SRM UNIVERSITY
(Under section 3 of UGC Act 1956)

BACHELOR OF SCIENCE
IN
PHYSICS

Curriculum and Syllabus

(For students admitted from the academic year 2015-2016 onwards)

UNDER CHOICE BASED CREDIT SYSTEM

DEPARTMENT OF PHYSICS

FACULTY OF SCIENCE AND HUMANITIES

SRM UNIVERSITY

KATTANKULATHUR-603203

B.Sc PHYSICS
(For students admitted from the academic year 2015 -2016 onwards)
CURRICULUM AND SYLLABUS

DETAILS OF THE CREDITS

Component	Course	Total number of credits
Part I	Language	**8**
Part II	English	**8**
Part III	Major, Allied Subjects and Core Based Electives	**106**
Part IV	Skill Based and Non Major Electives	**10**
Part V	Value Added Course and General (Excluding English and Language)	**13**
Part VI	Extension Activity	**01**
	Total	**146**

Eligibility

The candidates seeking admission to the B.Sc. Degree program shall be required to have passed (10+2) (Higher Secondary) examination or any other equivalent examination of any authority, recognized by this University, with Physics, and Chemistry / Computer Science/Mathematics/ Biology.

Duration and Structure of the B.Sc Programme

3 Years (6 Semesters)

B.Sc PHYSICS

(For students admitted from the academic year 2015-2016)
CURRICULUM AND SYLLABUS

SEMESTER I							
Career Stream Title	**Course Code**	**Course Name**	**L**	**T**	**P**	**Total L+T+P**	**C**
General	ULH15101	Hindi-I	4	1	0	5	4
	ULF15101	French – I					
	ULT15101	Tamil – I					
General	ULE15101	English-I	4	1	0	5	4
Major Core	UPY15101	Properties of Matter and Acoustics	4	1	0	5	4
Major Core	UPY15102	Elements of Optics	4	1	0	5	4
Major Core	UPY15103	Physics Practicals-I	0	0	4	4	2
Allied Subjects	UMA15161	Allied Mathematics-I	4	0	0	4	4
Value Added Course (Internal Evaluation)	CDC15101	Verbal Ability	2	0	0	2	2
		Total	**22**	**4**	**4**	**30**	**24**

SEMESTER II							
Career Stream Title	**Course Code**	**Course Name**	**L**	**T**	**P**	**Total L+T+P**	**C**
General	ULH15201	Hindi – II	4	1	0	5	4
	ULF15201	French – II					
	ULT15201	Tamil – II					
General	ULE15201	English-II	4	1	0	5	4
Major Core	UPY15201	Electricity and Magnetism	4	1	0	5	4
Major Core	UPY15202	Classical Mechanics and Relativity	4	1	0	5	4
Major Core	UPY15203	Physics Practicals-II	0	0	4	4	2
Allied Subjects	UMA15261	Allied Mathematics II	4	0	0	4	4
Value Added Course (Internal Evaluation)	CDC15201	Quantitative Aptitude and Reasoning – I	2	0	0	2	2
Extension Activity	UNS15201	NSS	0	0	0	0	1
	UNC15201	NCC					
	UNO15201	NSO					
	UYG15201	YOGA					
		Total	**22**	**4**	**4**	**30**	**25**

SEMESTER III							
Career Stream Title	**Course Code**	**Course Name**	**L**	**T**	**P**	**Total L+T+P**	**C**
Major Core	UPY15301	Heat and Thermodynamics	4	1	0	5	4
Major Core	UPY15302	Physics of Biological Systems	4	1	0	5	4
Major Core	UPY15303	Physics Practicals-III	0	0	4	4	2
Allied Subjects	UCY15361	Allied Chemistry-I	4	1	0	5	4
Allied Subjects	UCY15362	Allied Chemistry Practicals-I	0	0	4	4	2
Skill Based Elective-I	UPY15E51	Electronics Instrumentation	3	0	0	3	3
	UPY15E52	Laser Technology					
	UPY15E53	Computer Networks					
Non Major Elective – I		Open Elective - I	2	0	0	2	2
Value Added Course (Internal Evaluation)	CDC15301	Quantitative Aptitude and Reasoning – II	2	0	0	2	2
		Total	**19**	**3**	**8**	**30**	**23**

SEMESTER IV							
Career Stream Title	**Course Code**	**Course Name**	**L**	**T**	**P**	**Total L+T+P**	**C**
Major Core	UPY15401	Laser Physics and Spectroscopy	4	1	0	5	4
Major Core	UPY15402	Solid State Physics	4	1	0	5	4
Major Core	UPY15403	Physics Practicals-IV	0	0	4	4	2
Skill Based Elective –II	UPY15E54	Wireless Technology	3	0	0	3	3
	UPY15E55	Solar Technology					
	UPY15E56	Cell Phone Servicing					
Allied Subjects	UCY15461	Allied Chemistry-II	4	1	0	5	4
Allied Subjects	UCY15462	Allied Chemistry Practicals-II	0	0	4	4	2
Non Major Elective – II		Open Elective - II	2	0	0	2	2
Value Added Course (Internal Evaluation)	CDC15401	Communication Skills	2	0	0	2	2
		Total	**19**	**3**	**8**	**30**	**23**

SEMESTER V							
Career Stream Title	**Course Code**	**Course Name**	**L**	**T**	**P**	**Total L+T+P**	**C**
Major Core	UPY15501	Quantum Mechanics	4	1	0	5	4
Major Core	UPY15502	Atomic and Nuclear Physics	4	0	0	4	4
Major Core	UPY15503	Analog Electronics	4	0	0	4	4
Core Based Elective – I	UPY15E01	Elements of Earth Atmosphere	4	0	0	4	4
	UPY15E02	Low Temperature Physics					
Core Based Elective – II	UPY15E03	Radiation Physics	4	0	0	4	4
	UPY15E04	Plasma Physics					
Major Core	UPY15504	Physics Practicals-V	0	0	3	3	2
Major Core	UPY15505	Electronics Laboratory-I	0	0	3	3	2
Value Added Course	UES15501	Environmental Studies	3	0	0	3	3
		Total	**23**	**1**	**6**	**30**	**27**

SEMESTER VI							
Career Stream Title	**Course Code**	**Course Name**	**L**	**T**	**P**	**Total L+T+P**	**C**
Major Core	UPY15601	Elements of Nano Science and Nanotechnology	4	1	0	5	4
Major Core	UPY15602	Digital Electronics and Microprocessors	4	1	0	5	4
Core Based Elective – III	UPY15E05	Astrophysics	4	0	0	4	4
	UPY15E06	Computational Physics					
Core Based Elective – IV	UPY15E07	Nonlinear Optics	4	0	0	4	4
	UPY15E08	Introduction to Forensic Sciences					
Major Core	UPY15604	Electronics Laboratory-II	0	0	4	4	2
Major Core	UPY15605	Core Based Project	0	2	4	6	4
Value Added Course(Internal Evaluation)	CDC15601	Personality Development	2	0	0	2	2
Total			18	4	8	30	24

Legend:

L - Number of lecture hours per week

T - Number of tutorial hours per week

P - Number of practical hours per week

C - Number of credits for the course

SEMESTER I

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
ULH15101	HINDI-I	4	1	0	5	4

INSTRUCTIONAL OBJECTIVES	
1.	To express and communicate literature which is part of life
2.	To incorporate day to day personal and professional life's needed to communicate in the language.
3.	To help the students to imagine and express their mind through Literature

UNIT – I - Prose

1. USNE KAHA THA (STORY)
CHANDRADHAR SHARMA GULERI

2. CHIEF KI DAWAAT (STORY)
BHISHAM SAHNI

3. PREMCHAND (NIBANDH)
DR. RAMVILAS SHARMA

4. BHOLARAM KA JEEV (SATIRE STORY)
HARISHANKAR PARSAI

5. BHAGWAN NE KAHA THA (SATIRE STORY)
SURYA BALA

6. CHAMAR KI BETI (STORY)
DR.N. CHANDRSHEKHARAN NAIR

UNIT – II- OneActPlay

1. LAXMI KA SAWAGAT ***UPENDRANATH ASHK***

2. JAB MAA RO PADI ***SETH GOVIND DAS***

UNIT – III – CORRESPONDENCE

1. OFFICIAL LETTER

2. DEMI- OFFICIAL LETTER

UNIT – IV - COMPUTER

UNIT – V - TECHNICAL TERMINOLOGY

TEXT BOOK

1. Hindi I Edited by Dr.S.Preethi, Dr.MD.Islam, Dr. S. Razia Begum Published by Department of Hindi, FS&H,SRM University

REFERENCE

1. Prayajon Mulak Hindi (Author - *Madhav Sontakke*)

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
ULF15101	FRENCH-I	4	1	0	5	4

INSTRUCTIONAL OBJECTIVES	
1.	To encourage greater written skills through comprehension writing and composition writing.
2.	Improve their oral and written skills through a combination of theory and practice.
3.	Extend and expand their savoir-faire through the acquisition of latest skills and techniques by practical training

UNITE-I **(15 Heures)**

Vous comprenez? – Conjugaison des verbes – Masculin/Féminin – Singulier/Pluriel – Interrogation – Négation simple- L'identité- Les lieux de la ville- Les mots du savoir-vivre.

UNITE-II **(15 Heures)**

Au travail ! Conjugaison – Les verbes en –ER – Accord des noms et des adjectifs - Articles indéfinis et définis- Interrogation- Est-ce-que, Qu'est-ce, Qu'est-ce que c'est, Où- L'état civil- Personnes et objets caractéristiques d'un pays.

UNITE-III **(15 Heures)**

On se détend ?- Conjugaison- faire, aller, venir, vouloir, pouvoir, devoir- Futur proche - Pronoms moi, toi, lui, elle, etc.., après une préposition – On = Nous- Les loisirs, Sports, Spectacles, Activités.

UNITE-IV **(15 Heures)**

Racontez-moi- Passé composé - Présentation d'un événement passé- La date et l'heure- Les moments de la journée, de l'année- Événements liés au temps - **Bon voyage !**- Comparaison simple- Adjectifs démonstratifs- Adjectifs possessifs- Les Voyages – Les transports.

UNITE-V **(15 Heures)**

Bon appétit- Articles partitif- Emploi des articles- Interrogation, forme avec inversion- Réponses : Oui, Si, Non- Forme possessive : à+pronom- La nourriture, Les repas, La fête.

REFERENCES

1. **"Echo-A1"**, Méthode de français, J.GIRARDET, J.PECHEUR, CLE International, Janvier-2011.

2. Girardet J., Pecheur J. *Echo-A1, Méthode de français*, CLE International, Janvier-2011.

குறியீட்டு எண்	பாடம்	L	T	P	Total LTP	C
ULT15101	தமிழ்- I	4	1	0	5	4

பகுதி 1. தமிழ்இலக்கியவரலாறு

(நூல் – தமிழ்இலக்கியவரலாறு- முனைவர் சு.ஆனந்தன், கண்மணி பதிப்பகம், திருச்சி, 2010.)

1. சிற்றிலக்கியம் - தோற்றமும் வளர்ச்சியும்
2. புதுக்கவிதை - தோற்றமும் வளர்ச்சியும்
3. சிறுகதை - தோற்றமும் வளர்ச்சியும்
4. புதினம் - தோற்றமும் வளர்ச்சியும்
5. உரைநடை - தோற்றமும் வளர்ச்சியும்

பகுதி 2. இலக்கியம்

அ.இக்காலக்கவிதைகள்

1. பாரதியார்
   நெஞ்சு பொறுக்கு திலையே ...என்றுதொடங்கும்கவிதை
2. பாரதிதாசன்
   உலக ஒற்றுமை - தன்பெண்டு தன்பிள்ளை
   ...என்றுதொடங்கும்கவிதை
3. ந.பிச்சமூர்த்தி - கிளிக்கூண்டு
4. இன்குலாப் - மரங்களின் சுற்றம்
   சந்திக்கச் செல்வதில்லை...என்று தொடங்கும் கவிதை
5. நா. காமராசன் - கருப்புமலர்கள்
   காகிதப்பூக்கள் - கால மழைத்தூறலிலே... என்று தொடங்கும் கவிதை

6. சு.வில்வரெத்தினம் --வேற்றாகி நின்ற வெளி
நிலவின் எதிரொலி – பறம்பு மலை …என்று தொடங்கும்கவிதை

7. பாரதி புத்திரன் - மாரிக்கால இரவுகள்
சிவகாசிச் சிசுக்கள் – மகனே அன்றொரு நாள் …என்று
தொடங்கும்கவிதை

8. து.நரசிம்மன் - வானம் பிறந்தது
ஒரு பிஞ்சின் வேண்டுகோள்…என்று தொடங்கும்கவிதை

9. ப.கல்பனா- வானம் பிறந்தது
கீறல் விழுந்த மாலைக்காலங்கள்- இன்று வர… என்று
தொடங்கும்கவிதை

ஆ. சிற்றிலக்கியம்

கலிங்கத்துப்பரணி- போர் பாடியது: 404 -- 408 பாடல்கள்

குற்றாலக்குறவஞ்சி – மலைவளம்

1. வானரங்கள்கனிகொடுத்து …. என்றுதொடங்கும்பாடல்
2. முழங்குதிரைப்புனலருவிகழங்கெனமுத்தாடும் ….
என்றுதொடங்கும்பாடல்

இ. காப்பியங்கள்

சிலப்பதிகாரம் – வழக்குரை காதை - 'தேரா மன்னா! செப்புவது
உடையேன்;--இணை அடி தொழுது வீழ்ந்தனளே, மடமொழி.
(30 – வரிகள்)

பகுதி 3 உரைநடைப்பகுதி

"**எண்ணங்கள்**" டாக்டர் எம்.எஸ்.உதயமூர்த்தி,கங்கை புத்தக
நிலையம், 2005.

பாட நூல்கள் :

1. முனைவர் சு.ஆனந்தன் (2010), தமிழ் இலக்கிய வரலாறு,
கண்மணி பதிப்பகம், திருச்சி, 2010.

