug experiment - Theory - Liquefaction of Helium by K. Onnes method - Properties of Helium I and Helium II.	8	CO 3
IV	**Optics:** Interference - Air wedge - Thickness of a wire - Jamin's Interferometer - Rayleigh's Interferometer - Polarization - Nicol prism as a polarizer and analyzer - Specific rotary power and its determination – Diffraction – Principle – Bragg's law - Fresnel's and Fraunhofer diffraction. **Sound:** Laws of transverse vibration of strings - Sonometer - Musical sound and noise - Characteristic of musical sound.	8	CO 4

V	**Electricity and Magnetism:** Potentiometer - Low range voltmeter and ammeter calibration - Theory of moving coil ballistic galvanometer – Determination of current and voltage sensitivities - Comparison of capacitances – Magnetic susceptibility - magnetic permeability - Properties of dia, para, ferro magnetic materials.	8	CO 5

Text Books

1. *Murugesan, R. 2007.* **Allied Physics - I.** S. Chand & Company. New Delhi.
2. *Kamalakannan, D.* and *Rangarajan. C.* 1992. **Allied Physics Part - I.** [First Edition] S. Viswanathan Printers and Publishers Pvt. Ltd., Chennai.

Reference Books

1. *Brijlal* and *Subramanian.* 2004. **Optics.** S. Chand & Company. New Delhi.
2. *Mathur, D.S.* 1991. **Heat and Thermodynamics.** [Fifth Edition] Sultan Chand & Sons. New Delhi.
3. *Murugesan. R.* 2005. **Mechanics and Mathematical Method.** [Second Edition]. S. Chand & Company, New Delhi.
4. *Murugeshan. R.* 1995. **Electricity and Magnetism.** [First Edition]. S. Chand & Co, New Delhi

Web References:

1. http://www.nptel.ac.in

COURSE OUTCOMES (CO)

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

CO 1	Comprehend the motion of objects in various range and collision between them with suitable law.
CO 2	Apply knowledge of the properties of matter to understand the natural physical processes and related technological advances.
CO 3	Explain the basic concepts of heat like temperature measurement and specific heat measurement.
CO 4	Acquire the knowledge on light and sound.
CO 5	Describe the fundamentals of electricity and magnetism.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	M	M
CO 2	M	H	M	M	L
CO 3	M	L	H	H	M
CO 4	M	H	M	L	H
CO 5	L	M	H	H	H

H-High; M-Medium; L-Low

18UPHMAA201	**ALLIED II: PHYSICS II** **(For B.Sc., Mathematics Students)**	**SEMESTER – II**

Course Objectives:

The course aims

- To impart knowledge on the basic principles of Atomic Physics, Nuclear Physics, Basic Electronics and Digital Electronics.
- To impart knowledge on the basic principles of laser optics and spectroscopy.

Credits: 2 **Total Hours: 40**

UNIT	CONTENTS	Hrs.	CO
I	**Atomic Physics:** Bohr Atom model - Spectral series of hydrogen - Vector atom model - Spatial quantization - Spinning electron - Quantum numbers associated with vector atom model - Coupling schemes – LS coupling - JJ Coupling – Pauli's exclusion principle - Example of electron configuration - Photoelectric effect - Laws - Einstein's equation.	8	CO 1
II	**Nuclear Physics:** Radioactivity - Properties of α, B, γ rays – Laws of radioactivity - Half-life and Mean-life - Nuclear models –Liquid drop model - Semi-empirical mass formula - Merits and demerits - Shell model – Evidences - Nuclear radiation detectors – Ionization chamber – G.M counter - Particle accelerator - Cyclotron – Synchrocyclotron.	8	CO 2
III	**LASER Physics:** LASER - Characteristics of laser – Theory of laser – Population inversion – Optical pumping – Construction and working of: Ruby laser – He-Ne laser – Semiconductor laser – Application of laser. **Spectroscopy:** Types of spectra - Emission and absorption spectra - Raman Effect – Quantum theory of Raman Effect – Experimental study of Raman Effect – Application of Raman effect.	8	CO 3
IV	**Basic Electronics:** Junction diode - Zener diode – Characteristics – Half & Full wave rectifiers - Construction and characteristics of transistors (common emitter only) - Oscillators - Hartley oscillator - Astable multivibrator - Construction and characteristics of FET.	8	CO 4
V	**Digital Electronics:** Binary, Octal, Hexadecimal numbers and their conversion – Basic logic gates, their truth tables - Laws of	8	CO 5

	Boolean algebra – De'Morgan's theorem - NAND/NOR as universal blocks.		

Text Book

1. *Murugesan. R. 2007.* **Allied Physics - II.** S. Chand & Company. New Delhi.

Reference Books

1. *Murugesan, R.* 2007. **Modern Physics.** S. Chand & Company Limited, New Delhi.
2. *Metha, V.K.* 2002. **Principles of Electronics**. [Eleventh Edition] S. Chand & Company Limited, New Delhi.
3. *Avadhanula, M.N.* 2001. **An Introduction to Laser Theory and Application.** S. Chand & Company, New Delhi.
4. *Brijlal and Subramanian*. 2005. **Atomic and Nuclear Physics.** S. Chand & Company Limited, New Delhi.

Web References:

1. http://www.nptel.ac.in
2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO 1	Know the basic principles of atomic structure of atom, photo electricity and atom models.
CO 2	Acquire knowledge in nuclear physics related various theoretical models.
CO 3	Assess the properties of new laser systems based on knowledge of their design and spectroscopy applications.
CO 4	Know the unique vocabulary associated with electronics and explain the basic concepts of semiconductor devices.
CO 5	Comprehend the concepts of number systems, logic gates and Boolean algebraic functions.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	H	H	H
CO 2	H	H	H	H	H
CO 3	M	L	M	H	M
CO 4	M	H	M	L	H
CO 5	L	M	H	H	H

H-High; M-Medium; L-Low

18UPHCHA301	**ALLIED III: PHYSICS I** **(For B.Sc., Chemistry Students)**	**SEMESTER – III**

Course Objectives:

The course aims

- To impart knowledge on the basic principles of Mechanics.
- To inculcate the concepts of various properties of matter.

Credits: 2 **Total Hours: 35**

UNIT	CONTENTS	Hrs.	CO
I	**Mechanics:** Projectile - Range up and down an inclined plane - Maximum range - Impulse and impact - Laws of impact - Coefficient of restitution - Direct impact between two spheres - Compound pendulum – Theory – Determination of acceleration due to gravity.	7	CO 1
II	**Properties of Matter:** Newton's law of gravitation – Determination of gravitational constant – Boy's method – Bending of beams – Expressions for bending moment – Theory of uniform and nonuniform bending - Torsion expression for couple per unit twist - Torsion pendulum – Theory - Surface tension and interfacial surface tension by drop weight method.	7	CO 2
III	**Heat:** Postulates of kinetic theory of gases – Vander Waal's equation - Derivation of critical constants in terms of Vander Waal's constants – Expressions for Vander Waal's constants - Thermal conductivity of a bad conductor - Lee's disc method – Joule-Thomson effect - Porous plug experiment - Theory - Liquefaction of Helium by K. Onnes method - Properties of Helium I and Helium II.	7	CO 3
IV	**Optics:** Interference - Air wedge - Thickness of a wire - Jamin's Interferometer - Rayleigh's Interferometer - Polarization - Nicol prism as a polarizer and analyzer - Specific rotary power and its determination – Diffraction – Principle – Bragg's law - Fresnel's and Fraunhofer diffraction. **Sound:** Laws of transverse vibration of strings - Sonometer - Musical sound and noise - Characteristic of musical sound.	7	CO 4
V	**Electricity and Magnetism:** Potentiometer - Low range voltmeter and ammeter calibration - Theory of moving coil ballistic galvanometer – Determination of current and voltage sensitivities - Comparison of capacitances – Magnetic	7	CO 5

	susceptibility - magnetic permeability - Properties of dia, para, ferro magnetic materials.		

Text Books

1. *Murugesan, R. 2007.* **Allied Physics - I.** S. Chand & Company. New Delhi.
2. *Kamalakannan, D.* and *Rangarajan. C.* 1992. **Allied Physics Part - I.** [First Edition] S. Viswanathan Printers and Publishers Pvt. Ltd., Chennai.

Reference Books

1. *Brijlal* and *Subramanian.* 2004. **Optics.** S. Chand & Company. New Delhi.
2. *Mathur, D.S.* 1991. **Heat and Thermodynamics.** [Fifth Edition] Sultan Chand & Sons. New Delhi.
3. *Murugesan. R.* 2005. **Mechanics and Mathematical Method.** [Second Edition]. S. Chand & Company, New Delhi.
4. *Murugeshan. R.* 1995. **Electricity and Magnetism.** [First Edition]. S. Chand & Co, New Delhi

Web References:

1. http://www.nptel.ac.in
2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO 1	Comprehend the motion of objects in various range and collision between them with suitable law.
CO 2	Apply knowledge of the properties of matter to understand the natural physical processes and related technological advances.
CO 3	Explain the basic concepts of heat like temperature measurement and specific heat measurement.
CO 4	Acquire the knowledge on light and sound.
CO 5	Describe the fundamentals of electricity and magnetism.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	M	L
CO 2	M	H	M	M	L
CO 3	M	L	H	H	M
CO 4	M	H	M	L	H
CO 5	L	L	H	H	H

H-High; M-Medium; L-Low

18UPHCHA401	**ALLIED IV: PHYSICS II** **(For B.Sc., Chemistry Students)**	**SEMESTER – IV**

Course Objectives:

The course aims

- To impart knowledge on the basic principles of Atomic Physics, Nuclear Physics, Basic Electronics and Digital Electronics.
- To impart knowledge on the basic principles of laser optics and spectroscopy.

Credits: 2 **Total Hours: 35**

UNIT	CONTENTS	Hrs.	CO
I	**Atomic Physics:** Bohr Atom model - Spectral series of hydrogen - Vector atom model - Spatial quantization - Spinning electron - Quantum numbers associated with vector atom model - Coupling schemes – LS coupling - JJ Coupling – Pauli's exclusion principle - Example of electron configuration - Photoelectric effect - Laws - Einstein's equation.	7	CO 1
II	**Nuclear Physics:** Radioactivity - Properties of α, B, γ rays – Laws of radioactivity - Half-life and Mean-life - Nuclear models –Liquid drop model - Semi-empirical mass formula - Merits and demerits - Shell model – Evidences - Nuclear radiation detectors – Ionization chamber – G.M counter - Particle accelerator - Cyclotron – Synchrocyclotron.	7	CO 2
III	**LASER Physics:** LASER - Characteristics of laser – Theory of laser – Population inversion – Optical pumping – Construction and working of: Ruby laser – He-Ne laser – Semiconductor laser – Application of laser. **Spectroscopy:** Types of spectra - Emission and absorption spectra - Raman Effect – Quantum theory of Raman Effect – Experimental study of Raman Effect – Application of Raman effect.	7	CO 3
IV	**Basic Electronics:** Junction diode - Zener diode – Characteristics – Half & Full wave rectifiers - Construction and characteristics of transistors (common emitter only) - Oscillators - Hartley oscillator - Astable multivibrator - Construction and characteristics of FET.	7	CO 4
V	**Digital Electronics:** Binary, Octal, Hexadecimal numbers and their conversion – Basic logic gates, their truth tables - Laws of	7	CO 5

	Boolean algebra – De'Morgan's theorem - NAND/NOR as universal blocks.		

Text Book

1. *Murugesan. R. 2007.* **Allied Physics - II.** S. Chand & Company. New Delhi.

Reference Books

1. *Murugesan, R.* 2007. **Modern Physics.** S. Chand & Company Limited, New Delhi.
2. *Metha, V.K.* 2002. **Principles of Electronics**. [Eleventh Edition] S. Chand & Company Limited, New Delhi.
3. *Avadhanula, M.N.* 2001. **An Introduction to Laser Theory and Application.** S. Chand & Company, New Delhi.
4. *Brijlal and Subramanian*. 2005. **Atomic and Nuclear Physics.** S. Chand & Company Limited, New Delhi.

Web References:

1. http://www.nptel.ac.in
2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO 1	Know the basic principles of atomic structure of atom, photo electricity and atom models.
CO 2	Acquire knowledge in nuclear physics related various theoretical models.
CO 3	Assess the properties of new laser systems based on knowledge of their design and spectroscopy applications.
CO 4	Know the unique vocabulary associated with electronics and explain the basic concepts of semiconductor devices.
CO 5	Comprehend the concepts of number systems, logic gates and Boolean algebraic functions.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	H	M	M
CO 2	H	M	M	M	M
CO 3	M	L	M	H	M
CO 4	M	H	M	L	H
CO 5	L	M	H	H	H

H-High; M-Medium; L-Low

18UPHMAAP101 / 18UPHCHAP301	**ALLIED PRACTICAL I: PHYSICS I / ALLIED PRACTICAL III: PHYSICS I (for B.Sc., Maths and B.Sc., Chemistry Students)**	**SEMESTER – I / SEMESTER – III**

Course Objectives:

The course aims

- To provide basic skills in measurements using microscope, telescope, spectrometer, potentiometer etc.
- To impart knowledge in properties of matter, light and electricity.

Credits: 2 **Total Hours: 30**

Ex.No.	**LIST OF EXPERIMENTS**	**Hrs.**	**CO**
1.	Young's modulus - Non - uniform bending – Scale and telescope.	3	CO 1
2.	Torsion pendulum – Rigidity modulus - without masses.	3	
3.	Compound pendulum – Gravity and radius of gyration.	3	
4.	Surface tension and interfacial surface tension – Drop weight method.	3	
5.	Potentiometer – Calibration of low range voltmeter.	3	
6.	Figure of merit of a galvanometer (Table galvanometer).	3	
7.	Thermal Conductivity – Lee's disc method	3	
8.	Spectrometer - Dispersive power of a prism (Angle of prism is given).	3	
9.	Sonometer - Frequency of a fork.	3	
10.	Air wedge – Thickness of a wire.	3	

Text Book

1. *Srinivasan, M.N, Balasubramanian, S* and *Ranganathan, R.* 2004. **A Book for Study of Practical Physics**. S. Chand & Co. New Delhi.

Reference Books

1. *Usha Rani, Subbarayan, A* and *Somasundaram.* 2007. **Practical Physics**. APSARA Publication, Trichy.
2. B.Sc., Physics Laboratory Manual of the year 2018 – 2019.

COURSE OUTCOMES (CO)

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

CO 1	Analyze the various physical parameters such as length and thickness, stress, strain and elastic limit needed to achieve a given amount of deformation in the given material using vernier scale, micrometer screw gauge and the travelling microscope, pin & microscope method and scale & telescope method.

18UPHMAAP201 / 18UPHCHAP401	**ALLIED PRACTICAL II: PHYSICS II / ALLIED PRACTICAL IV: PHYSICS II (for B.Sc., Maths and B.Sc., Chemistry Students)**	**SEMESTER – III / SEMESTER – IV**

Course Objectives:

The course aims

- To provide basic skills in physical properties of the materials using microscope, telescope, spectrometer, potentiometer etc.
- To impart knowledge in properties of matter, light and electricity.

Credits: 2 **Total Hours: 30**

Ex.No.	LIST OF EXPERIMENTS	Hrs.	CO
1.	Torsion pendulum – Rigidity modulus – with masses	3	CO 1
2.	Young's modulus - Uniform bending – Scale and telescope	3	
3.	Potentiometer –Calibration of high range Ammeter.	3	
4.	Spectrometer - Grating - wavelength of Mercury spectrum.	3	
5.	Newton's ring –Radius of curvature.	3	
6.	Zener diode – VI–Characteristics, Breakdown voltage and voltage regulator.	3	CO 2
7.	Bridge rectifier with voltage regulator.	3	
8.	Characteristics of FET.	3	CO 3
9.	Basic logic gates - Verification of truth tables.	3	
10.	NAND and NOR as universal gates.	3	

Text Book

1. *Srinivasan, M.N, Balasubramanian, S* and *Ranganathan, R.* 2004. **A Book for Study of Practical Physics**. S. Chand & Co. New Delhi.

Reference Books

1. *Usha Rani, Subbarayan, A* and *Somasundaram.* 2007. **Practical Physics**. APSARA Publication, Trichy.
2. *Arora, C.L.* 1995**. B.Sc., Practical Physics.** S. Chand & Co. New Delhi.
3. *Ouseph.C.C, Rao.U.J, Vijayendran, S.* 2009. **Practical Physics and Electronics.** Viswanathan, S., Printers & Publishers Pvt Ltd, Chennai.
4. B.Sc., Physics Laboratory Manual of the year 2018 – 2019.

COURSE OUTCOMES (CO)

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

CO 1	Analyze the various physical properties of the various materials.
CO 2	Analyze the basic characterization of semiconductor devices.
CO 3	Examine the arithmetic and logical operations through the digital circuits.

18UPHM501	**CORE VII: ELECTRICITY AND ELECTROMAGNETISM**	**SEMESTER – V**

Course Objectives:

The course aims

- To impart knowledge on basic concepts of Electricity and Electromagnetism.
- To enhance the student's skill in basic concepts of Electrostatics, D.C circuits and AC circuits.