2. எம்.எஸ்.உதயமூர்த்தி, "எண்ணங்கள்",கங்கை புத்தக நிலையம், 2005.

3. செய்யுள் புத்தகம், தமிழ்த்துறை, அறிவியல் மற்றும் மானுடவியல் புலம் , எஸ். ஆர். எம். வெளியீடு, 2014.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
ULE15101	ENGLISH-I	4	1	0	5	4

INSTRUCTIONAL OBJECTIVES	
1.	To enhance students' proficiency in English language.
2.	To enable the students to think in English.
3.	To be abreast with the world literature.
4.	To equip students with the awareness and strategies needed to enable the study of English as a lifelong process.
5.	To engage in ongoing professional development with respect to both teaching and research.

UNIT I Poetry: (15 Hours)

1. If by Rudyard Kipling
2. Where the Mind is Without Fear by Rabindranath Tagore
3. The Road Not Taken by Robert Frost
4. Snake by D. H. Lawrence

UNIT II Prose: (15 Hours)

1. Of Truth by Francis Bacon
2. Spirit of India by A.P.J.Abdul Kalam

UNIT III Short Stories: (15 Hours)

1. The Bet by Anton Chekhov
2. The Postmaster by Rabindranath Tagore

UNIT IV Movie Review: (15 Hours)

1. Whose Life is it Anyway?

2. The Accused- Feature Film
3. Water

UNIT V Language Component : (15 Hours)

1. Tenses
2. Focus on Articles, Prepositions, Subject Verb Agreement
3. Comprehension Passage

TEXT BOOKS

1. Cambridge University Press,. Raymond Murphy, *Essential Grammar in Use* 3rd Edition 2010
2. Edited by Dr.Shanthichitra, *Glean to ACME English Tex Book* Published by Department of English, FSH, SRM University

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15101	PROPERTIES OF MATTER AND ACOUSTICS	4	1	0	5	4
INSTRUCTIONAL OBJECTIVES						
1.	To understand the different kinds of moduli via experimental methods.					
2.	To understand the surface tension i.e.boundary property and viscosity.					
3.	To understand the wave phenomena, in general and sound wave in particular.					
4.	To understand ultrasonics and acoustics.					

UNIT I - ELASTICITY AND MODULI

Elasticity - Three types of elastic moduli and relation among them - Poisson's ratio and Poisson's ratio for rubber band- Bending of beams - Expression for bending moment - Depression of the loaded end of a Cantilever - Uniform - Non uniform bending - Theory - Experiment pin and microscope method - Work done in uniform bending – Koenig's method – Non-uniform bending - Theory - Expression for couple per unit twist - Determination of rigidity modulus - Static torsion method with scale and telescope – Rigidity modulus by torsion pendulum with mass.

UNIT II - FLUID MOTION

Viscosity - Coefficient of critical velocity – Poiseulli's formula for coefficient of viscosity and its correction - Determination of coefficient of viscosity by capillary

flow method - comparison of viscosities Oswald's viscometer - Viscosity of a highly viscous liquid - Stoke's method for the Coefficient of a highly viscous liquid - Variations of viscosity with temperature and pressure - Viscosity of gases - Mayer's formula for the rate of flow of a gas through a capillary tube - Rankine's method for the determination of viscosity of a gas.

UNIT III – SURFACE TENSION

Surface tension and Osmosis - Surface energy - Angle of contact and its determination - Excess of pressure inside curved surface - Formation of drops - Experimental study of variation of Surface tension with temperature - Drop weight method of determining surface tension and interfacial surface tension - Angle of contact of mercury - Quincke's method - Surface tension and vapour pressure osmosis - Experimental determination of osmotic pressure - Laws of osmosis pressure - Osmotic and vapour pressure of a solution.

UNIT IV - SOUND

Sound - Definition of free, damped and forced vibrations – Theory of forced vibrations -Resonance - Sharpness of resonance - Fourier's theorem - Application for Saw-tooth wave and square wave -Sonometer - Determination of A.C. frequency using sonometer - Determination of frequency using Melde's apparatus.

UNIT V - ULTRASOUND AND ACOUSTICS

Ultrasonics - Production - Piezo electric method – Magnetostriction method - detection - Properties - Applications. Acoustics : Intensity Level, Loudness - Acoustics of buildings - Reveberation - Reverberation time - Derivation of Sabine's formula - determination of absorption coefficient - Optimum reverberation time - Factors affecting Acoustics of buildings - Sources of noises and its control - Sound level meter.

TEXT BOOKS

1. Brijlal and Subramaniam N., *Properties of Matter* , Revised Edition, S.Chand and Company,2005.
2. Murugesan R., *Properties of Matter and Acoustics*, Revised Edition, S.Chand and Company, 2005.

REFERENCES

1. Landau L. D., Pitaevskii L P, Kosevich A M and Lifshitz E M, *Theory of Elasticity*, Revised Edition, Butterworth-Heinemann, 2014.

2. Landau L. D., Pitaevskii L P, Kosevich A M and Lifshitz E M, *Fluid Mechanics*, Revised Edition, Butterworth-Heinemann, 2014.
3. Saighal R. L, *A Text Book of Sound* , 5th Edition, S. Chand and Company, 2010.
4. Mathur D. S, *Elements of Properties of Matter*, 3rd Edition, S. Chand and Company, 2005.
5. Satyaprakash and Akash Saluja, *Oscillations and Waves*, Pragati Prakashan, 2002.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15102	ELEMENTS OF OPTICS	4	1	0	5	4

INSTRUCTIONAL OBJECTIVES	
1.	To understand the concepts of optics.
2.	To apply the Physics Principles in optical systems.
3.	To study interference and diffraction of light.
4.	To understand the ray theory and wave theory of optics.

UNIT I – RAY THEORY AND GEOMETRICAL OPTICS

Elementary geometrical optics in the paraxial approximation - Refractive index; reflection and refraction at a plane boundary from Fermat's principle - Snell's Law-total internal reflection - Image formation by reflection at a spherical boundary-concave and convex mirrors -Real and virtual images - Magnification - Image formation by refraction at a spherical boundary and by converging and diverging thin lenses - Derivation of the expression for the focal length of a thin lens- Prisms - Angle of minimum deviation -Rectangular slab.

UNIT II – WAVE THEORY

One dimensional Waves - Harmonic waves - Phase velocity and group velocity - Wave packet - Dispersion - Normal dispersion - Anomalous dispersion - Complex representation of waves - Phasors - Addition of waves of same frequency - Addition of waves of different frequency - Plane waves - Huygen's principles and its applications - Lissajous figures - Generation - Application.

UNIT III – INTERFERENCE, DIFFRACTION AND POLARISATION

Interference- Planar wave description of light - Interference of two beams-Michelson interferometers - Fringes from thick dielectric - Fabry-Perot cavity - Diffraction: Fraunhofer Diffraction -Diffraction from a single slit - Fresnel Diffraction -Criterion for

Fresnel Diffraction - Fresnel diffraction from a circular aperture - Polarisation: Linear polarised light - Malus' Law - circular and elliptical polarisation - Crystal birefringence and optical activity including quarter wave and half wave plates - Fresnel's relation at dielectric interface - Brewster's Angle and its implications.

UNIT IV - FOURIER OPTICS

Fourier transform - Properties of Fourier Transform - Amplitude and phase spectra-separable functions - Linear systems - phase transformation with a thin lens - Fourier transforming with lenses - Wave field incident on the lens – Wavefield incident to the left of the lens - Wave field incident to the right of the lens - Image formation as a 2D linear filtering.

UNIT V - OPTICAL SYSTEMS

Telescope -Reflecting Telescope - Simple Microscope – Compound microscop-Resolving power of microscope - Camera - Aperture - fstop - focal length - Fiber optics - Applications, Interferometer - Michelson interferometer, Holograms-conventional versus holography photography - Construction – Applications - Defects in optical systems - Aberration – Spherical - Chromatic - Coma.

TEXT BOOKS

1. Eugene Hecht, *Optics,* 4thEdition, Addison Wesley, 2002.
2. Okan K. Ersoy, *Diffraction, Fourier Optics and Imaging*, 2007.
3. Subrahmanyam, N., Brij Lal and Avadhanulu M. N., *A Text Book of Optics*, S. Chand, 2004.

REFERENCES

1. Grant R. Fowles, *Introduction to Modern Optics*, Dover Publication, 1968.
2. Guenther, Robert D and Robert Guenther, *Modern Optics*, Vol. 1. Wiley, 1990.
3. Brooker, Geoffrey, *Modern Classical Optics*, Oxford Univ. Press, 2003.
4. Develis John B, George B. Parrent and Bria Thompson, *The New PhysicalOptics Notebook: Tutorials in Fourier Optics*, Vol. 61, SPIE OpticalEngineering Press, 1989.
5. Herzberger Max, *Modern Geometrical Optics*, Wiley,1958.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15103	PHYSICS PRACTICAL I	0	0	4	4	2

INSTRUCTIONAL OBJECTIVES

1. 2.	To gain knowledge in the scientific methods and learn the process of measuring different Physical variables.
3.	To enable the student to explore the field of properties of matter.
4.	To make the student understand the basic concepts in acoustics.
5.	To allow the student to have a deep knowledge of the fundamentals of optics.

LIST OF EXPERIMENTS

1. Determination of Young's modulus of the material of the beam - Uniform Bending using Pin and Microscope.
2. Determination of rigidity modulus using Torsional Pendulum – Without masses.
3. Determination of Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method).
4. Determination of Surface Tension of water by capillary rise method.
5. Determination of AC frequency main using Sonometer.
6. Generation of Lissajous figure using Signal Generator.
7. Determination of dispersive power of a prism using spectrometer.
8. Determination of minimum deviation-Diffraction Grating.
9. Determination of thickness of thin wire-Air Wedge.

TEXT BOOKS

1. Shukla R. K. and Anchal Srivastava, *Practical Physics*, New Age International (P) Ltd, Publishers, 2006.
2. Arora C. L., *B.Sc Practical Physics,* S. Chand and Company Ltd, 2007.

REFERENCES

1. Squires G. L., *Practical Physics*, 4th Edition, Cambridge University Press, 2001.
2. Halliday D., Resnick R. and Walker J., *Fundamentals of Physics*, 6th Edition, John Wiley and Sons, 2001.
3. Jenkins F.A. and White H.E., *Fundamentals of Optics*, 4th Edition, McGraw-Hill Book Company, 2007.
4. Geeta Sanon, *B. Sc., Practical Physics*, 1st Edition, S. Chand and Company, 2007.
5. Benenson, Walter, and Horst Stöcker, *Handbook of Physics*,Springer, 2002.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UMA15161	ALLIED MATHEMATICS I	4	0	0	4	4
INSTRUCTIONAL OBJECTIVES						
1.	To apply basic concepts for clear understanding of mathematical principles.					
2.	To solve practical problems.					

UNIT I - SETS, RELATIONS AND FUNCTIONS

Sets- Sets- representation of sets- Types of sets- Operation on sets- Venn diagram. Relation- Types of relation- Equivalence relation.Function- types of functions- Composite of two functions- Composite of three functions.

UNIT II - MATHEMATICAL CONNECTIVES LOGIC

Statements- Connectives- Conjunction- Disjunction- Negation- Tautology- contradiction- Logical equivalence- tautological implications- arguments- validity of arguments – Normal forms – Principal disjunctive normal form - Principle conjunctive normal form.

UNIT III - THEORY OF EQUATIONS

Polynomial equations- Irrational roots- Complex roots-(up to third order equations only) - Reciprocal equations- Approximation of roots of a polynomial equation by Newton's and Horner's methods.

UNIT IV - MATRICES

Symmetric- Skew symmetric- Hermitian- Skew Hermitian- Orthogonal-Unitary

matrices – Cayley Hamilton Theorem –Eigen values– Eigen vectors – Solving the equations using cramers rule.

UNIT V - DIFFERENTIATION

Simple problems only – Maxima and minima of functions of single variable – Radius of curvature (Cartesian co– ordinate) – Partial differentiation – Euler's theorem.

TEXT BOOKS

1. Veerarajan. T, *Discrete Mathematics*, 7th Edition, Tata McGrawhill,2006.
2. Singaravelu. A, *Allied Mathematics*, 3rd Edition, 2013.

REFERENCES

1. Vittal, P.R., Allied Mathematics, 4th Edition Reprint, Margham Publications, 2013.
2. Venkatachalapathy, S.G.,Allied Mathematics, 1st Edition Reprint, Margham Publications, 2007.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
CDC15101	VERBAL ABILITY (Internal Evaluation)	2	0	0	2	2

INSTRUCTIONAL OBJECTIVES

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

1.	Answer objective questions for any verbal ability exam.
2.	Answer a model verbal ability exam.

UNIT –I

Vocabulary- Synonyms, Antonyms, Idioms and phrases, ordering of words/sentences.

UNIT –II

Grammar- Sentence improvement, Change of speech, sentence correction.

UNIT-III

Vocabulary-One word Substitute, Verbal Analogies, Clozetest.

UNIT-IV

Grammar- Spotting errors, selecting words, sentence completion

UNIT-V

Vocabulary- Word Quest, Puzzles, Crossword

TEXT BOOKS

1. Raymond Murphy, Essential English Grammar, Cambridge University Press,2007
2. Raymond Murphy, Intermediate English Grammar, Cambridge University Press,2007
3. Raymond Murphy Advanced English Grammar Cambridge University Press, 2007

REFERENCE:

1. Prabhu.C, Vivekanandan.P (2012), The Essentials of Quantitative Aptitude and Verbal Aptitude, Enrich & Excell, BEACON, Chennai, 2012

SEMESTER II

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
ULH15201	HINDI-II	4	1	0	5	4

INSTRUCTIONAL OBJECTIVES	
1.	To express and communicate literature which is part of life
2.	To incorporate day to day personal and professional life's need to communicate in the language.
3.	To help the students to imagine and express their mind through Literature .