Credits: 5 **Total Hours: 50**

UNIT	CONTENTS	Hrs.	CO
I	**Electric Field:** Flux of electric field – Gauss's law (statement and proof) – Differential form of Gauss law – Application: Electric field due to uniformly charged sphere – Coulomb's theorem – Mechanical force experienced by unit area of a charged conductor – Deduction of Coulomb's inverse square law from Gauss's law. **Electric Potential:** Potential at a point due to point charge – Relation between electric field and electric potential – Electric potential energy – Potential at a point due to uniformly charged conducting sphere.	10	CO 1
II	**Electrostatics:** Capacitance - Principle - Types of capacitors - Capacitance of a Spherical, Cylindrical and Parallel plate capacitor - Effect of dielectric – Energy stored in a capacitor - Loss of energy due to sharing of charges - Force of attraction in parallel plate capacitor.	10	CO 2
III	**DC Circuit:** Growth and decay of current in resistance and inductance - Growth and decay of charge in resistance and capacitor - LCR circuit - Condition for the discharge to be oscillatory - Frequency of oscillation.	10	CO 3
IV	**Alternating Currents:** Peak average and RMS values of AC voltage and current - Power factor and current values in an AC circuit containing LCR (reactance and impedance) series and parallel resonant circuits - Power in an AC circuit - Wattless current - Choke coil - Construction and working of transformers (step up & down) - Energy losses and uses – Skin effect - Tesla coil.	10	CO 4
V	**Electromagnetism :** Ampere's circuital law – Magnetic field inside a long solenoid - Moving coil ballistic galvanometer -	10	CO 5

	Theory - Application to determine absolute capacity - Faraday's laws of electromagnetism - Lenz's law - Self-inductance and mutual inductance - Expression for self-inductance of a coil - Mutual inductance between two coils - Anderson's method - Absolute mutual inductance - co-efficient of coupling.		

Text Book

1. *Murugeshan, R.* 2017. **Electricity and Magnetism**. [10th Edition]. S. Chand & Co, New Delhi.

Reference Books

2. *Brijal and Subrahmanyam.* 1994. **A book for study of Electricity and Magnetism** [Twelfth Edition]. Ratan Prakashan Mandir educational and University Publishers, New Delhi.
3. *Jackson, J. D.* 1999. **Classical Electrodynamics.** [Third Edition]. BPB Publisher, New Delhi.
4. *Tiwari, K.K.* 1987. **Electricity and Magnetism** [First Edition]. S. Chand & Co., New Delhi.
5. *Richard J Fowler*. 1998. **Electricity: Principles and Applications**. [Fourth Edition]. Tata McGrawHill Publishing Company Ltd., New Delhi.

Web References:

1. http://www.nptel.ac.in
2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO 1	Obtain the fundamental properties of the electric charge and the electric potential within a framework of distributed symmetric charge distributions.
CO 2	Understand electrostatic charges and its application.
CO 3	Measuring the growth and decay of charges in various combination inductance, resistance and capacitor.
CO 4	Knowing the peak, average value of RMS in AC containing LCR circuits and its energy losses.
CO 5	Obtain the knowledge of electromagnetism.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	L	L
CO 2	H	M	M	M	L
CO 3	M	M	M	H	M
CO 4	H	H	M	L	H
CO 5	M	M	L	L	L

H-High; M-Medium; L-Low

18UPHM502	**CORE VIII: SOLID STATE PHYSICS**	**SEMESTER – V**

Course Objectives:

The course aims

- To impart knowledge on the structure of crystals - X ray diffraction and on theories of Magnetism.
- To provide basic concepts regarding dielectrics and modern engineering materials.

Credits: 5 **Total Hours: 50**

UNIT	CONTENTS	Hrs.	CO
I	**Crystal Structures:** Crystal lattice - Primitive and unit cell - Seven classes of crystals - Bravais lattice - Miller indices - Structure of crystals - Simple cubic Structure - Hexagonal close packed structure - Face centered cubic structure - Body centered cubic structure - Sodium chloride structure - Zinc blende structure and diamond structure.	10	CO 1
II	**X-Ray Diffraction and Crystal Defects:** Diffraction of X-rays by crystals - Bragg's law in one dimension - Experimental method of x-ray diffraction - Laue method - Rotating crystal method - Powder photograph method - Point defects - Line defects - Surface defects - Volume defects - Effects of crystal imperfections.	10	CO 2
III	**Theory Magnetism: of** Different types of magnetic materials - Classical theory of diamagnetism (Langevin's theory) - Langevin's theory of para magnetism - Weiss theory of paramagnetism - Qualitative explanation of Heisenberg's internal field and quantum theory of ferromagnetism - B_H curve – Energy loss due to magnetic hysteresis.	10	CO 3
IV	**Free Electron Theory of Metals:** Free electron theory – Drude Lorentz theory – Explanation of Ohm's law – Electrical conductivity – Thermal conductivity –Sommerfield model – Schotcky effect – Hall effect – Hall voltage and Hall coefficient – Mobility and Hall angle – Importance of Hall effect – Experimental determination of Hall coefficient.	10	CO 4
V	**Dielectrics:** Fundamental definitions in dielectrics - Different types of dielectric polarization - Frequency and temperature effects on polarization - Dielectric loss - Qualitative study of local field or internal field - Clausius-Mossotti relation -	10	CO 5

	Determination of dielectric constant - Dielectric breakdown - Properties of different types of insulating materials.		

Text Book

1. *Arumugam. M.* 2008. **Materials Science** [Third Edition], Amerada Publications, Kumbakonam.
2. *Gupta, S.L and Kumar. V.* 2009. **Solid State Physics.** [Ninth Edition]. K. Nath & Co, Meerut..

Reference Books

1. *Murugesan. R.* 2007. **Modern Physics** [Thirteenth Edition], S. Chand & Company, New Delhi.
2. *Kittel. C.* 1996**. Introduction to Solid State Physics** [Seventh Edition], John Wiley & Sons (Asia) Pvt Ltd., New Delhi.
3. *Raghava. V.* 1997. **Material Science and Engineering** [Fourth Edition], Prentice Hall of India Pvt Ltd., New Delhi.

Web References:

1. http://www.nptel.ac.in

COURSE OUTCOMES (CO)

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

CO 1	Comprehend crystal symmetry and understand the structural properties of crystals.
CO 2	Understand the basic characteristic method to analyzing the crystals structure and defects.
CO 3	Obtain the knowledge of various magnetic material based on the properties and its relevant theories.
CO 4	Understanding the concept of free electron theory and Hall effects for solid state materials.
CO 5	Knowing different types of polarization in dielectric and analyze dielectric material based on frequency, temperature and breakdown voltage

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	M	M
CO 2	H	H	L	M	L
CO 3	M	H	H	H	M
CO 4	H	H	M	L	H
CO 5	M	M	M	M	H

H-High; M-Medium; L-Low

18UPHM503	**CORE IX: MATHEMATICAL PHYSICS**	**SEMESTER – V**

Course Objectives:

The course aims

- To impart basic knowledge in Laplace transform - Matrices and Beta - Gamma functions which will be used for studies solving problems during research work.

Credits: 4 **Total Hours: 50**

UNIT	CONTENTS	Hrs.	CO
I	**Vector Analysis:** Scalar and vector fields - Gradient of scalar field - Divergence of vector field - Curl of a vector field - Vector integration - Line integral - Surface integral - Gauss divergence theorem and it's proof in the simple problems – Stoke's theorem and its proof with simple problems.	10	CO 1
II	**Matrices:** Special matrices with their properties - Rank of a matrix - Solutions to linear equations – Cramer's rule – Characteristic equation of a matrix – Eigen values and Eigen vectors – Cayley – Hamilton theorem - Sub spaces and null spaces – Transformations – Linear, similarity, unitary and orthogonal transformations	10	CO 2
III	**Beta and Gamma Functions:** Fundamental property of gamma functions – The value of gamma (1/2) and graph of the gamma function – Transformation of gamma function – Different forms of beta function - Relation between beta and gamma functions.	10	CO 3
IV	**Laplace Transforms:** Laplace transform – Definition and properties – Methods of finding Laplace transforms –Direct method - Series expansion method - Method of differential equations - Applications of Laplace transform to the solution of differential equation with constant and variable coefficients.	10	CO 4
V (Self-Study)	**Complex Analysis**: Functions of complex variables - Differentiability - Analytic function – Cauchy – Riemann condition – Differential equation – Cauchy integral theorem - Cauchy integral formula – Taylor's series.	10	CO 5

Text Book

1. *Gupta, B. D.* 2010. **Mathematical Physics**. [Fourth Edition]. Vikas Publishing House Pvt. Ltd., New Delhi.

Reference Books

1. *Kakani, S.L and Hema Rajani, C.* 1994. **Mathematical Physics.** [First Edition].

Himalaya Publishing House Ltd., Mumbai.
2. *Singaravelu, A.* 1995. **Engineering Mathematics - I.** [First Edition]. Meenakakshi Agency, Chennai.
3. *Dass, H.K* 1998. **Mathematical Physics** [First Edition] S. Chand and Company, New Delhi.
4. *Erwin kreyszig*. 2009. **Advanced Engineering Mathematics.** [Eighth Edition]. John Wiley and Sons, New York.

Web References:

1. http://www.nptel.ac.in
2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO 1	Understand the basic concepts of scalar and vector fields and also interrelation between the integrations with simple problems.
CO 2	Comprehend the knowledge of matrices and its characteristics, orthogonally conditions & transformations.
CO 3	Define and manipulate the Dirac Delta and other distributions and be able to derive their various properties.
CO 4	Understand the use of Laplace transformations to solve differential equations and its applications.
CO 5	Demonstrate the complex analysis through the physical concept.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	M	M	M	L
CO 2	H	H	M	M	L
CO 3	M	M	H	H	M
CO 4	H	H	M	L	H
CO 5	L	M	H	M	H

H-High; M-Medium; L-Low

18UPHM504	**CORE X:** **ELECTRONICS AND COMMUNICATION**	**SEMESTER – V**

Course Objectives:

The course aims

- To provide fundamentals regarding amplitude and frequency modulation.
- To enhance the students skill in communication and application.

Credits: 4 **Total Hours: 45**

UNIT	CONTENTS	Hrs.	CO
I	**Amplitude Modulation :** The elements of communication systems – The electromagnetic spectrum – Amplitude modulation principles - Modulation index - Side bands - Power distribution – Single side band communication –amplitude modulators - Balanced modulators - SSB circuits.	9	CO 1
II	**Frequency Modulation:** Frequency Modulation principle - Phase modulation –Side bands - Modulation index - Frequency Modulator - Phase modulator - Frequency demodulator.	9	CO 2
III	**Receivers:** Super heterodyne receiver – Intermediate Frequency selection and images - AM receiver - FM receiver - Communication receiver.	8	CO 3
IV	**Communication Systems:** Antenna fundamentals - Wave propagation - Satellites - Orbits - Satellite communication systems – Earth station- Microwave Techniques: Waveguide – Klystron - Reflex Klystron – Magnetron - Traveling Wave Tube.	9	CO 4
V	**Modern Communication systems and Applications:** Facsimile – Concept – Charge coupled device – Scanning mechanism – Block Diagram of Facsimile – Cellular Radio system – Cellular transmitter and receiver – RADAR – Principle – Pulsed radar – Satellite TV, Cable TV, TV Channels, DTH Technology – Interlaced – Scanning – Colour signals - Basic concept of TDMA, FDMA, LTE, 5G and FSO (Free Space Optical Communication).	10	CO 5

Text Book

1. *Frenzel and Louis.* E. 2017. **Communication Electronics**. [Third Edition]. McGraw Hill International Edition, Singapore.

Reference Books

1. *George Kennedy and Bernard Davis.* 2002. **Electronics Communication Systems**.

[Fourth Edition]. Tata McGraw –Hill Publishing Company Ltd., New Delhi.
2. *William Schweber.* 2002. **Electronic Communication system**. [Fourth Edition]. Prentice Hall Ltd., New Delhi.
3. *Dennis Roddy and John Coolen.* 2008. **Electronic Communication**. [Fourth Edition]. Prentice Hall Ltd., New Delhi.
4. Arunabha Ghosh, Jun Zhang, Jeffrey G. Andrews, Rias Muhamed. 2010. **Fundamentals of LTE.** Prentice Hall Ltd., New Delhi.
5. Erik Dahlman, Stefan Parkvall, Johan Skold, Per Beming. 2010. **3G Evolution: HSPA and LTE for Mobile Broadband Evolution.** Academic Press, Elsevier.

Web References:

1. http://www.nptel.ac.in
2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO 1	Understand the fundamentals of communication system, modulation and demodulation.
CO 2	Understand the principle of frequency modulation and phase modulation.
CO 3	Study the functioning of radio receivers.
CO 4	Understand the fundamentals of the antenna, satellite and microwave techniques.
CO 5	Learn about the advanced communication technology such as DTH, 5G and FSO concepts.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	M	M
CO 2	H	H	M	L	L
CO 3	M	M	M	H	M
CO 4	H	M	M	L	H
CO 5	H	M	H	M	L

H-High; M-Medium; L-Low

18UPHEL501	**ELECTIVE I: ENERGY PHYSICS**	**SEMESTER – V**

Course Objectives:

The course aims

- To provide fundamental knowledge on Energy Physics.
- To develop Knowledge on various Energy Generation, Utilization, and conversion methods

Credits: 4 **Total Hours: 45**

UNIT	CONTENTS	Hrs.	CO
I	**Fundamentals:** Definitions – Energy sources – Classification - Scientific principles of renewable energy – Technical implications - Principles of energy conservation - Types of energy audit - Energy conservation technologies.	9	CO 1
II	**Solar Energy:** Physical principles of the conversion of solar radiation into heat - Types of Air Heaters - Applications of Solar Air Heaters - Types of Drier - Direct and Indirect Type Solar Drier - Principle of photovoltaic conversion of solar energy - Application of Solar Energy in Space - solar pond.	9	CO 2
III	**Wind Energy:** Turbine types and terms – Characteristics of wind – Power extraction by turbine – Electricity generation – Classification of electricity systems using wind power – Mechanical power	9	CO 3
IV	**Biomass and Bio-Fuels:** Introduction – Bio fuel classification – Biomass production for energy forming – Classification - Biomass conversion technologies - Pyrolysis – Alcoholic fermentation – Wastes and residues – Social and environment aspects.	9	CO 4
V	**Energy Storage Systems:** Importance – Chemical storage – Heat storage – Electrical storage – Lead acid battery – Advantages of batteries - Hydrogen storage - Fuel cells – Mechanical storage – national energy policy - Super capacitors.	9	CO 5

Text Book

1. *John Twidell and Tony Weir.* 2013. **Renewal Energy Resources**, [Second Edition], Taylor & Francis, New York.

Reference Books

1. *Sultana, S.P*. 1997. **Solar Energy**. [Second Edition].TMH, New Delhi.
2. *Boyle.* 2004. **Renewable Energy**. [Second Edition]. Oxford University Press, UK.

3. *Kothari, D.P, Singal, K.C. and Rajan, R.* 2011. **Renewable Energy Sources and Emerging Technologies.** [Second Edition]. Prentice Hall of India, New Delhi.

Web References:

1. http://www.nptel.ac.in
2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO 1	Recognize the sources of energy and energy conservation technology.
CO 2	Understand the basic principle of energy conversion from solar into other form.
CO 3	Recognize the wind energy and principle of wind energy conversion to electrical energy.
CO 4	Understand the natural fuel like biomass energies.
CO 5	Knowing the energy storage devices.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	M	M
CO 2	H	H	M	M	L
CO 3	M	M	H	H	M
CO 4	H	H	M	L	H
CO 5	L	M	M	M	L

H-High; M-Medium; L-Low

18UPHEL502	**ELECTIVE I: GEOPHYSICS**	**SEMESTER – V**

Course Objectives:

The course aims

- To develop knowledge about Earth in terms of its physical properties such as gravity, magnetic field, surface wave, earthquakes and structure of Earth.

Credits: 4 **Total Hours: 45**

UNIT	CONTENTS	Hrs.	CO
I	**Introduction and Seismology:** Introduction - P waves - S waves - velocities - Time distance curves and the location of epicenters - Effect of boundaries - Major discontinuities and resulting phase of seismic waves - Derivation of properties from the velocities.	9	CO 1
II	**Surface Waves and Seismometry:** Rayleigh waves and Love waves - Study of Earth by surface waves - Horizontal seismograph and seismography equation – Strain seismograph.	9	CO 2
III	**Earthquakes and Gravity:** Focus – Magnitude - Frequency - Detection and prediction – Gravity - Potential (Laplace's equation and Poisson's equation) - Absolute and relative measurements of gravity - Hammond Faller method - Worden gravimeter.	9	CO 3
IV	**Geomagnetism:** Fundamental equations - Measurements: Gauss-Saturation induction magnetometers - Theories of Earth's magnetism - Dynamo theories. **Internal structure of the Earth**: Variation of mechanical properties with depth - Materials and equation of state of the interior of the earth.	9	CO 4
V	**Geochronology:** Radioactivity of the Earth – Radioactive dating of rocks and minerals geological time scale - Age of the Earth - **Geothermal Physics:** Flow of heat to the surface of the Earth - Sources of heat within the Earth - Process of heat transport - Internal temperature of the Earth.	9	CO 5

Text Book

1. *William Lowrie,* 2007. **Fundamentals of Geophysics**. [Second Edition]. Cambridge University Press, Cambridge, New York.

Reference Books

1. *Cook, A. H.,* 1973. **Physics of the Earth and Planets**. 1st Edition, McMillan Press,

London.
2. *Telford, W.M., Geldart, L.P., Sheriff , R.E.* 1990. **Applied Geophysics**. 2nd Edition, Cambridge University Press, Cambridge, New York.
3. *Garland, G.D.,* 1979. **Introduction to Geophysics**. 11th Edition, W.B. Saunder Company, London.