UNIT - I POETRY

1. Suprashid Dohey ***Kabir, Rahim, Bihari, Surdas***
2. Nar Ho Na Nirash Karo Mann Ko ***Maithlisharan gup***
3. Jo Tum Aaa Jaate***Mahadevi Varma***
4. Hum Panchi Unmukt Gagan Ke ***Shiv mangal singh suman***
5. Chalawa ***Santosh shreeyansh***
6. Yahan Thi Vaha Nadi ***Manglesh Dabral***

UNIT-II STORY

1. Eidgaha ***Premchand***
2. Vapsi ***Priyamvada Usha***
3. Ek Muthi Aakash ***Santosh Srivastav***
4. Ek Plate Sailab ***Mannu Bhandari***

UNIT- III

1. Anuvad : Anuvad Ki Paribhasha Evam Bhed

UNIT- IV

1. Anuvad : English to Hindi

UNIT -V

1. Administrative words

TEXT BOOK

1. Hindi I Edited by Dr.S.Preethi, Dr. MD.Islam, Dr.S.Razia Begum.Published by Department of Hindi, FS&H,SRM.University

REFERENCES

1. Madhav Sontakke , *Prayajon Mulak Hindi*
2. Thakur K. P., *Practical Guide to Translation and Composition*

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
ULF15201	FRENCH-II	4	1	0	5	4
INSTRUCTIONAL OBJECTIVES						
1.	Consolidate the knowledge of theoretical aspects of French grammar with examples provided from different angles: from present day literature, day to day conversation.					
2.	Improve their oral and written skills through a combination of theory and practice.					

UNITE-I **(15Heures)**

Quelle journée !- La conjugaison pronominale- L'impératif- L'expression de la quantité : peu, un peu de, quelque, etc..,- Les activités quotidiennes- Les achats, L'argent - **Qu'on est bien ici !** Prépositions et adverbes de lieu- Verbes exprimant un déplacement : emploi des prépositions- Le logement, La localisation, L'orientation, L'état physique, Le temps qu'il fait.

UNITE-II **(15Heures)**

Souvenez-vous- L'imparfait- Emploi du passé composé et de l'imparfait- Expression de la durée- L'enchainement des idées : alors, donc, mais- Les sens réciproque- Les moments de la vie- La famille- Les relations amicales, amoureuses, familiales.

UNITE-III **(15Heures)**

On s'appelle ? – Les pronoms compléments directs- les pronoms compléments indirects de personne- L'expression de la fréquence et de la répétition – Les moyens de communication : courrier, téléphone, internet.

UNITE-IV **(15Heures)**

Un bon conseil ! – Expression du déroulement de l'action – Passé récent- Présent progressif – Futur proche – Action achevée/ inachevée – Les phrases rapportés – Les Corps – La santé et la maladie.

UNITE-V **(15Heures)**

Parlez-moi de vous – La place de l'adjectif – La proposition relative finale avec « qui » - C'est/il est – Impératif des verbes avec pronoms – La formation des mots – La description physique et psychologique des personnes – Les vêtements – Les Couleurs.

REFERENCES :

1. **"Echo-A1"**, Méthode de français, J.GIRARDET, J.PECHEUR, CLE International, Janvier-2011.
2. Girardet J., Pecheur J., *Echo-A1, Méthode de français*, CLE International, Janvier-2011.

SEMESTER II

குறியீட்டு எண்	பாடம்	L	T	P	Total LTP	C
ULT15201	**தமிழ்- II**	**4**	**1**	**0**	**5**	**4**

பகுதி -1 தமிழ்இலக்கியவரலாறு

(நூல் – தமிழ்இலக்கியவரலாறு- முனைவர் சு.ஆனந்தன், கண்மணி பதிப்பகம், திருச்சி, 2010.)

1. சங்க இலக்கியங்கள்
2. நீதி இலக்கியங்கள்
3. பக்தி இலக்கியங்கள்
4. காப்பியங்கள்

பகுதி -2 அ. சங்கஇலக்கியம்

1. முளி தயிர் பிசைந்த...
   என்றுதொடங்கும்**குறுந்தொகை(167)**பாடல்முல்லை, செவிலித்தாய் கூற்று).
2. மனை நடு வயலை வேழம் சுற்றும்... என்றுதொடங்கும் **ஐங்குறுநூறு**(11) பாடல் (மருதம்,ஐங்குறுநூறு- வேழப்பத்து.)
3. எம்வெங்காமம்இயைவதுஆயின் ....என்றுதொடங்கும்**அகநானூறு (15)** பாடல் (**பாலை**, **மகட்போக்கியதாய்சொல்லியது**)
4. சுடர் தொடீஇ கேளாய்.....என்றுதொடங்கும்**கலித்தொகை (51)**பாடல் (குறிஞ்சி, தலைவிகூற்று)

5. மண்டு அமர் அட்ட ...என்றுதொடங்கும்**புறநானூறு (213)** பாடல்,
பாடியவர் :புல்லாற்றூர் எயிற்றியனார், பாடப்பட்டோன் :
கோப்பெருஞ்சோழன்; திணை :வஞ்சி; துறை- துணைவஞ்சி.

6. **நறவுவாய் உறைக்கும் நாகுமுதிர் ...** என்றுதொடங்கும்**பத்துப்பாட்டு –**சிறுபாணற்றுப்படை (51-67) பாடல்

7. கலந்தோர்உவப்பஎயில்பலகடையி**...**
என்றுதொடங்கும்**பத்துப்பாட்டு -- மதுரைக்காஞ்சி (220-237)**
பாடல்.

ஆ. நீதிஇலக்கியம்

1. திருக்குறள்- நட்பாராய்தல்
புலவி நுணுக்கம் (2 அதிகாரம்)

2. நாலடியார்- பொருட்பால்- மேன்மக்கள் – 5 பாடல்

இ. பக்திஇலக்கியம்

சைவம் – பன்னிருதிருமுறைகள்

1. திருஞானசம்பந்தர்தேவாரம் – முதலாம்திருமுறை
காதல் ஆகி, கசிந்து ... என்றுதொடங்கும்பாடல்

2. திருநாவுக்கரசர்தேவாரம் - ஐந்தாம் திருமுறை
மாசில் வீணையும் மாலை ... என்றுதொடங்கும்பாடல்

3. சுந்தரர்தேவாரம் – ஏழாம்திருமுறை
பொன்னார் மேனியனே ... என்றுதொடங்கும்பாடல்

4. மாணிக்கவாசகர் – திருவாசகம் – பிடித்தபத்து
பால்நினைந்துஊட்டும்தாயினும்சால ... என்றுதொடங்கும்பாடல்

5. திருமூலர் – திருமந்திரம்
மரத்தை மறைத்தது மாமத யானை ... என்றுதொடங்கும்பாடல்

வைணவம் – நாலாயிரத்திவ்யப்பிரபந்தம்

1. பூதத்தாழ்வார்

பெருகு மத வேழம் மாப்பிடிக்கு…என்றுதொடங்கும்பாடல்

2. குலசேகராழ்வார்
ஆனாதசெல்வத்துஅரம்பையர்கள்தற்சூழ
...என்றுதொடங்கும்பாடல்

3. பெரியாழ்வார்
எந்நாள் எம்பெருமான் ...என்றுதொடங்கும்பாடல்

4. ஆண்டாள்
ஓங்கி உலகளந்த உத்தமன் … என்றுதொடங்கும்பாடல்

5. திருப்பாணாழ்வார்
சதுர மாமதில் சூழ் இலங்கைக்கு … என்று தொடங்கும் பாடல்

இஸ்லாம்

குணங்குடிமஸ்தான்சாகிபுபாடல்கள் –

தவமேபெறவேண்டுமெனல்- 3 பாடல்கள்

கிறித்துவம்

ஆதிநந்தாவனப்பிரளயம்– ஏதேன்தோட்டம்- 3 பாடல்கள்

பகுதி 3:சிறுகதை

“**ஒற்றைச் சிறகு**”,இலக்கியச்சிந்தனை 2012
ஆம்ஆண்டின்சிறந்தசிறுகதைகள்தொகுப்பு.

பாட நூல்கள் :

1. முனைவர் சு.ஆனந்தன் (2010), தமிழ் இலக்கிய வரலாறு, கண்மணி பதிப்பகம், திருச்சி, 2010.
2. ஒற்றைச் சிறகு, இலக்கியச்சிந்தனை 2012
ஆம்ஆண்டின்சிறந்தசிறுகதைகள்தொகுப்பு, 2012.
3. செய்யுள் புத்தகம், தமிழ்த்துறை, அறிவியல் மற்றும் மானுடவியல் புலம் , எஸ். ஆர். எம். வெளியீடு, 2014.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
ULE15201	ENGLISH-II	4	1	0	5	4

INSTRUCTIONAL OBJECTIVES	
1.	To enhance students' proficiency in English language.
2.	To enable the students to think in English.
3.	To become aware of the world literature and the writers.
4.	To equip students with the awareness and strategies needed to enable the study of English as a lifelong process.
5.	To engage in Ongoing professional development with respect to both teaching and research.

UNIT I - POETRY

1. The Hawk in the Rain by Ted Hughes
2. Crutches by Bertolt Brecht
3. Obituary- A. K. Ramanujan
4. Dream Deferred- Langston Hughes

UNIT II - PROSE

1. The Story of my Experiments with Truth by M.K. Gandhi (Excerpts)
2. I have a Dream by Martin Luther King
3. Farewell Speech by Mark Antony

UNIT III - PLAY AND SHORT STORY

1. Monkey's Paw by W.W.Jacobs
2. Bear by Anton Chekhov

UNIT IV - BOOK REVIEW

Excerpts from - 'To kill a Mocking Bird',

'Merchant of Venice'

UNIT V - LANGUAGE COMPONENT

1. Transformation of Sentences
2. Jumbled Sentences
3. Précis Writing

TEXT BOOKS

1. Cambridge University Press,. Raymond Murphy, *Essential Grammar in Use* 3rd Edition 2010

2. Edited by Dr.Shanthichitra, *Glean to ACME English Tex Book* Published by Department of English, FSH, SRM University

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15201	ELECTRICITY AND MAGNETISM	4	1	0	5	4

INSTRUCTIONAL OBJECTIVES	
1.	To understand the general concepts in Electrostatics.
2.	To apply the Physics concepts in solving problems.
3.	To educate scientifically the principles in Magnetism.
4.	To emphasize the significance of Electromagnetic theory.

UNIT I - ELECTROSTATICS AND DIELECTRICS

Electrostatic potential - Electric potential as line integral of electric field - Relation between electric potential and electric field in vector form - Gauss's Law and its applications – Gauss Divergence Theorem and differential form of Gauss's Law - Poisson's and Laplace's equations - Capacitance - Capacitance of a spherical andcylindrical capacitor - energy of a charged capacitor - Energy density - Loss of energy due to sharing of charges - Kelvin's attracted disc electrometer - The quadrant electrometer - Polarization in linear dielectric - Field inside a dielectric sphere in uniform electric field - Clausius-Mossoti Relation.

UNIT II - CURRENT ELECTRICITY AND THERMO ELECTRICITY

Current and current density - Equation of continuity – Ohm's law and electrical conductivity - Drude - Lawrence theory of electrical conduction - Kirchhoff's Laws - Carey Foster bridge - Theory - Determination of temperature coefficient of resistance - Calibration of ammeter and voltmeter using a potentiometer - Seebeck, Peltier and Thomson effects - Laws of thermoelectric circuits - Peltier coefficient - Thomson coefficient - Application of thermodynamics to a thermocouple and expressions for

Peltier and Thomson coefficients - Thermoelectric diagram and uses.

UNIT III - CHEMICAL EFFECTS AND MAGNETIC EFFECTS OF ELECTRIC CURRENT

Electrical conductivity of an electrolyte – Arhenius Theory of Electrolytic Dissociation - Faraday's laws of electrolysis - Determination of specific conductivity of an electrolyte (Kohlrausch bridge) - Gibbs Helmholtz equation for the emf of a reversible cell - calculation ofemf of a Daniel Cell - Ampere's circuital law (both in integral and differential form) and its application to simple systems viz., current carrying loop - solenoid – toroid - Biot-Savart's law and its application to simple systems viz., long straight wire carrying steady current - Circular loop carrying steady current - Solenoid - Helmholtz Galvanometer - Theory of moving coil Ballistic Galvanometer - Damping correction

UNIT IV - ELECTROMAGNETIC INDUCTION AND TRANSIENT CURRENTS

Faraday's laws - Lenz's laws – Integral and differential forms of Faraday's law– Mutual and Self Inductance - Determination of self-inductance by Anderson's bridge method and absolute mutual inductance by BG-Ruhmkorff's induction coil - Growth and decay of current in a circuit containing resistance and inductance - Growth and decay of charge in a circuit containing resistance and capacitor - Measurement of high resistance by leakage - Growth and decay of charge in a LCR circuit - Condition for the discharge to be oscillatory - Frequency of oscillation.

UNIT V - MAGNETIC PROPERTIES OF MATERIALS AND MAXWELL'S EQUATIONS

Susceptibility - permeability - Intensity of magnetization and the relation $B=\mu_0(H+I)$- Properties of dia, para and ferromagnetic materials - Langevin's theory of diamagnetism and paramagnetism - Weiss theory of ferromagnetism-antiferrimagnetism and ferrimagnetism - Maxwell's equations - Displacement current- Maxwell's equations in material media, plane electromagnetic waves in free space- Poynting vector-Hertz experiment for production of electromagnetic waves

TEXT BOOKS

1. Griffth D.J, *Introduction to Electrodynamics,* 4th Edition, Prentice Hall of India, 2012.
2. Murugeshan R., *Electricity and Magnetism*, 7th Edition, S. Chand and Company, 2008.