Web References:

1. http://www.nptel.ac.in
2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO 1	Understand the quantitative aspects of Seismology.
CO 2	Ability to interpret surface waves on the Earth.
CO 3	Determine earthquake gravity parameters.
CO 4	Understand the geomagnetic field and the principle.
CO 5	Understand the Geochronology and Geothermal Physics

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	M	M	M	L
CO 2	H	H	M	M	L
CO 3	M	M	H	H	M
CO 4	H	H	M	L	H
CO 5	M	M	L	L	L

H-High; M-Medium; L-Low

18UPHMP501	CORE PRACTICAL V: PRACTICAL PHYSICS - V	SEMESTER – V

Course Objectives:

The course aims

- To enhance the basic skills of the students in taking measurements using spectrometer, potentiometer, Ballistic Galvanometer , Tangent Galvanometer etc.,
- They also impart knowledge in light and electricity.

Credits: 2 **Total Hours: 30**

Ex.No.	LIST OF EXPERIMENTS	Hrs.	CO
1.	Measurement of (a) Resistances and Capacitance (b) AC and DC Voltages, (c) DC Current	3	CO 1
2.	Spectrometer - Narrow angled prism.	3	
3.	Potentiometer - Reduction factor of T.G.	3	
4.	B.G – Absolute determination of capacitance.	3	
5.	B.G – Comparison of mutual inductance.	3	
6.	Carey fosters bridge - Temperature coefficient of a coil.	3	CO 2
7.	Determination of band gap energy of thermistor.	3	
8.	Calibration of low range Ammeter – Potentiometer.	3	
9.	Calibration of high range Voltmeter – Potentiometer.	3	
10.	B.G – Quantity sensitiveness.	3	CO 3

Text Book

1. *Srinivasan, M.N, Balasubramanian, S* and *Ranganathan, R.* 2004. **A Book for Study of Practical Physics**. S. Chand & Co. New Delhi.

Reference Books

1. *Usha Rani, Subbarayan, A* and *Somasundaram.* 2007. **Practical Physics**. APSARA Publication, Trichy.
2. *Arora, C.L.* 1995**. B.Sc., Practical Physics.** S. Chand & Co. New Delhi.
3. B.Sc., Physics Laboratory Manual of the year 2018 – 2019.

COURSE OUTCOMES (CO)

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

CO 1	Analyze the various physical measurements of the various materials.
CO 2	Determine the charge and voltages for electrical circuits.
CO 3	Obtain basic concept of charge, potential and voltages etc.

18UPHSB501	**SBC III: SPECTROPHYSICS**	**SEMESTER – V**

Course Objectives:

The course aims

- To impart knowledge on principle, instrumentation and applications of various spectroscopy techniques.

Credits: 2 **Total Hours: 25**

UNIT	CONTENTS	Hrs.	CO
I	**Electromagnetic Spectrum:** Types of spectra - Solar spectrum – Stellar spectrum Explanation of the Fraunhofer lines. **Ultraviolet Spectroscopy:** Discovery – Sources – Detecting devices – Spectrograph for UV region: Quartz spectrograph for near UV region – Vacuum Spectrograph for extreme UV region – Applications (Elementary ideas only).	5	CO 1
II	**Microwave Spectroscopy:** Rotation of molecules - Rotational spectra of diatomic molecules - Microwave spectrometer - Applications: Determination of Bond length - Determination of atomic mass.	5	CO 2
III	**Infrared Spectroscopy:** Vibrational energy of a diatomic molecule - Infrared spectra: Preliminaries - IR spectrometer - Sample handling techniques - Applications.	5	CO 3
IV	**Raman Spectroscopy:** Discovery of Raman Effect – Experimental study of Raman Effect – Characteristics of Raman lines – Quantum theory of Raman effect – Mutual exclusion principle – Applications of Raman spectroscopy.	5	CO 4
V	**NMR Spectroscopy:** Introduction – Theory of NMR – Experimental arrangement – NMR spectrum – Applications (Elementary ideas only). **ESR Spectroscopy:** Introduction – Theory of ESR – Instrumentation – ESR spectrum – Applications (Elementary ideas only).	5	CO 5

Text Book

1. *Aruldhas, G.* 2013. **Molecular Structure and Spectroscopy**, [Second Edition], PHI, New Delhi.
2. *Kiruthiga Sivaprasath and R Murugeshan.* 2006. **Optics and Spectroscopy**, [Sixth Revised Edition], S. Chand Publishing, New Delhi.

Reference Books
1. *Banwell. C.N.* 1972. **Fundamentals of Molecular Spectroscopy**, [Fourth Edition], Tata McGraw Hill, New Delhi. 2. *Gupta, S.L. Kumar, V. and Sharma. R.C.* 1993. **Elements of Spectroscopy**, [Ninth Edition], Pragathi Prakasahan, Meerut.
Web References:
1. http://www.nptel.ac.in 2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO 1	Understand the electromagnetic spectrum.
CO 2	Comprehend the microwave spectrum and its applications.
CO 3	Knowing the infrared spectroscopy and its applications.
CO 4	Knowing the Raman Effect and its applications.
CO 5	Understand the elementary ideas about NMR & ESR spectroscopy and its applications.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	M	M	L	L
CO 2	H	M	M	M	L
CO 3	M	M	H	H	M
CO 4	H	H	M	L	M
CO 5	M	M	M	L	L

H-High; M-Medium; L-Low

18ULS501	CAREER COMPETENCY SKILLS – III	SEMESTER – V

Course Objectives:

The course aims

- To impart knowledge on the logical reasoning.
- To enhance employability skills and to develop career competency.

Credits: - **Total Hours: 15**

UNIT	CONTENTS	Hrs.	CO
I	**Verbal Reasoning:** Number Series Completion - Alpha Series Completion - Blood Relation - Distance and Direction – Analogy – Inequality - Classification.	3	CO 1
II	**Non-Verbal Reasoning:** Series Completion - Analogy and Classification - Completion of Incompletion Pattern.	3	CO 2
III	**Non-Verbal Reasoning:** Mirror Image and Water Image – Statement and Arguments - Cubes and Dices.	3	CO 3
IV	**Reasoning:** Puzzle Arrangement - Syllogism - Input and Output.	3	CO 4
V	**Verbal Reasoning:** Linear Arrangement - Circular Arrangement – Matrix Arrangement.	3	CO 5

Text Book

1. *Aggarwal R.S, 2017.* **Test of Reasoning,** S Chand and Company Limited, New Delhi.

Reference Book

1. *Gajendra Kumar, AbhishekBanerjee,* **Verbal & Non-Verbal Reasoning For Competitive Exams,** Disha publication, New Delhi.

COURSE OUTCOMES (CO)

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

CO 1	Understand the core concepts of Verbal Reasoning.
CO 2	Formulate Non Verbal Reasoning with shortcuts.
CO 3	Find Mirror Image, Cubes and Dices.
CO 4	Obtain the knowledge on shortcuts to solve Puzzles.
CO 5	Solve Linear Arrangement and Matrices with shortcuts.

18UPHM601	**CORE XI: QUANTUM MECHANICS AND RELATIVITY**	**SEMESTER – VI**

Course Objectives:

The course aims

- To provide basic concepts in wave nature of matter - Schrodinger's equations and their applications.
- To impart fundamental knowledge in relativity - special and general theory of relativity.

Credits: 5 **Total Hours: 50**

UNIT	CONTENTS	Hrs.	CO
I	**Wave Nature of Matter:** Inadequacy of Classical mechanics - Matter waves - Phase and group velocity - Wave packet - Expression for De' Broglie wavelength - Davisson and Germar's experiment - G.P. Thomson's experiment - Electron microscope - Heisenberg's uncertainty principle - Illustration – Gamma ray microscope experiment - Diffraction of electrons through a single slit.	10	CO 1
II	**Schrödinger's Equations:** Basic postulates of wave mechanics - Schrödinger's equation - Properties of wave function - Operator formalism - Linear operators -Self-adjoint or Hermitian's operator - Properties - Expectation value - Eigen value - Eigen function - Commutator algebra - Commutation relation between position and momentum - Components of angular momentum.	10	CO 2
III	**Applications of Schrodinger's Equations:** Ehernfast's theorem - Free particle solution of Schrödinger's equation - particle in a box - Qualitative treatment (outlining steps only) of the Barrier penetration problem - Potential well – Elementary ideas - Linear harmonic oscillator.	10	CO 3
IV	**Relativity - I:** Frame of reference - Galilean transformation - Michelson-Morley experiment - Einstein's postulates of special theory of relativity - Lorentz transformation and its interpretation – Consequence of Lorentz transformation - Length Contraction - Time dilation.	10	CO 4
V	**Relativity - II:** Addition of velocities - Variation of mass with Velocity - Mass energy equation - Minkowski's four dimensional space - Examples - Space Time continuum - Four vectors - Elementary ideas of general theory of relativity –	10	CO 5

	Evidences in support of this theory.		