REFERENCES

1. Laud B.B, *Electromagnetics*. 2nd Edition, New Age International Publication, 2005.
2. Navina Wadhani, *Electricity and Magnetism*, Prentice Hall of India, 2012.
3. Tiwari A.K., *Electricity and Magnetism*, S.Chand and Company, 2007.
4. Halliday-Resnick and Walker, *Fundamentals of Physics – Electricity andMagnetism*, Wiley India Pvt Ltd , 2011.
5. Edward M Purcell, *Electricity and Magnetism,* Berkeley Physics Course, Volume 2, 2nd Edition, 2011.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15202	CLASSICAL MECHANICS AND RELATIVITY	4	1	0	5	4

INSTRUCTIONAL OBJECTIVES	
1.	To understand the general principles of Classical Mechanics and Relativity.
2.	To comprehend the mathematical formulation involved.
3.	To apply the concepts in solving problems.
4.	To emphasize the significance of classical mechanics in real time situations.

UNIT I - MECHANICS OF SYSTEM OF PARTICLES

Mechanics of a single particle - Mechanics of system of particles- Conservation of linear momentum- Conservation of Angular momentum - Mechanical energy for a particle and a system of particles-Centre of mass and equation of motion - Constrained motion-Types of constraints-Forces of constraints - Principle of Virtual work - D'Alembert's principle.

UNITII - LAGRANGE AND HAMILTON FORMALISM

Degrees of freedom and generalized coordinates- Transformation equations-Generalized

Displacement-Generalized velocity- Generalized acceleration-Generalized momentum-Generalized Force -Generalized Potential-Hamilton's Variational principle- Lagrange's equation of motion from Hamilton's principle-Linear Harmonic Oscillator-Simple pendulum-Atwood's machine.

UNIT III - CENTRAL FORCE

Definition and properties of central force-Two body central force problem-Stability of orbits-Condition for closure-Reduction to the equivalent one body problem-Equations of motion and First integrals-Actual geometry of orbits and orbital elements-Kepler's problem: Inverse square law of force-The motion in time in Kepler's problem-Orbits of artificial satellites.

UNIT IV - THEORY OF RELATIVITY

Frame of reference- Limitation of Newton's law of motion- Inertial frame of reference-Galilean transformation- Frame of reference with linear acceleration-Classical relativity-Galilean invariance- Transformation equation for a frame of reference inclined to an inertial frame and rotating frame of reference-Non-inertial frames-Accelerated Frame of reference -Rotating frame of reference -Effect of centrifugal and coriolis forces due to earth's rotation- Fundamental frame of reference-Michelson- Morley's experiment-Concept of Einstein's relativity.

UNIT V - APPLICATIONS OF THEORY OF RELATIVITY

Special theory of relativity- Lorentz co-ordinate and physical significance of Lorentz invariance- Length contraction- Time dilation- Twin paradox- Velocity addition theorem-Variation of mass with velocity- Mass energy equivalence-Transformation of relativistic momentum and energy-Relation between relativistic momentum and energy, Mass, velocity, momentum and energy of zero rest mass

TEXT BOOKS

1. Rana N. C.and Joag P.S., *Classical Mechanics*, 1st Edition, McGraw Hill, 2011.
2. Herbert Goldstein, Charles P. Poole and John L. Safko, *Classical Mechanics*,

3rd Edition, Pearson, 2011.

REFERENCES

1. John R. Taylor, *Classical Mechanics*, 1st Edition, University Science Books, 2005.
2. David Morin, *Introduction to Classical Mechanics*, 1st Edition, Cambridge University Press, 2008.
3. Harald J. W. Muller-Kirsten, *Classical Mechanics and Relativity*, 1st Edition, World Scientific Publishing Ltd, 2008.
4. Dieter Strauch, *Classical Mechanics-An Introduction*, 5th Edition, Springer, 2009.
5. Frank H. Berkshire, T. W. B. Kibble and Tom W. B. Kibble, *ClassicalMechanics*, 5thEdition, World Scientific Publishing Company, 2004.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15203	PHYSICS PRACTICALS – II	0	0	4	4	2

INSTRUCTIONAL OBJECTIVES	
1.	To gain knowledge in the scientific methods and learn the process of measuring different Physical variables.
2.	To enable the student to explore the field of electricity.
3.	To make the student understand the basic concepts in magnetism.
4.	To allow the student to have a deep knowledge of the fundamentals electromagnetic circuits.

LIST OF EXPERIMENTS

1. Calibration of voltmeter using Potentiometer.
2. Calibration of ammeter using Potentiometer.
3. Determination of Internal resistance of the given cell using Potentiometer.
4. Determination of Magnetic Induction and Magnetic Intensity by Field along the axis of the coil.
5. Determination of Temperature Coefficient of Resistance using Post Office Box.
6. Determination of Magnetic moment and Ratio of magnetic moments by Searle's vibration magnetometer method.
7. Determination of Figure of merit of charge by Ballistic Galvanometer.
8. Comparison of Capacitance of two capacitors using Ballistic Galvanometer.
9. Study of resonance in series LCR circuits.

TEXT BOOKS

1. Shukla R. K.and Anchal Srivastava. *Practical Physics*, New Age International (P) Ltd, Publishers, 2006.
2. Arora C. L., *B.Sc., Practical Physics,* S. Chand and Company Ltd., 2007.

REFERENCES

1. Chattopadhyay, D., Rakshit, P. C. and Saha, B., *An Advanced Course inPractical Physics*, 8thEdition, Books and Allied Ltd., 2007.
2. Indu Prakash and Ramakrishna, *A Text Book of Practical Physics*, 11th Edition, Kitab Mahal, 2011.
3. Ouseph C., Rangarajan K., *A Text Book of Practical Physics*, Volume I,II, S.Viswanathan Publishers,1997.
4. Geeta Sanon, *B. Sc., Practical Physics*, 1st Edition. R. Chand and Co, 2007.
5. Benenson, Walter, and Horst Stöcker, *Handbook of Physics*. Springer, 2002.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UMA15261	**ALLIED MATHEMATICS- II**	**4**	**0**	**0**	**4**	**4**
INSTRUCTIONAL	**OBJECTIVES**					
1.	To apply basic concepts for clear understanding of mathematical principles.					
2.	To solve practical problems.					

UNIT I - INTEGRAL CALCULUS

Integral calculus- polynomial and irrational function – Partial fraction (Simple algebraic functions only) - Bernoulli's formula – Reduction formula- $\int \sin^n x\,dx$

$-\int \cos^n x\,dx - \int 2\sin^n x dx - \int 2\cos^n x dx$

UNIT II - TRIGONOMETRY

Trigonomery – Expansion of Sin nθ, Cos nθ and tan nθ – Expansion of $Sin^n\theta$and $Cos^n\theta$- Expansion of $Sin^n\theta.Cos^n\theta$

UNIT III - DIFFERENTIAL EQUATION

Differential Equation - Second order Differential Equation with constant coefficient. Problem based on R.H.S: $0, e^{ax}, Sin\,ax, Cos\,ax, x$.

UNIT IV - LAPLACE TRANSFORMATION

Laplace Transformation – Basic properties and simple problems – L [e^{at} f (t)] – L [t f (t)] - L [e^{at} t f (t)] –L [f (t)/t] .

UNIT V - INVERSE LAPLACE TRANSFORMATION

Inverse Laplace transformation – Simple Problems based on Inverse Laplace Transformation - Multiplied by 's'- Multiplied by '1/s'- 'Partial Fraction Method'.

TEXT BOOK

1. Singaravelu. A, *Allied Mathematics*, 3rd Edition, Meenakshi Agency, 2011.

REFERENCES

1. Vittal. P.R, *Allied Mathematics*, 4th Edition Reprint, Margham Publications, 2013.
2. Venkatachalapathy, S.G,*Allied Mathematics,* 1st Edition Reprint, Margham Publications, 2007.
3. Manickavasagam Pillai. T.K and Narayanan. S, *Ancillary Mathematics*, Reprint,S.Viswanathan P*rinters and Publishers P*vt. Ltd.,Chennai.

COURSE Code	COURSE TITLE	L	T	P	Total of LTP	C
CDC15201	QUANTITATIVE APTITUDE ANDREASONING – I (Internal Evaluation)	2	0	0	2	2

INSTRUCTIONAL OBJECTIVES	
At the end of this course, the students will be able to,	
1.	Critically evaluate various real life situations by resorting to Analysis of key issues and factors
2.	Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.

UNIT I

Simple equations - Ratio & Proportion – Variation

UNIT II

Percentages - Profit and loss – Partnership - Simple interest and Compound interest

UNIT III

Deductions – Connectives

UNIT IV

Analytical Reasoning puzzles - Problems on Linear arrangement -Problems on Circular arrangement

UNIT V

Clocks – Calendars - Blood relations

TEXT BOOKS:

1. R S Agarwal, 'Quantitative Aptitude' S.Chand Publishers,2013
2. R S Agarwal,'A modern approach to Logical reasoning' S.Chand Publishers

REFERENCES

1. Abhijit Guha, Quantitative Aptitude - Mc Graw Hills Publishers
2. R S Agarwal, , 'A modern approach to Logical reasoning' S.Chand Publishers

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UNS15201/ UNC15201/ UNO15201/ UYG15201	NSS/NCC/NSO/YOGA	0	0	0	0	1

SEMESTER III

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15301	HEAT AND THERMODYNAMICS	4	1	0	5	4

INSTRUCTIONAL OBJECTIVES	
1.	To know the fundamentals of heat.
2.	To understand the concepts involved in transmission of heat.
3.	To understand the basic principle and laws of thermodynamics.
4.	To understand the concepts of entropy.

UNIT I - INTRODUCTION TO HEAT

Basic Definitions – Newton's law of cooling – Specific heat of a liquid calendar and Barne's continuous flow method – Two specific heats of a gas – Specific heat of a gas by Jolly's differential steam calorimeter – Regnault's method – Dulong and Petit's law – Einstein's theory of specific heat - Debye's theory of specific heat - variation of specific heat ad atomic heat with temperature - Transference of heat.

UNIT II - TRANSMISSION OF HEAT

Conduction – Coefficient of the thermal conductivity – Rectilinear flow of heat along a metal bar - Methods of radial flow of heat - Spherical shell method and flow of heat along the wall of a cylindrical tube - Determination of thermal conductivity of rubber and bad conductor – Lee's disc method to find thermal conductivity of bad conductor. Conduction – Radiation – Black body – Wein's Law – Raleigh Law and its significance –Jean's Law – Stefan's law – Experimental Determination of Stefan's constant – Mathematical derivation of Stefan's law.

UNIT III - KINETIC THEORY OF GASES

Maxwell's law of distribution of molecular velocities – Experimental verification of

molecular velocities – Equilibrium speed distribution of velocities - Mean free path of gaseous molecules – Transport phenomena – Diffusion of gases – Viscosity and thermal conduction of gases – Vander walls equation of state – Determination of Vander walls constant – Comparison of vanderwall's equation with Andrews experiment - Relation between Vander Wall's constant and critical constants.

UNIT IV - LAWS OF THERMODYNAMICS

First law of thermodynamics – Isothermal and Adiabatic process – Gas equation during an adiabatic process – Work done an adiabatic expansion of gas – Equation of an adiabatic curve – Isothermal processes – Determination of g by Clement and Desorme's method – Second law of thermodynamics – Concept of Carnot's engine- Working efficiency of Carnot's engine – Carnot's refrigerator – Carnot's Theorem and its significance.

UNIT V - CONCEPT OF ENTROPY

Third law of thermodynamics - Concept of Entropy - Temperature entropy diagram – entropy of perfect gas - Entropy Change in entropy in a reversible process and irreversible process – temperature entropy diagram – Entropy of a perfect gas – increase of entropy in any irreversible process – Thermo dynamics functions – Maxwell's thermodynamics relations and applications – Joule Kelvin effect theory- Claussius and Clapeyron equation - Specific Heat Relation.

TEXT BOOKS

1. Brijlal, N. Subrahmanyam and P. S. Hemne,*Heat,Thermodynamics andStatistical Physics*, Revised Edition, S. Chand and Company, 2010.
2. Richard H Dittman and Zemansky MW, *Heat and Thermodynamics*, 3rd Special Edition, McGraw Hill, 2008.

REFERENCES

1. Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner and Margaret Bailey, *Fundamentals of Engineering Thermodynamics,* John Wiley and Sons, 2011.
2. D.S. Mathur, *Heat and Thermodynamics*, S. Chand and Company, 2006.
3. Kittel C and Kroemer H, *Thermal Physics,* W. H. Free man, New York, 1980.
4. Stephen Blundell and Katherine M. Blundell, *Concepts in Thermal Physics,* Oxford University Press, 2006.
5. Anandamoy Manna, *Heat and Thermodynamics,* Dorling Kindersely Pvt Ltd, 2011.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15302	PHYSICS OF BIOLOGICAL SYSTEMS	4	1	0	5	4

INSTRUCTIONAL OBJECTIVES	
1.	To make the student understand the principles of biophysics.
2.	To enable the student to explore the field of biophysics.
3.	To make the student understand the basic concepts in biophysics.
4.	To allow the student to have a deep knowledge of the fundamentals of biophysics.

UNIT I - INTRODUCTION TO BIOPHYSICS

Electronic structure of atoms -Types of Bonds - Biomolecules and molecular system - Nucleic acids - Heterocyclic bases-Nucleosides-Nucleotides-primary - Secondary and tertiary structure of DNA- Ribo nucleic acid (RNA) amino acids-Primary structure of proteins - Peptide bond - Secondary- Tertiary and quaternary structure of proteins.

UNIT II - BIOPHYSICAL INSTRUMENTATION TECHNIQUES

Ultrasound - Nuclear magnetic resonance - Positron emission topography - Computer axial tomography - Whole body scanner - Dose calibrators - Gamma scintillation camera - Digital imaging techniques – Acquisition - Analysis and processing of data from gamma camera - Enhancement - Topographic reconstruction - Display and recording of image.

UNIT III - DIFFUSION AND ENERGY PRODUCTION IN BIOSYSTEMS

Forces and Flows - Fick's law of diffusion - Brownian motion - Physiological diffusion of ions and molecules - Molecular motors- ATP and Flagellar motors - Actin and myosin - Intracellular cargo transport and Intercellular cargo transport.-Importance. Energetics of human performance - Adenosine Triphosphate (ATP) production - Glycolysis.