Text Book

1. *Sathya Prakash.* 2007. **Advanced Quantum Mechanics, [**Ninth Edition], Kedar Nath Ramnath Publishing, Meerut.
2. *R. Murugeshan, Kiruthiga Sivaprasath*. 2005. **Modern Physics**, **[**Twelfth Edition], S. Chand & Company, New Delhi.

Reference Books

1. *Aruldhas, G.* 2010. **Quantum Mechanics**. Prentice Hall of India Private Ltd, New Delhi.
2. *Sriranjan Banerji* and *Asit banerji.* 2003. **The Special Theory Of Relativity**. Prentice Hall of India Pvt Ltd., New Delhi.
3. *Leonard I. Schiff.* 2010. **Quantum Mechanics.** [Third Edition]. Tata Mcgraw Hill Edition, New Delhi.

Web References:

1. http://www.nptel.ac.in
2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO 1	Understand the basic principles of quantum mechanics.
CO 2	Understand the operator formulation and Schrodinger's equations of motion of particle and wave mechanics.
CO 3	Obtain the solution of various physical problems through Schrodinger's equation of motion of material particle.
CO 4	Understand the basic theory of relativity.
CO 5	Learning the special theory of relativity and obtain the relation between the mass-energy and four dimensional vector space etc.,

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	M	L
CO 2	H	H	M	M	L
CO 3	M	M	H	M	M
CO 4	H	H	M	L	H
CO 5	L	M	L	M	L

H-High; M-Medium; L-Low

18UPHM602	**CORE XII: NUCLEAR PHYSICS**	**SEMESTER – VI**

Course Objectives:

The course aims

- To motivate the students to analyze the utility of nuclear energy reactors, detectors and accelerators.

Credits: 5 **Total Hours: 50**

UNIT	CONTENTS	Hrs.	CO
I	**Properties of Nucleus:** Nuclear size - Measurement of nuclear radius - Mirror nuclei method - Nuclear charge - Measurement of charge by alpha scattering method – Mass density - Total angular momentum - Nuclear magnetic dipole and electric quadrople moment. **Nuclear Structure**: Models of nuclear structure - Liquid drop model (Weizacker's semi- empirical mass formula) - Nuclear shell model - Evidence for Shell model.	10	CO 1
II	**Radioactivity:** Properties of alpha, beta, gamma rays - Laws of radioactive and successive disintegration - Transient and secular equilibrium - Range of alpha particles - Geiger-Nuttal Law - Alpha spectrum and fine structure – Gamow's Theory of alpha decay - Beta ray spectra - Origin of line and continuous spectrum - Fermi theory of beta decay - K-electron capture - Nuclear Isomerism.	10	CO 2
III	**Artificial Transmutation:** Rutherford's Experiment - Bohr's theory of nuclear disintegration - Q-value equation and threshold energy for nuclear reaction - Types of nuclear reactions - Exothermic and endothermic reactions - Threshold energy of an endoergic reaction. **Neutron:** Mass – Charge – Decay - Spin - Magnetic moment Neutron diffraction - Absorption of neutrons by matter - Neutron sources - Detectors - Neutron collimator.	10	CO 3
IV	**Nuclear Fission and Fusion Reactions:** Nuclear fission - Bohr Wheeler theory - Chain reaction and multiplication factor - Critical size and critical mass – Atom bomb – Nuclear fusion - Sources of Stellar energy - Carbon-Nitrogen cycle - Proton-Proton cycle - Controlled and uncontrolled thermo nuclear reactions - Nuclear reactors and its uses.	10	CO 4

	Elementary Particles: Classification of elementary particles - Particle quantum numbers - Baryon number - Lepton number - Strangeness number - Hyper charge - Iso spin quantum number - Elementary idea of Quark model.		
V	**Nuclear Detectors and Accelerators:** Interaction between energetic particles and matter - Heavy charged particles – Electrons – Gamma ray - Solid state detector- Proportional Counter – Geiger - Muller counter - Wilson's Cloud chamber - Bubble chamber - Scintillation counter - Cyclotron – Betatron.	10	CO 5

Text Book

1. *Murugesan R.* 2007. **Modern Physics [**Thirteenth Edition] S. Chand and Company, New Delhi.

Reference Books

1. *Tayal, D. C.* 2005. **Nuclear Physics.** Himalaya Publishing House, Mumbai
2. *Brijal and Subrahmanyam N.* 1994. **Atomic and Nuclear Physics. [**Fifth Edition] S. Chand and Company, New Delhi.
3. *Pandiya M. L and Yadav R.P.S*. 2007. **Elements of Nuclear Physics.** [Seventh Edition] Kedar Nath & Ram Nath Publishers, Meerut.
4. *John R, Taylor, Chris D, Zafiratos and Michel A*. 2009. **Modern Physics.** PMI Learning Private Limited.
5. *Beiser, Mahajan and Chowdhry*. 2009. **Concepts of Modern Physics.** [Sixth edition] Tata Mc-Graw Hill Company Limited, New Delhi.

Web References:

1. http://www.nptel.ac.in
2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO 1	Identify the basic nuclear properties and outline their theoretical descriptions.
CO 2	Understand the natural of radioactivity.
CO 3	Understand the experimental evidence of decay the reaction to obtain the Q values for the different types of nuclear reactions.
CO 4	Learn the types of nuclear reactions and conservation laws, energetics of nuclear reactions for various type of cycling.
CO 5	Knowing the detection methods of nuclear reaction radiations.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	H	L
CO 2	H	H	M	M	L
CO 3	M	M	H	H	M
CO 4	H	H	M	L	H
CO 5	H	M	L	M	L

H-High; M-Medium; L-Low

18UPHM603	**CORE XIII: DIGITAL ELECTRONICS AND MICROPROCESSOR**	**SEMESTER – VI**

Course Objectives:

The course aims

- To provide knowledge in Digital electronic fundamentals- logic circuits and flip flops.
- To impart basic concepts in microprocessors.

Credits: 4 **Total Hours: 50**

UNIT	CONTENTS	Hrs.	CO
I	**Digital Electronics Fundamentals:** Number systems - Conversion from one number system to another – BCD code - Logic gates - AND - OR - NOT gates - Truth tables - Boolean Algebra - Laws - Simplification of Boolean Functions – De'Morgan's theorem - NAND - NOR gates - Universal building blocks - Binary addition – Subtraction by 1's and 2's Complement forms.	10	CO 1
II	**Simplification of Logic Circuits:** Sum of products - Product of sums - Simplification of logic equations using Boolean algebra - Simplification by Karnaugh map – Pairs - Quads - Octets - upto 4 – Variables - Half adder - Full adder - Half Subtractor and Full Subtractor - Decoder - Encoder - Multiplexer – Demultiplexer.	10	CO 2
III	**Flip Flops and Counter:** Flip Flops - RS Flip flop - JK Flip flop - D Flip flop - T Flip flop - JK Master Slave Flip flop - Shift register - Counters – Binary counter - BCD counter - Ring counter.	10	CO 3
IV	**Microprocessor 8085:** Architecture of 8085 microprocessor - Registers - Flags - ALU - Address bus and data bus Demultiplexing address / data bus - Control and status signals - Control bus - Programming model of 8085 - Pin out signal function diagram - Functions of different pins.	10	CO 4
V	**Instruction Set of 8085:** Data transfer - Arithmetic - Logic - branching and machine control group of instructions - Addressing modes - Register - Register indirect - Direct and immediate and implied addressing modes - Assembly language and machine language - Programming exercises - Addition - Subtraction - Multiplication and division.	10	CO 5

Text Book
1. *Albert Paul Malvino and Donald P. Leach.* 1986. **Digital Principles and Applications.** [Fourth Edition]. Tata Mc Graw Hill, New Delhi. 2. *Ramesh, S.Goankar,* 2006, **Microprocessor Architecture Programming & Application with 8085/8086A.** [Fifth edition]. Penram publications, New Delhi.
Reference Books
1. *Basavaraj, B.* 1998. **Digital Fundamentals**. [First Edition]. Vikas Publications House Pvt. Ltd., New Delhi. 2. *Krishna Kant*. 2007. **Microprocessors and Microcontroller: Architecture Programming and Systems Design.** [First Edition]. Prentice Hall Of India, New Delhi. 3. *Floyd*, *Thomas, L.* 2011. **Digital Fundamentals.** [Tenth edition]. Pearson, New Delhi.
Web References:
1. http://www.nptel.ac.in 2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO 1	Understand the concepts of number systems, logic gates and Boolean functions.
CO 2	Study about the simplification of logic circuits and combinational circuits.
CO 3	Understand the basic concept of sequential circuits.
CO 4	Learn about the architecture, registers and functions of 8085 microprocessor.
CO 5	Study about the instruction set and addressing mode of 8085 microprocessor with program examples.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	M	L
CO 2	H	H	M	M	L
CO 3	M	M	H	H	M
CO 4	H	H	M	L	H
CO 5	H	M	H	M	L

H-High; M-Medium; L-Low

18UPHEL601	**ELECTIVE II: PHYSICS OF NANOSCALE**	**SEMESTER – VI**

Course Objectives:

The course aims

- To understand the basic concepts of Nanoscience and its Applications in various filed.

Credits: 4 **Total Hours: 45**

UNIT	CONTENTS	Hrs.	CO
I	**Nanoscience:** Importance of nanoscale – classification of nanostructure – fundamental concept – Science behind nanoscience – Effects of nanoscale system – Particle nature of matter - Size and dimensionality effects – Quantum Confinement 1D,2D and 3D - Single electron tunneling.	9	CO 1
II	**Nanomaterials:** Fundamental concept of nanomaterials – Allotropes of carbon – Aggregated nanorods – Nanoribbons – Fullerene – Carbon nanotubes – Colloids – Nanocomposite – Nanocrystal.	9	CO 2
III	**Nano and Molecular Electronics**: Integrated circuits – Microelectro mechanical system – Nanowire – Nanocircuits – Quantum wire, well, dot – Molecular conductance – Molecular logic gates – Molecular wire – Nanorobotics.	9	CO 3
IV	**Nanotechnology in Solar/Fuel Cell:** Nanomaterials for solar cells, Dye-sensitized solar cells, Organic-inorganic hybrid solar cells, Carbon Nanotubes for energy storage, Hydrogen Storage in Carbon Nanotubes.	9	CO 4
V	**Nanomedicine:** Drug delivery – Cancer – Surgery – Visualization – Nanoparticle targeting – Neuro-electronics interfaces – Nanorobots – Cell repair machines – Nanonephrology.	9	CO 5

Text Book

1. *Phani Kumar.* 2014. **Principles of Nanotechnology**. Second Edition. Scitech Publication Pvt. Ltd. India.

Reference Books

1. *Mick Wilson, Kamali Kannangara Geoff Smit.* 2005. **Nanotechnology- (Basic science and Emerging technologies)** [First Edition] THI, London.
2. *Charles P. Poole, Jr and Frank J. Owens.* 2006. **Introduction to Nanotechnology**, John Wiley & Sons, Asia.

3. *Lynn.E, Foste.* 2006. **Nanotechnology- Science, innovation, and opportunity, [**First Edition], Pearson Education (P) Ltd, New Delhi.
4. *T. Pradeep.* 2009. **NANO the Essentials, [**Third Edition], Tata McGraw-Hill Publishing Company Ltd, New Delhi.

Web References:

1. http://www.nptel.ac.in
2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO 1	Obtain the knowledge of Nanoscience in physics point of view.
CO 2	Understand the different potentials application of nanomaterials.
CO 3	Analyze the study and application of nanomolecular electronics.
CO 4	Knowing the application of nanotechnology in energy and fuel cell.
CO 5	Recognize the nanotechnologies in nanomedicine applications.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	M	L
CO 2	H	H	M	M	L
CO 3	M	M	H	H	M
CO 4	H	H	M	L	H
CO 5	H	M	H	M	H

H-High; M-Medium; L-Low

18UPHEL602	ELECTIVE II: BIOMEDICAL INSTRUMENTATION	SEMESTER – VI

Course Objectives:

The course aims

- To introduce basic application of Physics in medical field.
- To impart knowledge regarding of medical instruments.

Credits: 4 **Total Hours: 45**

UNIT	CONTENTS	Hrs.	CO
I	**Introduction to Physiology and Anatomy:** Cell and its function - Anatomy and physiology of respiratory system - Cardio vascular system - Endocrine system -Central nervous system. **Bioelectric Phenomenon:** Basic biopotentials - Bioelectricity – Resting and action potentials - Sodium pump generation - Characteristics of electric signals from heart, brain and muscle.	9	CO 1
II	**Electrodes:** Half-cell potential - Electrode paste – Electrode material – Metal micro electrodes - Depth needle electrodes - Surface electrodes - Multi point and floating needle electrodes - Distortion in the measured signals - Chemical electrodes.	9	CO 2
III	**Diagnosing Instruments:** Computer axial tomography - Thermography – Blood pressure monitors - Respiration rate monitors - pH meters – Biomedical imaging.	9	CO 3
IV	**Recorders:** Introduction – Characteristics – Electrocardiography (ECG) – Electroencephalography (EEG) – Electromyography (EMG) – Electroretinography (ERG) - High accuracy recorders – offline analyzers – Recorders.	9	CO 4
V	**Assisting Devices:** Introduction – Pace makers – Artificial heart valves - Defibrilators – Nerve and muscle – Stimulators – Heart lung machine – Kidney machine.	9	CO 5

Text Book

1. *Arumugam. 2002*. **Biomedical Instrumentation.** [Second Edition] Anuratha Agencies Publishers.

Reference Books

1. *B. Jacobson* and *J.G. Webster, 2004.* **Medicine and Clinical Engineering,** Prentice Hall of India.
2. *D.W. Hill.* 1965. **Principles of Electronics & Medical Research,** Butterworths, London.

Web References:
1. http://www.nptel.ac.in 2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO 1	Obtain the knowledge of human body and its anatomy and physiology.
CO 2	Understand the different potentials and equivalent circuits for medical treatment.
CO 3	Analyze the study of diagnostic and therapautic applications like computed tomography, ultrasound imaging and MRI.
CO 4	Knowing the characteristics of recorders like ECG, EEG, EMG and ERG.
CO 5	Apply the modern technologies and modern trends used in the biomedical instrumentation.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	L	L
CO 2	H	H	M	M	L
CO 3	M	M	H	H	M
CO 4	H	H	M	L	H
CO 5	H	M	H	M	H

H-High; M-Medium; L-Low

18UPHMP601	CORE PRACTICAL VI: PRACTICAL PHYSICS - VI	SEMESTER – VI

Course Objectives:

The course aims

- To enhance the students skill in communication electronics and particle penetration nature.
- To providing basic skill to the students in construction of digital electronic circuits, Microprocessors.

Credits: 2 **Total Hours: 30**

Ex.No	LIST OF EXPERIMENTS	Hrs.	CO
1.	Verification of Basic logic gates, DeMorgan's theorem and NAND & NOR as universal gates.	3	CO 1
2.	Half adder and full adder Using NAND/NOR gates	3	
3.	Half subtractor and full subtractor Using NAND/NOR gates	3	
4.	Shift Register	3	
5.	Conversion from decimal to hexadecimal and from binary to hexadecimal system.	3	CO 2
6.	Multiplexer and demultiplexer.	3	
7.	Encoder and decoder.	3	
8.	Construction of Flip flop (RS, D) using NAND/NOR gates.	3	CO 3
9.	8 Bit addition with carry, subtraction with borrow using 8085 microprocessor.	3	
10.	8 Bit multiplication and division using 8085 microprocessor	3	

Text Book

1. *Srinivasan, M.N, Balasubramanian, S* and *Ranganathan, R.* 2004. **A Book for Study of Practical Physics**. S. Chand & Co. New Delhi.

Reference Books

1. *Usha Rani, Subbarayan, A* and *Somasundaram.* 2007. **Practical Physics**. APSARA Publication, Trichy.
2. *Arora, C.L.* 1995**. B.Sc., Practical Physics.** S. Chand & Co. New Delhi.
3. B.Sc., Physics Laboratory Manual of the year 2018 – 2019.

COURSE OUTCOMES (CO)

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

CO 1	Verify the operations of logic gates and DeMorgan' s theorem through ICs.
CO 2	Construct combinational and sequential logic circuits.
CO 3	Knowledge the programs for various operations using 8085 microprocessor.

18UPHSB601	SBC IV: MATERIALS AND PROCESSING	SEMESTER – VI

Course Objectives:

The course aims

- To provide a basic knowledge about different kinds of materials.
- To inculcate the research thrust on processing of materials.