UNIT IV - MEMBRANE ELECTRICAL PROPERTIES

Membrane Biophysics - Nerve cell- bioelectrical and biochemical conduction of nerve impulses - Membrane potential - Resting potential and action potential - Gross bioelectrical phenomenon of ECG and EEG - Membrane potential-Action potential- Goldman and Nernst equation -ECG (Electrocardiogram)-EG (Electroencephalogram) -EMG(Electromyogram) - Channel Ion selectivity.

UNIT V - FORCE AND MOVEMENT IN BIOLOGICAL SYSTEMS

Skeletal length - Tension relation - Muscle contraction and relaxation- Calcium dependence of muscle movement - Smooth muscles - Cardiac muscles - Carrier transport across gated channels in different types of muscles - Fluid properties - synovial fluid flow - Arterial blood flow - Arterial stenosis- Lymph - Amniotic fluid - Peritoneal fluid - Cerebrospinal fluid.

TEXT BOOKS

1. Patrick F.Dillon, *Biophysics- A Physiological Approach-Patrick,* 1st Edition, Cambridge University Press, 2012.
2. Willian Bialek*, Biophysics: Searching for Principles*, 1st Edition, Kindle, 2012.

REFERENCES

1. Vasantha Pattabhi and Gautham N., *Bio Physics*, Narosa Publishing House, 2005.
2. Agarwal S. K.,*Advanced Biophysics,* APH Publishing Corporation, 2005.
3. Daniel M., *Basic Biophysics for Biologists*, Agrobios (India), 2003.
4. Narayanan P., *Essential of Biophysics,* New Age International (P) Limited, 2005.
5. Roland Glaser, *Biophysics*, Springer, 2001.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15303	PHYSICS PRACTICAL-III	0	0	4	4	2

INSTRUCTIONAL OBJECTIVES	
1.	To gain knowledge in the scientific methods and learn the process of measuring different Physical variables.
2.	To enable the student to explore the field of thermal physics.
3.	To make the student understand the basic concepts in heat conductors.
4.	To allow the student to have a deep knowledge in the field of latent heat.

LIST OF EXPERIMENTS

1. Determination of Thermal conductivity of a good conductor using Forbes method.
2. Determination of Specific heat capacity of a solid by Method of mixtures. (Half time correction).
3. Determination of Thermal conductivity of a bad conductor using Lee's disc method.
4. Calculate the Temperature coefficient of resistance of the given coil by Carey Foster Bridge.
5. Determination of saturated vapour pressure of water at different temperatures using Joly's method.
6. Determination of thermal conductivity of good conductors by Searle's method.
7. Determination of Specific Heat Capacity of the liquid using Joule's calorimeter.
8. Determination of Specific Heat Capacity of the liquid using Newton's Law of Cooling
9. Determination of specific heat capacity of a liquid by continuous flow (Callender and Barnes) method.

TEXT BOOKS

1. Shukla R. K and Anchal Srivastava. *Practical Physics*, New Age International (P) Ltd, Publishers, 2006.
2. Arora C. L, *B.Sc Practical Physics,* S. Chand and Company Ltd, 2007.

REFERENCES

1. Chattopadhyay, D., Rakshit, P. C. and Saha, B., *An Advanced Course inPractical Physics*, 8thEdition, Books and Allied Ltd., Calcutta, 2007.

2. Indu Prakash and Ramakrishna, *A Text Book of Practical Physics*, 11th Edition, Kitab Mahal, 2011.
3. C.Ouseph, K. Rangarajan, *A Text Book of Practical Physics*, Volume I, II, S.Viswanathan Publishers, 1997.
4. Geeta Sanon, *B. Sc Practical Physics*, 1st Edition, S. Chand and Co, 2007.
5. Benenson Walter and Horst Stöcker, *Handbook of Physics,* Springer, 2002.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UCY15361	ALLIED CHEMISTRY- I	4	1	0	5	4

INSTRUCTIONAL OBJECTIVES	
1.	To gain knowledge on the importance of basic organic chemistry.
2.	To acquire knowledge about hydrocarbons and their reactions.
3.	To understand the importance of silicon and metals.
4.	To acquire knowledge in chemical kinetics.
5.	To gain knowledge in photochemistry.

UNIT I - INTRODUCTION OF HYBRIDISATION AND ISOMERISM

Hybridisation - sp, sp^2 and sp^3 - Bond length, bond angle, dipole moment, inductive effect, mesomeric effect and hyperconjucation - Isomerism-geometrical and optical isomerism, optical activity, asymmetry, dissymmetry, elements of symmetry, R, S notations.

UNIT II - HYDROCARBONS

Methods of preparation of alkanes, properties - Reactions. Free radical mechanism of halogention of alkanes, Methods of preparation of alkenes - Stereochemistry of dehydrohalogenation (E1, E2, E1CB mechanism). Properties of alkenes - Electrophilic and nucleophilic addition mechanisms.

UNIT III - CHEMISTRY OF HYDROGEN, SILICON AND METALS

Occurrence, extraction and chemical properties of iron, cobalt, nickel and copper.Position of hydrogen in periodic table, atomic hydrogen and isotopes of hydrogen.Preparation and structure of borozole, SiO_2, SiC and $SiCl_4$.

UNIT IV - CHEMICAL KINETICS

Rate of reaction, order, molecularity, first order rate law and simple problems, half life period of first order reaction, pseudo first order reaction, zero and second order reactions. Arrhenius and collision theories.

UNIT V - PHOTOCHEMISTRY

Difference between photochemical reactions and dark reactions. Laws of photochemistry-Einstein law of photochemical equivalence, quantum yield. Kinetics of Hydrogen-chlorine, Hydrogen-bromine.Fluorescence, phosphorescence.

TEXT BOOKS

1. Puri B.R., Sharma L.R., Kalia K.K., *Principles of Inorganic Chemistry*, Shobulal Nagin Chand and Co, 2001.
2. Soni P. L., *A Textbook of Inorganic Chemistry,* Sultan Chand and Co., 1977.

REFERENCE

1. Bahl B.S. and Arun Bahl, A *Text book of Organic Chemistry*, 21st Edition, Sultan Chand and Co., 2012.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UCY15362	ALLIED CHEMISTRY PRACTICALS-I	0	0	4	4	2
INSTRUCTIONAL OBJECTIVES						
1.	To gain knowledge on the importance of basic acidimetry.					
2.	To acquire knowledge about permanganametry.					
3.	To understand the importance of dichrometry.					
4.	To acquire knowledge in iodimetry.					

VOLUMETRIC ANALYSIS

Acidimetry and Alkalimetry

1) Estimation of HCl using standard oxalic acid
2) Estimation of NaOH using standard sodium carbonate

Permanganametry

1) Estimation of FAS using standard oxalic acid
2) Estimation of $KMnO_4$ using standard potassium dichromate

Dichrometry

1) Estimation of $FeSO_4$ using standard FAS.

Complexometric or EDTA titration

1) Estimation of Zn/Mg

Iodimetry

1) Estimation of ascorbic acid
2) Estimation of phenol / aniline

TEXT BOOK

1. Venkateswaran V., Veeraswamy R., Kulandaivelu A.R., *Basic Principles ofPractical Chemistry,* 2nd Edition ,Sultan Chand and Sons,1997.

REFERENCE

1. Gnanapragasam N.S. and Ramamurthy G., *Organic Chemistry – LabManual*, S. Viswanathan and Co., 1998.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15E51	ELECTRONIC INSTRUMENTATION	3	0	0	3	3

INSTRUCTIONAL OBJECTIVES	
1.	Understand and learn the different principles and instruments adopted for measurement of current, voltage, power, energy etc.
2.	Study different methods available for measurement of passive elements like resistance, inductance and capacitance.
3.	Solve problems in the topics mentioned above.
4.	Storage of digital signal and analyzers for analyzing digital signal to provide with meaningful information.

UNIT I - MEASUREMENT OF CURRENT AND VOLTAGE

Introduction to electrical measurements – Classification of analog instruments – Galvanometers – Vibration- tangent and d'Arsonval type- Principle of operation-construction- sources of errors and compensations in PMMC- Moving iron-dynamometer and induction type instruments- Extension of ranges and calibration of ammeters and voltmeters.

UNIT II - MEASUREMENT OF POWER AND ENERGY

Power measurement – Voltmeter ammeter method- Electrodynamic wattmeter – Theory- Errors and compensation methods- Low power factor wattmeter – Power measurement in poly-Phase systems-Energy measurement – Single phase and poly phase induction type energy meter – Theory and adjustments – D.C.energy meter – Testing of energy meters-Calibration of wattmeter and energy meter.

UNIT III - MEASUREMENT OF RESISTANCE AND IMPEDANCE

Low Resistance- Kelvin's double bridge and Ductor Ohmmeter method-Medium Resistance- Voltmeter- Ammeter method- Substitution method- Wheatstone bridge method - High Resistance- Megger- Direct deflection method- Megohm bridge method- Earth resistance measurement- Introduction to A.C. bridges – Sources and Detectors in A.C. bridges- Measurement of Self Inductance - Maxwell's bridge- Hay's bridge- and Anderson's bridge. Measurement of Mutual Inductance - Heaviside M.I. bridge- Measurement of Capacitance - Schering's bridge- De- Sauty's bridge Measurement of frequency using Wien's bridge.

UNIT - IV POWER SUPPLIES- OSCILLOSCOPES and SIGNAL GENERATORS

Fixed and variable power supplies - Positive and negative voltage regulators - Functional block diagram of voltage regulator IC's- CRO-general purpose and advanced type - Sampling and storage scopes – Signal and function generators – Random noise generators - Pulse and square wave generator-Sweep Generator – Alignment Procedure - Wobbluscope - Pattern Generator-Video pattern Generator.

UNIT - V RECORDING DEVICES AND WAVE ANALYSERS

Bar graph display - Seven segment and dot matrix displays - Signal recorders - x-y recorder - Magnetic tape recorders - Digital recording and data loggers -Basic wave analyzer - Frequency selective and heterodyne spectrum analyzer - Fundamental type harmonic distortion analyzers - Distortion factor meter - Q meter - Distortion analyzers using resonance bridge- Wien bridge -T Method - Impedance measurement.

TEXT BOOKS

1. Kalsi.H.S.*, Electronic Instrumentation*, Tata McGraw-Hill Education, 3rd Edition,

2010.
2. Hlefrick A.D., *Modern Electronic Instrumentation and MeasurementTechniques*, Dorling Kindersley (India) Pvt Limited, 3rdEdition, 2005.

REFERENCES

1. Stout .M. B., *Basic Electrical Measurements*, Prentice Hall of India, 1990.
2. Rajendraprasad, *Electrical Measurements and Measuring Instruments,* Khanna Publishers, 1999.
3. Gupta J.B, *Courses in Electrical Measurements and Measuring Instruments,* S.K. Kataria and Sons, 13th Edition, 2009.
4. B.M. Oliver and J.M.Gage, *Electronic Measurements and Instrumentation*, McGraw Hill, 1977.
5. Bhuyan M, *Intelligent Instrumentation: Principles and Applications,* CRC Press*, Taylor and Francis,* 2011.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15E52	LASER TECHNOLOGY	3	0	0	3	3

INSTRUCTIONAL OBJECTIVES	
1.	Students will be able to learn about the basic theory of lasers, importance of optical resonators.
2.	Students will gain knowledge about the lasing actions in different level laser systems.
3.	Students will be knowledgeable about the types of lasers.
4.	Students will understand the principle involved in Gas and semiconductor lasers working in materials processing.

UNIT I - INTRODUCTION TO LASERS

Black body radiation - Modes of oscillation - Lifetime of excited state - Decay of excited states - Condition for producing laser - Gain and gain saturation - Saturation intensity - Threshold condition - Requirements for obtaining population inversion - 2,3 and 4 level systems - Steady state and transient population processes - Variation of laser power around threshold - Optimum output coupling conditions for CW and pulsed laser action.

UNIT II - OPTICAL RESONATORS

General considerations - Laser resonators - Fox and Li theory - Fresnel number - Photon representation of cavity properties of a cavity - Plane and spherical mirror

cavities - General conditions of stability - Lens sequence - Matrix treatment of thin lens sequence - Confocal resonator - Gaussian beam propagation - Multimode oscillation - Degeneracy.

UNIT III - GAS LASERS

Electrical discharge mechanism – Gas discharge processes - Glow discharge - RF discharge - Pulsed discharge - Selective Excitation processes in gas discharges - Excitation mechanism - Power supplies for pulsed and CW gas lasers– He-Ne laser - Argon-ion laser - Excitation mechanism - Nitrogen laser - Carbon-dioxide laser - Gas dynamic laser - Excimer laser - Chemical laser - X-ray laser - Free electron laser.

UNIT IV - SOLID STATE, SEMICONDUCTOR AND LIQUID LASERS

Pumping mechanism - Arc lamp - Diode pumping - Cavity configuration - Ruby laser - Nd:YAG - Nd:Glass - Er doped laser – Ti-Sapphire laser - Intrinsic semiconductor laser - Doped semiconductor - Condition for laser action - Injection laser - Threshold current - Homojunction – Hetrojunction - Double hetrojunction lasers - Quantum well laser - Liquid lasers - Pulsed-CW dye laser - Threshold condition - Configuration - Tuning methods.

UNIT V - APPLICATION OF LASERS

Material Processing - Models for laser heating - Choice of a laser for material processing - Laser welding – Drilling - Machining and cutting - Laser surface treatment - Laser vapour deposition - Thin film applications - Surgical Applications **-** Evaporation and excitation techniques - Sterilization - Hemostasis - Laryngeal surgery - Cancer surgery - Liver surgery - Stomach surgery - Gynecological surgery - Urological surgery - Cardiac surgery - Lasers in Opthalmology – Dermatology and Dentistry – Cosmetic surgery.

TEXT BOOKS

1. Trager, *Handbook of Lasers and Optics*, 2nd Edition, Springer, 2012.
2. Walter Koechner, *Solid State Lasers Engineering*, 6th Edition, Springer Verlag, 2006.

REFERENCES

1. Breck Hitz C., James J, *Introduction to Laser Technology* , John Wiley and Sons,

2004
2. Renk Karl F, *Basics of Laser Physics*, Springer, 2012.
3. Orazio Svelto, *Principles of Lasers*,Springer, 4th Edition, 1998.
4. David C. Hanna, Steen and William, Mazumder, *Laser Material Processing*, 4th Edition,Springer, 2010.
5. Ronald W. Waynant, *Lasers in Medicine*, CRC Press, 2010.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15E53	COMPUTER NETWORKS	3	0	0	3	3

INSTRUCTIONAL OBJECTIVES	
1.	To understand the general concepts of data communications.
2.	To study the functions of different layers.
3.	To introduce IEEE standards employed in computer networking.
4.	To emphasize the significance of different protocols and network components.

UNIT I - DATA COMMUNICATIONS

Components - Direction of Data flow - Networks distributed processing - Network criteria - Physical structure - Network model - Categories of networks - Interconnection of networks - Components and Categories - Types of Connections – Topologies - Protocols and Standards - ISO / OSI model - Data and signals - Periodic analog signal - Digital signal - Transmission impairment - Data rate limits - Digital to digital conversion - Analog to digital conversion - Bandwidth and utilization - Multiplexing and spreading - Transmission Media - Coaxial Cable - Fiber Optics - Line Coding - Modems - RS232 Interfacing sequences.

UNIT II - DATA LINK LAYER

Error block coding - Linear coding - Cyclic coding - Checksum - Detection-Correction - Parity - LRC - CRC - Hamming code - Low Control and Error control - Stop and wait - Go back-N ARQ - Selective repeat ARQ - Sliding window - HDLC. - LAN - Ethernet IEEE 802.3 - IEEE 802.4 - IEEE 802.5 - IEEE 802.11 - FDDI - Connecting devices - Backbone networks - Virtual LANs - Satellite networks - SONET - Frame relay – ATM – Bridges.

UNIT III - NETWORK LAYER

Logical addressing - IPV4 and IPV6 address - Internetworks address mapping - Error reporting and multicasting - ICGMP - Delivery - Forwarding and routing - Packet Switching and Datagram approach - IP addressing methods - Subnetting - Routing -Distance Vector Routing - Link State Routing - Routers - Unicast routing protocols - Multicast protocols and applications.

UNIT IV - TRANSPORT LAYER

Process to process delivery - Client/server paradigm – Multiplexing - Demultiplexing - Connectionless versus connection oriented service - Reliable versus unreliable - Three protocols - Sockets - User Datagram Protocol (UDP) user datagram - Checksum - Operation - Use - Transmission Control Protocol (TCP) service - Features - Connections - Flow control and error control - Congestion Control - Quality of services (QOS) – Integrated services.

UNIT V - APPLICATION LAYER

Domain Name Space (DNS) Name space - Label – Domain - Distribution of name space - DNS in internet – Mapping – Messages - Types of records – DDNS – Encapsulation - Remote logging - Electronic mail - File transfer - SMTP - FTP - HTTP – WWW - Web documents - Network management system – Simple network management protocol - Multimedia - Cryptography - Symmetric key and asymmetric key - Security – Services - Message confidentiality - Message integrity - Digital signature.

TEXT BOOKS

1. Behrouz A. Forouzan, *Data communication and Networking*, 5th Edition, Tata McGraw-Hill, 2012.
2. Andrew S. Tanenbaum, *Computer Networks*, 4thEdition , Pearson, 2009.

REFERENCES

1. Keshav S., *An Engineering Approach to Computer Networks*, 2nd Edition, Pearson Education, 2009.
2. Shay W.A., *Understanding communications and Networks*, 3rd Edition, Cengage Learning,2005.
3. Wayne Tomasi, *Introduction to Data Communications and Networking*, 3rd Impression, Pearson Education, 2009.
4. Hura G.S.and Singhal M., *Data and Computer Communications*, CRC Press, Taylor and Francis Group, 2005.

COURSE Code	COURSE TITLE	L	T	P	Total of L+T+P	C
CDC15301	QUANTITATIVE APTITUDE AND REASONING – II (Internal Evaluation)	2	0	0	2	2

INSTRUCTIONAL OBJECTIVES	
At the end of this course, the students will be able to,	
1.	Critically evaluate various real life situations by resorting to Analysis of key issues and factors
2.	Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.

UNIT I:

- Numbers
- Time and Distance
- Time and Work
- Averages, Mixtures and Allegations

UNIT II:

- Data Interpretation
- Data Sufficiency
- Mensuration
- Permutation and Combinations
- Probability

UNIT III:

- Cubes
- Venn diagrams
- Binary Logic

UNIT IV:

- Number and letter series
- Number and Letter Analogies
- Odd man out

UNIT V:

- Coding and decoding
- Direction sense test

- Critical Reasoning
- Lateral reasoning puzzle

TEXT BOOKS:

1. R S Agarwal, 'Quantitative Aptitude' S.Chand Publishers,2013
2. R S Agarwal,'A modern approach to Logical reasoning' S.Chand Publishers

REFERENCES

1. Abhijit Guha, Quantitative Aptitude - Mc Graw Hills Publishers
2. R S Agarwal, , 'A modern approach to Logical reasoning' S.Chand Publishers.

SEMESTER IV

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15401	LASER PHYSICS AND SPECTROSCOPY	4	1	0	5	4

INSTRUCTIONAL OBJECTIVES	
1.	To enable the students to understand the basic concepts of Lasers.
2.	To emphasize the principles involved in various spectroscopies.
3.	To comprehend the instrumentation and working of different Laser systems.
4.	To develop expertise in applying the spectroscopic techniques in appropriate situations.

UNIT I - FUNDAMENTALS OF LASERS AND TYPES

Characteristics of a Laser - Directionality- High Intensity-High Degree of Coherence- Spatial And Temporal coherence- Spontaneous and stimulated emission - Einstein's Coefficients and possibility of Amplification- Population Inversion- Laser Pumping- Resonance Cavity- Threshold Condition for Laser Emission - Ruby Laser-He-Ne Laser-CO_2 Laser - Nd-YAG laser- Applications of Laser .

UNIT II - CONTROL OF LASER PROPERTIES AND PRODUCTION

Resonators - Vibrational modes of resonators- Number of modes/unit volume - Open resonators- Control resonators- Q Factor- Losses in the cavity- Threshold condition- Quantum yield-Mode locking (active and passive)-Q Switching.

UNIT III - MICROWAVE SPECTROSCOPY

Rotation of molecules-Rotational spectra-Rigid and non-rigid diatomic rotator-Intensity of spectral lines-Isotopic substitution-Poly atomic molecules (Linear and symmetric top)-Hyperfine structure and quadrupole effects-Inversion spectrum of ammonia-Chemical analysis by Microwave spectroscopy-Techniques and instrumentation.

UNIT IV - INFRA RED SPECTROSCOPY

Basic Theory- Vibration of molecules-Diatomic vibrating rotator-vibrational rotational spectrum-Interactions of rotations and vibrations-Influence of rotation on the vibrational spectrum of linear and symmetric top and poly atomic molecules -Instrumentation-Sample Handling- Characteristic VibrationalFrequencies- Effect of Hydrogen Bonding and solvent effect on Vibrational Frequencies- Overtones- Combination bands and Fermi Resonance-FTIR.

UNIT V - RESONANCE SPECTROSCOPY

NMR - Basic principles - Classical and quantum mechanical description- Bloch equations - Spin-spin and spin-lattice relaxation times – Chemical shift and coupling constant - Experimental methods – Single coil and double coil methods. ESR: Basic principles – ESR spectrometer – Nuclear interaction and hyperfine structure –relaxation effects – g-factor – Characteristics – Free radical studies and biological applications.

TEXT BOOKS

1. Colin Banwell and Mc Cash, *Fundamentals of Molecular Spectroscopy*, TMH Publishers, 4th Edition, 2002.
2. Sune Svanbag, *Atomic and Molecular Spectroscopy: Basic Aspects andPractical Applications*, Springer, 3rdEdition, 2001.

REFERENCES

1. Jeanne L Mc Hale, *Molecular Spectroscopy*, Pearson Education, 1st Indian Edition, 2008.
2. Aruldhas G., *Molecular Structure and Spectroscopy*, Prentice Hall of India, 2001.
3. Wolfgang Demtröder, *Laser Spectroscopy: Vol. 1: Basic Principles*, 4th Edition, Springer, 2008.
4. Halina Abramczyk, *Introduction to Laser Spectroscopy,* 4th Edition,Elsevier,2005.
5. Laud B B*, Lasers and Non linear Optics*, Wiley Eastern Ltd, 1991.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15402	SOLID STATE PHYSICS	4	1	0	5	4
INSTRUCTIONAL OBJECTIVES						
1.	The course is to understand the basic knowledge on crystal structures and crystal systems.					
2.	To understand the various techniques available in X-Ray Crystallography.					
3.	To acquire the knowledge of bonding in solids and Lattice waves.					
4.	To comprehend the concepts of dielectric properties of solids and superconductivity.					

UNIT I - CRYSTAL PHYSICS

Crystalline and amorphous solids- Lattice and basis-Unit cell and primitive cell-Crystal systems-Translation vectors-Number of atoms per unit cell in a Cubic Crystal -Bravais lattice - Simple - Body centered and face centered cubic lattices-Hexagonal close packed and diamond structure-Miller indices-Interplanar spacing- Crystal diffraction- Bragg's law-Experimental diffraction methods-Laue method-Powder diffraction method-Reciprocal lattice.

UNIT II - BONDING IN SOLIDS

Crystal binding-Crystal binding-Crystals of inert gas-Van der Walls-Cohesive energy-Compressibility and bulk modulus-Ionic Crystals-Madelung energy-Evaluation of Madelung constant – Covalent crystals- Energy value for single covalent bonds – Metallic crystals-Hydrogen bonding– Atomic radii –Tetrahedral covalent radii and ionic crystal radii.

UNIT III - LATTICE VIBRATION AND THERMAL PROPERTIES OF SOLIDS

Vibration of one dimensional monatomic linear lattice-Derivation of force constant-Dispersion relation-Brillouin zone-Phase velocity-Group velocity-Phonons-characteristics of phonons – Phonon momentum-Thermal Properties of Solids-Classical theory of specific heat- Einstein's theory of specific heat-Debye's theory of specific heat-Debye approximation-Specific heat capacity-Experimental verification

UNIT IV - FREE ELECTRON THEORY OF METALS

Free electron theory – Drude Lorentz theory – Explanation of Ohm's law – Electrical conductivity – Thermal conductivity – Wied-Mann and Franz ratio – Sommerfield model – Schotcky effect – Hall effect – Hall voltage and Hall coefficient – Mobility and Hall angle – Importance of Hall effect – Experimental determination of Hall coefficient.

UNIT V - DILECTRICS AND SUPERCONDUCTIVITY

Dielectrics- Dielectric constant and displacement vector- Clausiss mossotti relation- Atomic or molecular polarizability – Types of polarizability – Superconductivity- Occurrence of superconductivity – Destruction of superconductivity by magnetic fields – Meissner effect – London equation – Josephson effect – Energy gap – Elements of BCS theory – Classification of Superconductivity – Application

TEXT BOOKS

1. Pillai S.O., *Soild State Physics*, 6th Edition, New Age Science, 2013.
2. Charles Kittel, *Introduction to Solid State Physics*, Wiley, 2005.

REFERENCES

1. Ashcroft W.and *Mermin N.D., Solid State Physics, H*olt-Rinehart-Winston, 1976.
2. Blakemore J. S., Solid State Physics, 2nd Edition, Cambridge University Press, Cambridge, 1974.
3. Dekker A. J., *Solid State Physics*, Mac Millan, 1971.
4. Giuseppe Grosso, Giuseppe Pastori Parravicini, *Solid State Physics,* Academic Press, Second Edition, 2014.
5. Woolfson M. M., *An Introduction to X-ray Crystallography*, Cambridge University Press,1991.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15403	PHYSICS PRACTICALS – IV	0	0	4	4	2

INSTRUCTIONAL OBJECTIVES

1.	To make the student familiarize with the basics of materials science experiments.
2.	To enable the student to explore the field of semiconductors.
3.	To make the student understand the basic concepts in magnetism.
4.	To enhance the students understand the concepts in crystal physics.

LIST OF EXPERIMENTS

1. Resistivity determination for a semiconductor wafer using Four probe method.
2. Determination of dielectric constant for a given material.
3. Determination of Planck's constant using Light Emitting Diode.
4. Study of Laser beam parameters, (a). Measurement of Wavelength of He-Ne Laser light using ruler (b) Measurement of thickness of thin wire with laser.
5. Determination of particle size using given laser source.
6. Determination of Hall coefficient and carrier type for a given semiconductor material.
7. To trace the hysteresis loop for a magnetic material.
8. Determination of Magnetic susceptibility for a given paramagnetic liquid by Quincke's method.
9. Determination of Lattice parameters using X Ray Diffraction.

TEXT BOOKS

1. Thiruvadigal, J. D., Ponnusamy, S. Preferencial Kala, C. and Krishna Mohan, M. *Materials Science*, Vibrant Publications, Chennai. 2014.
2. Gupta S. K., *Engineering Physics Practical*, 9th Edition, Krishna Prakashan Media Publishers, 2010.

REFERENCES

1. Callister, Jr. W.D. *Materials Science and Engineering: An Introduction*, 7th Edition, Wiley, 2007.
2. Kasap S.O., *Principles of Electronic Materials and Devices*, Tata McGraw Hill

Edition, 2002.
3. Sam Zhang, *Materials Characterization Techniques*, CRC Press, 2008.
4. Chaikin, Paul M., and Tom C. Lubensky, *Principles of Condensed MatterPhysics*. Vol. 1. Cambridge University Press, 2000.
5. Shackelford, James F., and William Alexander, *CRC Materials Science andEngineering Handbook*, CRC Press, 2010.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15E54	WIRELESS TECHNOLOGY	3	0	0	3	3

INSTRUCTIONAL OBJECTIVES	
1.	To understand the wireless technology and its applications.
2.	To apply the Physics concepts in solving engineering problems.
3.	To understand VOIP, WAP, GPS technologies.
4.	To educate scientifically the new developments in wireless power transfer.