Credits: 2 **Total Hours: 25**

UNIT	CONTENTS	Hrs.	CO
I	**Materials:** Material – Definition – Classification of materials – Functional materials – Characteristics of materials – Elasticity – Toughness, Ductility, Brittleness – Effect of heat treatment – Technological properties of metals.	5	CO 1
II	**Types of Materials:** Ferrous materials – Classification – Steels (carbon, alloy steels) – Nonferrous materials and their alloys (Cu, Mg, Ni, Al) – Materials for nuclear energy – ceramic materials, glass, polymers (qualitative only).	5	CO 2
III	**Testing of Materials:** Introduction – Destructive testing – Tensile testing – Hardness testing – Torsion test – Nondestructive testing – Radiography – Liquid penetrant test – Ultrasonic inspection – Corrosion testing.	5	CO 3
IV	**Heat Treatment Process:** Definition – Classification – Principles of heat treatment – Annealing – Quenching – Tempering – Ausforming – Maraging – Production and heat treating process of glass – Polymer processing.	5	CO 4
V	**Surface Treatment of Materials:** Introduction – Carburizing – Nitriding -Cyaniding – Carbonitriding – Hardening – Coating – Faced coatings – Weldings – Various welding processes – Process of soldering – Soldering alloys – Laser and Plasma surface treatment.	5	CO 5

Text Book

1. *Askeland, D.R. Pardeep. P. Fulay, D. K. Bhattacharya*. 2010. **Material Science and Engineering**, Cengage Learning , New Delhi .

Reference Books

1. *Agarwal. B. K.* 2003. **Introduction to Engineering Materials**, Tata McGraw Hill Publishing, New Delhi.
2. *Khanna, O. P.* 1996. **Material Science and Metallurgy**. Dhanpat Rai & Sons, New Delhi.

Web References:
1. http://www.nptel.ac.in 2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO 1	Analyze the materials properties in physics point of view.
CO 2	Knowledgeable of types of materials.
CO 3	Understand the importance methods of materials testing, heat treatment and surface analyzing.
CO 4	Obtain the heat treatment process to modify the microstructure and properties of materials.
CO 5	Knowing the various surface treatment processes to improve the surface characteristics of the materials.

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	M	M	M	L
CO 2	H	H	M	M	L
CO 3	M	M	H	H	M
CO 4	H	H	M	L	M
CO 5	M	M	M	M	L

H-High; M-Medium; L-Low

18ULS601	CAREER COMPETENCY SKILLS – IV	SEMESTER – VI

Course Objectives:

The course aims

- To understand the basic needs of Communication.
- To utilize the communication skills for achieving at the time of Interview.

Credits: - **Total Hours: 15**

UNIT	CONTENTS	Hrs.	CO
I	Basic Grammar - English usage - Reading and Writing (Level -2) Direct and Indirect Speech	3	CO 1
II	Spotting Errors – Parts of speech and Punctutation	3	CO 2
III	Role Play – Just a Minute (JAM) - Group Discussion	3	CO 3
IV	Interview Presentation (Self-Introduction) - Critical thinking, problem solving.	3	CO 4
V	Dress Code and Body Language - Leadership	3	CO 5

Text Book

1. Basic English Grammar for English-Book 1, Learners, Anne Seaton, Y.H.Mew, Saddlepoint Publishers (E-Copy).
2. Basic English Syntax with Exercises, Mark Newson (E-Copy)

Reference Book

1. *Agarwal, R.S.,* **Objective General English**, S. Chand.

COURSE OUTCOMES (CO)

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

CO 1	Recall the basic grammar in language.
CO 2	Concentrate on sentence correction.
CO 3	Recognize the differences among facts, opinions and judgments.
CO 4	Develop their personal skills through interview.
CO 5	Appropriately apply their learning and leadership style and strength.

ADVANCE LEARNERS COURSE OFFERED BY THE DEPARTMENT

18UPHAL501	**ADVANCE LEARNERS COURSE II: SPINTRONICS**	**SEMESTER – V**

Course Objectives:

The course aims

- To provide a knowledge on the role played by spin of electron and its associated magnetic moment, in addition to its fundamental electronic charge, in solid-state devices.

Credits: 2 **Total Hours: -**

UNIT	CONTENTS	Hrs.	CO
I	**Basic of Spintronics:** History and overview of spin electronics - Classes of magnetic materials - Early history of spin - Quantum Mechanics of spin -Spin-orbit interaction - Exchange interaction.	-	CO 1
II	**Spin relaxation and Spin dependent transport:** Spin relaxation mechanisms - Spin relaxation in a quantum dots - Spin Galvanic effect - Basic electron transport - Spin-dependent transport - Spin dependent tunneling.	-	CO 2
III	**Spin Transfer Torques:** Intuitive picture of spin transfer torques - Spin-transfer drive magnetic dynamics - Current-driven switching of magnetization and domain wall motion.	-	CO 3
IV	**Spin injection:** Spin injection - Spin accumulation, and spin current - Spin Hall Effect - Silicon based spin electronic devices - Toward a spin transistor.	-	CO 4
V	**Advances in Spintronic Materials:** Materials for spin electronics - Nanostructures for spin electronics - Deposition techniques - Micro and nanofabrication techniques.	-	CO 5

Text Book

1. *Awschalom, D.D. Buhrman, R.A. Daughton, J.M. Molnar, S.V. and Roukes, M.L.* 2004. **Spin Electronics**, Kluwer Academic Publishers, India.
2. *Xu Y.B. and Thompson S.M.* 2006**. Spintronic Materials and Technology**, Taylor & Francis.

Reference Books

1. *Bandyopadhyay, S. andCahay, M.* 2008. **Introduction to Spintronics**. CRC Press.
2. *Sellmyer, D. J. and Skomski, R.* 2006. **Advanced Magnetic Nanostructures**, Springer.
3. *Maekawa, S.* 2006. **Concepts in Spin Electronics**, Oxford University Press.

Web References:

1. http://www.nptel.ac.in
2. https://ocw.mit.edu/courses/physics/

COURSE OUTCOMES (CO)

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

CO 1	Know the basic concepts of spintronics in historical view point.
CO 2	Understand the spin dependent transport of electron nature.
CO 3	Acquires knowledge of spin transfer magnetic dynamics.
CO 4	Comprehends the fundamental phenomena of spin injection and its applications.
CO 5	Acquires knowledge of advanced spintronics materials. □

MAPPING

PSO / CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	M	L
CO 2	H	H	M	M	L
CO 3	M	L	H	H	M
CO 4	M	H	M	L	M
CO 5	L	M	H	H	M

H-High; M-Medium; L-Low

GUIDELINES
MARK DISTRIBUTION

1. SUBMISSION OF RECORD NOTE BOOKS AND PROJECT DISSERTATION:

Candidates appearing for Practical and Project & Viva-Voce Examinations shall submit Bonafide Record Note Books/ Dissertation prescribed for Practical/ Project Viva-Voce Examinations, otherwise the candidates will not be permitted to appear for the Practical/ Project Viva-Voce Examinations.

2. PASSING MINIMUM AND INTERNAL MARK DISTRIBUTION (Theory, Practical and Project)

(i) THEORY: The candidate shall be declared to have passed the Examination, if the candidate secure not less than 40 marks put together out of 100 in the Comprehensive Examination in each Theory paper with a passing minimum of 30 marks in External out of 75.

Internal Marks Distribution [CA - Total Marks: 25]

Attendance	:	05 Marks
Assignment (3 Assignments)	:	05 Marks
Internal Examinations	:	15 Marks
Total	**:**	**25 Marks**

(ii) PRACTICAL: The candidate shall be declared to have passed the Examination, if the candidate secure not less than 40 marks put together out of 100 in the Comprehensive Examination in each Practical paper with a passing minimum of 24 marks in External out of 60.

Internal Marks Distribution [CA - Total Marks: 40]

Experiments	:	10 Marks
Attendance	:	05 Marks
Record Submission	:	05 Marks
Internal Examinations	:	20 Marks
Total	:	**40 Marks**

External Marks distribution [CE - Total Marks: 60]

Formula, symbol representation	:	10 Marks
Circuit , model graph	:	10 Marks
Observation	:	20 Marks
Calculation	:	10 Marks
Viva-Voce	:	05 Marks
Result	:	05 Marks
Total	**:**	**60 Marks**

(iii) **CAREER COMPETENCY SKILLS (CCS)**

CCS – I & IV: Viva Voce – Semester III & VI

- The student has to come in proper dress code and he/she should bring 2 copies of resume for the Viva Voce
- The student may be asked to
  - Give Self introduction
  - Submit the resume to the examiner(s) and answer the questions based on it.
  - Speak on any given topic for at least two minutes.
  - Give a presentation for 10 minutes on a topic of their choice.
  - Sit with other students in a group for a discussion.

CCS – II & III: On Line Objective Examination (Multiple Choice Questions) – Semester IV & V

- 100 questions-100 minutes
- Twenty questions from each UNIT.
- On line examination will be conducted at the end of IV Semester.

3. QUESTION PAPER PATTERN: (Theory: for 75 Marks)

1. PART – A (10 x 2 = 20 Marks)
   - Answer ALL questions.
   - Two questions from each UNIT.
2. PART – B (5 x 5 = 25 Marks)
   - Answer ALL questions.
   - One question from each UNIT with Internal choice.
3. PART – C (3 x 10 = 30 Marks)
   - Answer ANY THREE questions
   - Open Choice – 3 out of 5 questions
   - One question from each UNIT