UNIT I - RADIO WAVE PROPAGATION

Introduction - Electromagnetic spectrum and waves - Free space propagation model - Relating power to electric field – Reflection - Ground reflection – Diffraction – Scattering - Outdoor propagation models - Indoor propagation models - Signal penetration into buildings - Small scale multipath propagation - Types of small scale fading - Rayleigh and Ricean distributions.

UNIT II - OVERVIEW OF WIRELESS TECHNOLOGY

Evolution of wireless technology - Comparison of wired and wireless mechanismAdvantages and limitations - Types of wireless communications – Cellular mobile - Radio paging - Radio trunking - Cordless phone - Wireless LAN – WLAN Microwave radio relay links – Satellites - Concept of narrow band and spread spectrum - Various types of spread spectrum - Spreading sequences.

UNIT III - WIRELESS NETWORKS

Wireless local area network (WLAN) technology - Over view - Infrared LANs - Spread spectrum LANs - Narrow band - Wireless internet - Cellular wireless networks - Microwave LANs – Architecture – Services - Medium access control - Physical layer - Bluetooth technology - Design and principle of operation - Radio specification - Base band specification - Time division multiple access (TDMA) - Code division multiple access(CDMA) - Satellite communications - Global Positioning System **(**GPS).

UNIT IV - WIRELESS APPLICATION PROTOCOL

Design and principle of operation - Wireless Application Protocol (WAP) architecture overview - Wireless access protocols - Various types of blue tooth specifications and protocols - Introduction to Voice over Internet Protocol (VoIP) - Wireless voip solution - Introduction to mobile - Internet protocol TCP/IP protocol– Transition from IPV4 to IPV6 – IPV6 header format – IPV6 Features.

UNIT V - WIRELESS POWER TRANSFER

Introduction - Theory of wireless power transfer – Tesla's Experiment - Magnetic induction - Inductive charging - Inductive coupling - Magnetic resonance – Evanescent wave coupling – Difference between near field – Mid field and far field - Magnifying transmitter - Microwave transmission - Beam formation - Coupling efficiency - RF generation - Applications.

TEXT BOOKS

1. Gary S. Rogers and John Edwards, *An Introduction to Wireless Technology*, Dorling Kinderslay, 2008.
2. Andrea Goldsmit, *Wireless communications*, Cambridge University Press, 2007.

REFERENCES

1. Yi-Bing Lin and Imrich Chlamtac ,*Wireless and Mobile NetworkArchitectures*, John Wiley and Sons, 2008.
2. Hu, A. P, *Wireless/Contactless Power Supply., VDM Publis*hing, 2009.
3. Pahlavan, Kaveh, *Priniples of Wireless Networks: A Unified Approach*, John Wiley and Sons, 2011.
4. Goodm*an, David J., and Andrew J. Viterbi., Wireless PersonalCommunications*. Wesley, Addison *LonGman, Incorporated, 1997*.
5. Smith Clint, *3G wireless networks. McGr*aw-Hill, Inc., 2006.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15E55	SOLAR TECHNOLOGY	3	0	0	3	3

INSTRUCTIONAL OBJECTIVES	
1.	To learn the fundamentals of Solar Energy Technologies.
2.	To learn the Solar thermal based energy systems.
3.	To learn basic principles and applications of Photovoltaic systems.
4.	To learn solar passive architecture.

UNIT I - SOLAR RADIATION AND COLLECTORS

Energy emitted by sun and energy that reaches the earth - Sun-Earth geometry-Solar angles - Angles of incidence- Zenith angle - Azimuthal angle - Hour angle - Latitude and longitude - Solar Spectrum and Solar constant – Extraterrestrial characteristics - Measurement and estimation on horizontal and tilted surfaces - Solar Collector Basics - Flat plate collector – Evacuated tubular collectors - Concentrator collectors - Tracking systems - Compound parabolic concentrators - Parabolic trough concentrators - Concentrators with point focus.

UNIT II - SOLAR THERMAL TECHNOLOGIES

Solar heating and cooling system - Principle of working – Types - Design and operation - Thermal Energy storage - Types of thermal Energy Storage systems - Sensible Heat Storage – Liquids - Latent heat Storage -Thermo chemical storage - Solar thermal power plant - Solar Desalination - Solar cooker – Domestic - Community - Solar pond technology - Principle of working and description - Solar drying.

UNIT III - SOLAR PV FUNDAMENTALS

Semiconductor – Properties – Energy levels – P-N junction - Homo and hetro junctions – P-N junction - Equilibrium condition - Non equilibrium condition – Basic Silicon Solar cell - Crystalline and multicrystalline – Dark and illumination characteristics – Efficiency limits – Variation of efficiency with band gap and temperature – Beyond single junction Efficiency Limit - Efficiency measurements– GaAs Solar cells.

UNIT IV - SPV SYSTEM DESIGN AND APPLICATIONS

Photovoltaic cell – Photovoltaic module – PV array - Solar cell array designconcepts –

PV system design - Maximum power points tracking - Storage autonomy - Centralized and decentralized SPV systems – Stand alone - Hybrid and Grid connected system – System installation – Operation and maintenances – Field experience – PV market analysis and Economics of Solar Photovoltaic systems.

UNIT V - SOLAR PASSIVE ARCHITECTURE

Passive heating concepts - Direct heat gain – Indirect heat gain - Thermal storage wall - Attached Green house – Isolated gain and sunspaces – Passive cooling concepts - Evaporative cooling – Shading and ventilation - Radiative cooling – Green coupling - Application of wind - Water and earth for cooling – Paints and cavity walls for cooling – Roof radiation traps – Energy efficient landscape design.

TEXT BOOKS

1. Sukhatme S P, J K Nayak, *Solar Energy, Principle of Thermal Storage andCollection*, 3rdEdition, Tata McGraw Hill, 2008.
2. *Chetan Singh Solanki, Solar Photovoltatics, Fundamentals, Technologies and Applications*, PHI Learning Private Limited, 2011.

REFERENCES

1. Peter Würfel, *Physics of Solar Cells: From Basic Principles to AdvancedConcepts*, Wiley-VCH, 2009.
2. Jeffrey M. Gordon, *Solar Energy: The State of the Art*, Earthscan, 2013.
3. Garg H. P. and Prakash J., *Solar Energy Fundamentals and application,* TataMcGraw- Hill Publishing, 7th Reprint 2006.
4. Roger A. Messenger and Jerry Vnetre, *Photovoltaic Systems Engineering*, CRC Press, 2010.
5. Kalogirou S. A., *Solar Energy Engineering: Processes and Systems*, 2nd Edition, Academic Press, 2013.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15E56	CELL PHONE SERVICING	3	0	0	3	3
INSTRUCTIONAL OBJECTIVES						
1.	To understand cell phone communication methods.					
2.	To know the parts of the cell phone.					
3.	To understand working of each blocks of cell phone.					
4.	To give practice of troubleshooting the cell phone.					

UNIT – I FUNDAMENTALS OF CELL PHONE

Introduction to GSM/CDMA - Concepts of GSM/CDMA Cellular Technologies - Working of GSM - Information of Cell Sites and Base Station - Call Processing of a GSM – GPRS - Mobile Softwares (PC suite).

UNIT – II CHIP LEVEL STUDY

Chip Level Information of Mobile Phones (Tools and Components) - BGA - SMD - Air Gun - Soldering Station - Rework Station - Soldering lead - Soldering paste - De-Soldering wire – Identification of IC's - Assembling and Disassembling of mobile phones.

UNIT – III TROUBLE SHOOTING

Causes for various problems and Troubleshooting of Problems in a Mobile Phone - Network Problems - Display Problems - SIM Card Problems - Charging problems - Battery Problems - Software Unlocking – Software Flashing - IMEI information - Downloads of logos and Ring tones – Problems related to mobile phone hand sets -Replacement of various components ICS.

UNIT - IV HARDWARE ASSEMBLING

Assembling - Disassembling the cell phone - Battery problems – Display – Antenna problems – Network problems – SIM Card problems – SMD soldering.

UNIT – V CELL PHONE SOFTWARE

Software Unlocking – Software flashing – Downloads of logos – Downloads of Ring tones – Hand set problems – Replacement of modules (display- mic-speaker-antenna- amplifier- etc).

TEXT BOOKS

1. Pandit Sanjib, *Advance Mobile Repairing*: (*Multicolour Circuits, ServiceDiagrams and Repairing)* BPB Publications, 2010.
2. Stetz P. J., *The Cell Phone Handbook*, 2nd Edition, FindTech Ltd, 2006.

REFERENCES

1. Manahar Lotia**,***Modern Mobile Phone Repairing-Computer Software KeDware And Service Devices***,**BPB Publication**s,**201**0.**
2. Manahar Lotia, *Modern (GSM) Mobile Phone Practical Troubleshooting andRepairing,* BPB Publications, 2008.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UCY15461	ALLIED CHEMISTRY - II	4	1	0	5	4

INSTRUCTIONAL OBJECTIVES	
1.	To gain knowledge on the importance of carbohydrates and heterocyclic compounds.
2.	To acquire knowledge about coordination compounds.
3.	To promote the importance of industrial chemistry.
4.	To acquire knowledge in phase rule and adsorption.
5.	To gain knowledge in fundamentals in electrochemistry.

UNIT I - CARBOHYDRATES, BENZENE AND HETEROCYCLIC COMPOUNDS

Classification of carbohydrates–Properties and uses of glucose and fructose-mutarotation - Chemistry of benzene - Preparation, mechanism of electrophillic substitution reactions. Heterocyclic compounds– Preparation and properties of pyrrole and pyridine.

UNIT II - COORDINATION CHEMISTRY

Nomenclature and isomerism of coordination compounds. EAN rule - VB and Crystal field theories of octahedral, tetrahedral and square planar complexes. Chelation and its industrial applications.

UNIT III - INDUSTRIAL CHEMISTRY

Hardness of water – Temporary and permanent hardness, disadvantages of hard water Boiler scales and sludges - Softening of hard water – Zeolite process - demineralization process and reverse osmosis – Purification of water for domestic use: use of chlorine, Ozone and UV light.

UNIT IV - PHASE RULE AND ADSORPTION

Phase rule- Definition of terms involved. phase diagram of H_2O, Pb-Ag . Adsorption - Langmuir adsorption isotherms - Principles of chromatography (Paper, TLC and column).

UNIT V - ELECTROCHEMISTRY

Faradays laws of electrolysis - Specific conductance, equivalent conductance - Cell constant - Arrhenius theory Ostwald's dilution law and Kohlrausch law - Nernst

equation - Applications of EMF- Measurements.

TEXT BOOK

1. Puri B.R., Sharma L.R., Kalia K.K., *Principles of Inorganic Chemistry*, Shobulal Nagin Chand and Co, 2001.

REFERENCE

1. Bahl B.S. and Arun Bahl, A *Text book of Organic Chemistry*, 21st Edition, Sultan Chand and Co., 2012.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UCY15462	ALLIED CHEMISTRY PRACTICALS-II	0	0	4	4	2
INSTRUCTIONAL OBJECTIVES						
1.	To enable the students to acquire the quantitative skills in volumetric analysis.					
2.	At the end of the course, the students should be able to plan experimental projects and execute them.					

LIST OF EXPERIMENTS

1. Estimation of $KMnO_4$ using standard Oxalic Acid
2. Estimation of $K_2Cr_2O_7$ using decinormal solution of Sodium thiosulphate solution
3. Estimation of Copper using decinormal solution of Potassium dichromate solution
4. Estimation of Nickel using decinormal solution of EDTA
5. Determination of Molecular Weight of a Polymer
6. Conductometric Titrations –I (HCl vsNaOH)
7. Conductometric Titrations- II (KClvs $AgNO_3$)
8. Potentiometric Titration (Redox Titrations)

TEXT BOOK

1. Venkateswaran V., Veeraswamy R., Kulandaivelu A.R., *Basic Principles ofPractical Chemistry*, 2ndEdition ,Sultan Chand and Sons,1997.

REFERENCE

1. Gnanapragasam N.S. and Ramamurthy G., *Organic Chemistry – LabManual*, S. Viswanathan and Co., 1998.

Course Code	Course Title	L	T	P	Total of L+T+P	C
CDC15401	COMMUNICATION SKILLS (Internal Evaluation)	2	0	0	2	2

INSTRUCTIONAL OBJECTIVES	
At the end of this course, the students will be able to	
1.	Communicate fluently
2.	Develop skills in listening, speaking, reading and writing

UNIT –I LISTENING SKILL

Listening comprehension and response through various modes- face-to-face conversations, telephone conversations, reading out written material, audio-video recorded material, mimes.

UNIT –II SPEAKING SKILL

Group communication- Features of an effective, fluent speech through regular practice-role-play, extempore-situational conversations-Greetings, requests, demands, instructions and enquiries.

Informal speech- Facing audience-Body language- Conversion of mother tongue to English language, Formal speech-Paper presentation and essential aspects of Business communication.

UNIT-III READING SKILL

Reading Comprehension-Poems, passages- conversations, short messages, e-mails, formal/informal letters, Phonics, Speed Reading, Reading comprehension strategies.

UNIT-IV WRITING SKILL

Letter Writing- Formats and language- Types-Personal, Business, Applications, Thanks, Invitation, Condolence, Requests, Complaints-E-mail etiquette.Reports, Essay Writing.

UNIT-V

Interpersonal and intrapersonal communication- Ways to communicate in different scenarios- job interview, business meeting, project submission/proposal, informal gathering, speech for a large audience, a debate etc.- dress code, Eye contacts, body language and handshakes.

TEXT BOOK

1. Soft Skills- Know Youand Know the World, Author-Dr.K.Alex.

REFERENCE

1. Communication Skills-Language in Use-Cambridge Edition.

SEMESTER V

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15501	QUANTUM MECHANICS	4	1	0	5	4

INSTRUCTIONAL OBJECTIVES	
1.	To understand the dual nature of matter wave.
2.	To apply the Schrodinger equation to different potential.
3.	To understand the Heisenberg Uncertainty Relation and its application.
4.	To emphasize the significance of Harmonic Oscillator Potential and Hydrogen atom.

UNIT I - WAVE NATURE OF MATTER

Inadequacy of classical mechanics - Black body radiation - Quantum theory – Photo electric effect -Compton effect -Wave nature of matter-Expressions for de-Broglie wavelength - Davisson and Germer's experiment - G.P. Thomson experiment - Phase and group velocity and relation between them - Wave packet - Heisenberg's uncertainity principle – Its consequences (free electron cannot reside inside the nucleus and gamma ray microscope).

UNIT II - QUANTUM POSTULATES

Basic postulates of quantum mechanics - Schrodinger's equation - Time Independent -Time Dependant - Properties of wave function - Operator formalism

– Energy - Momentum and Hamiltonian Operators - Interpretation of Wave Function - Probability Density and Probability - Conditions for Physical Acceptability of Wave Function -. Normalization - Linearity and Superposition Principles - Eigen values and Eigen functions - Expectation Values - Wave Function of a Free Particle.

UNIT III - APPLICATION OF WAVE MECHANICS IN ONE DIMENSION

Free Particle Solution and Plane Wave Normalization - Particle in a box of length L - Energy Eigen value and normalized Eigen function - Barrier penetration problem - Finite potential well - Tunnel effect - Scanning Tunneling Microscope - Harmonic Oscillator wave function - Energy levels - Zero point energy.

UNIT IV - APPLICATION OF WAVE MECHANICS IN THREE DIMENSION

Angular momentum operators and their commutation relations - Eigen values and Eigen functions of L^2 and L_z - Theorem of addition of angular momenta [statement with examples] - The Hydrogen Atom problem - Stationary state wave functions as simultaneous Eigen functions of H, L^2, and L_z - Radial Schrodinger equationand Energy Eigen values [Laguerre polynomial solutions to be assumed] - Degeneracy of the energy Eigen values.

UNIT V - SPIN ANGULAR MOMENTUM

Electron spin – Stern Gerlach experiment - Orbital angular momentum - Magnetic dipole moment and energy in magnetic field from classical viewpoint - Zeeman effect -spin-orbit coupling - Fine structure - Total angular momentum - Pauli Exclusion Principle - Spin of an electron - Magnetic moment of an electron due to spin - Energy values in a Coulomb potential.

TEXT BOOKS

1. David J. Griffiths, *Introduction to Quantum Mechanics,* 2nd Edition, Pearson Publication, 2009.
2. Satya Prakash,*Advanced Quantum Mechanics,* 5th Edition, Kedar Nath Ram Nath Publishing Ltd, 2013.

REFERENCES

1. Merzbacher E., *Quantum Mechanics*, 3rd edition, Wiley Publishing, 1998.
2. Leonard I Schiff, *Quantum Mechanics*, 3rd Edition, McGraw Hill Book Company, 1968.
3. Thankappan V.K., *Quantum Mechanics*, 2nd Edition, New Age International (P) Ltd, 1996.
4. Mathews P.M.and Venkatesan K., *Quantum Mechanics*, Tata McGraw Hill Publishing Ltd,1975
5. Gupta, Kumar and Sharma, *Quantum Mechanics*, Jai Prakash Nath Company, 2010.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15502	ATOMIC AND NUCLEAR PHYSICS	4	0	0	4	4
INSTRUCTIONAL OBJECTIVES						
1.	To make the student understand the principles of atomic and nuclear physics.					
2.	To enable the student to explore the field of atomic and nuclear structure.					
3.	To make the student understand the basic concepts in atom models.					
4.	To allow the student to have a deep knowledge of the fundamentals of nuclear physics and radioactive decay.					

UNIT I - ATOMIC STRUCTURE

Thomson model of atom - Rutherford's experiment-scattering of alpha particles and Rutherford model of atom - Bohr model of the atom - Bohr's theory of hydrogen spectrum - Spectral series and energy levels of hydrogen atom - Bohr's correspondence principle - Quantization of angular momentum - Elliptical orbits-Wilson-Somerfield quantization theory - Zeeman effect - Raman effect - Vector atom model - Quantum numbers associated with vector atom model - Coupling schemes - application of vector atom model - Pauli's exclusion principle - Electronic structure in atoms - Fine structure of spectral lines - Experimental conformation of vector atom model-Stern and Gerlach experiment - Wave mechanical atom model.

UNIT II - INTERACTION OF CHARGED PARTICLES AND NEUTRONS WITH MATTER

Charged particles - Energy dependence - Bragg curve - Electrons - Gamma rays - Photoelectric effect - Compton scattering - Pair production – Attenuation – Neutrons - Neutron moderation - Nuclear detectors - GM counter - Scintillation counter - Cloud chamber - Spark chamber - Nuclear emulsions.

UNIT III - RADIOACTIVITY

Early discoveries - Properties - Alpha particles as nucleus of Helium atom, counting of alpha particles - Range of alpha particles in gases - Geiger and Nuttal experiment - Geiger- Nuttal law - Radioactive transformation - Rutherford and Soddy theory - half-life period - Average life period - Theory of alpha disintegration- Neutrino theory of beta decay - Continuous energy spectrum of beta rays - Nuclear isomerism - discovery of neutron - Artificial radioactivity - Radioisotopes - Medical applications of radio isotopes.

UNIT IV - STRUCTURE OF NUCLEI

Structure of nucleus - Proton-electron hypothesis and its failure - Proton –Neutron hypothesis - Nuclear size - Electron volt – spin - Nuclear magnetic moment - Electric quadrupole moment - Atomic mass unit and binding energy - Mass defect and packing fraction - Deuteron binding energy - *n-p* scattering - *p-p* scattering - nuclear binding forces- Mesonic field.

UNIT V - NUCLEAR REACTIONS AND NUCLEAR ENERGY

NUCLEAR REACTIONS - Introduction, Q value of a nuclear reaction - Nuclearreaction kinematics - Direct reactions. NUCLEAR ENERGY- Nuclear models -Liquid drop model - Shell model and magic numbers - Collective model - Optical or cloudy crystal ball model - Nuclear energy - Nuclear fission - Chain reaction - Nuclear reactors - Development of atomic power in India - Atom bomb - Nuclear fusion - Cosmic rays - Stellar energy- Carbon-Nitrogen cycle - Elementary particles - Transuranic elements.

TEXT BOOKS

1. Subrahmanyam N., Brij Lal, Jevan Shesan, *Atomic and Nuclear Physics,* 8th Edition, S Chand and Company Ltd, 2009.
2. Christopher .J. Foot, *Atomic physics*, Oxford University Press Inc, 2005.

REFERENCES

1. Robley D. Evans, *The Atomic Nucleus*, TMH, 1982.
2. Irving Kaplan, *Nuclear Physics*, Narosa Publshers, 1989.
3. Preston M. A., *Physics of Nucleus*, Addison-Wesley, 1962.
4. Sergee E., *Experimental Nuclear Physics*, John Willey, 1959.
5. Krane K. S., *Introductory Nuclear Physics*, John-Wiley, 1987.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15503	ANALOG ELECTRONICS	4	0	0	4	4

INSTRUCTIONAL OBJECTIVES	
1.	To understand the concept of networks and semiconductors.
2.	To understand the working principles of a transistors.
3.	To familiarize the operation of amplifiers and to study the working of sequential circuits.
4.	To emphasize the significance of low power, small size, reliable, high performance IC chips.

UNIT I - NETWORK THEOREM AND SEMICONDUCTORS

Circuit Elements and Kirchhoff's Law - Methods of Analysing circuits - Mesh and Nodal Method - Thevenin Theorem - Norton theorem - Maximum power transfer theorem - Superposition principle - T and Π networks - Millman's Theory - Intrinsic and extrinsic semi conductor - PN junction diode-construction-Biasing of PN junction-VI characteristics of diode-Zener diode-LED-LCD-Photo diode-LASER diode - Reverse Recovery time.

UNIT II - TRANSISTORS

Bipolar Junction Transistors - Construction-CE, CB configuration-input and output characteristics-Two port network analysis of transistor-FET – Construction and characteristics of JFET- Biasing of JFET- Depletion and Enhancement modes-Important Relationships – Depletion type MOSFET – Enhancement type of MOSFET – MOSFET Handling- VMOS - CMOS - MESFETS -UJT- UJT relaxation oscillator- Thyristors.

UNIT III - AMPLIFIERS AND OSCILLATORS

RC coupled single stage amplifiers-Frequency response –Feedback constant-Gain with feedback – Advantages of negative feedback amplifier-(quantitative treatment only) - Power amplifiers – Class A, Class B, Class AB and Push full amplifiers. Principle of Feedback and oscillators-Feedback concepts - Connection types - Feedback amplifier- Phase and frequency considerations – Oscillator operations - Burcausan criteria-Sinusoidal oscillators-Hartly oscillator-Colpit's oscillators-Phase shift oscillator- Wien bridge oscillator - Crystal oscillator – Unijunction Oscillator.

UNIT IV - WAVE SHAPING AND SWEEP CIRCUITS

Clipping circuit - Positive clipper - Biased clipper - Combinations clipper - Applications of clipper-

Clamping Circuits-Basic idea of a clamper - Positive clamper - Operations - negative clamper-Schmitt Trigger - IC555 (Timer IC) - Astable multivibrator and Monostable multivibrator - Operational Amplifiers - Open loop and closed loop -OP-AMP characteristics- Ideal OP-AMP with virtual ground-Inverting and Non inverting OP-AMP-Basic OP-AMP with applications- Sign changer- Adder - Subtractor-Multiplier-Divider-Voltage follower-Integrator - Differential - Comparator - Phase locked loop.

UNIT V - POWER SUPPLIES AND VOLTAGE REGULATORS

D.C Power supply - Rectifiers-Half wave-Full wave and bridge rectifiers- Filters – capacitor- Inductor – LC – Pi - RC. Voltage Multipliers - Halfwave voltage doubler- Fullwave voltage doubler- Voltage tripler-Voltage quadrupler- Voltage Regulator – Zener- Emitter - Electronic feedback series -Switch mode power supply- Uninterrupted power supply- Integrated circuit voltage regulators.

TEXT BOOKS

1. Sudhakar A and Shyammohan S Palli, *Circuits and Network Analysis andSynthesis*, 4thEdition, Tata McGraw Hill, 2010.
2. Metha V.K., Mehta R., *Principles of Electronics*, S. Chand and Company Ltd.,2008.

REFERENCES

1. Jacob Millman, Christos C Halkias, Satyabrata Jit, *Electron Devices andCircuits*, Tata McGraw Hill, 2010.
2. Millman and Halkias ,*Electronics Devices and Circuits*, Tata Mc Graw Hill,2008.
3. William H.Hyte, Jr, J.E.Kemmerly and Steven M.Durban, *Engineering CircuitAnalysis*, 7thEdition, McGraw Hill, 2010.
4. Robert L. Boylestad and Louis Nashelsky, *Electronic Devices and CircuitTheory*, Pearson Education, 9thEdition, 2009.
5. Deshpande N.P., *Electronic Devices and Circuits – Principles andApplications*, Tata McGraw Hill, 2012.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15E01	ELEMENTS OF EARTH ATMOSPHERE	4	0	0	4	4

INSTRUCTIONAL OBJECTIVES	
1.	To understand the basic laws governing the earth's energy.
2.	To understand the different processes of earth atmosphere interactions.
3.	To understand the role of aerosols in energy budget.
4.	To have over all idea on climate change concepts.

UNIT I - SOLAR SYSTEM AND EARTH ATMOSPHERE

Kepler's Laws of Planetary Motion- Structure- Composition and atmosphere of our solar system (all nine planets)- Solar Energy - Solar constant- solar radiation at the Earth's surface- Solar energy collectors - Physical principle of the conversion of solar radiation in to heat - Composition of earth atmosphere- Layers of the atmosphere and Vertical structure of atmosphere

UNIT II - AIR TEMPERATURE- HUMIDITY AND CONDENSATION

Daily temperature variations- Day time warming- night time cooling- The controls of temperature- Air temperature data- air temperature and human comfort-Circulation of water in the atmosphere- Evaporation- Condensation and saturation- Humidity- vapour pressure- Relative humidity and dew point

UNIT III - CLOUDS AND PRECIPITATION

Classification of clouds- Cloud identification- Cirrocumulus- middle clouds-altocumulus- low clouds - Clouds with vertical development- Unusual clouds-Atmospheric stability- Determining stability- Unstable air-conditionally unstable air- convection and clouds- Precipitation processes and precipitation types

UNIT IV - AEROSOLS

Various aerosol sources- Formation processes and types of aerosols-Background of marine aerosols- Sulphur cycle and sulphate aerosols- Dust aerosols- Carbon aerosols- Urban aerosols- Volcanic aerosols- High latitude atmospheric aerosols- Global spatial and temporal variability of aerosols-Interaction between aerosols and minor gas components- Photochemical processes with the participation of aerosols

UNIT V - CLIMATE CHANGE

Earth's changing climate- Climate during last 100 years- Possible causes of climate change- Climate change- Plate tectonics and mountain building- Climate change and variations in earth's orbit- Climate change and atmospheric particles-Carbon dioxide- Greenhouse gas effect and global warming

TEXT BOOKS

1. Donald Ahrens C., *Essentials of Meteorology*, Brooks/Cole Cengage Learning, 2008.
2. Kirill ya kondratyev, *Atmospheric aerosol properties*, Praxiz Publishing House, 2006.

REFERENCES

1. Chandrasekhar A., *Basics of Atmospheric Science*, PHI Learning Private Limited, 2010.
2. Murry Salby, *Fundamentals of Atmospheric Physics*, Academic Press, 1996.
3. David G Andrews, *An Introduction to Atmospheric Physics*, 2nd Edition, Cambridge University Press, 2010.
4. John T Houghton, *The Physics of the Atmospheres*, Cambridge University Press, 2009.
5. Thomas D Potter and Bradley R Colman, *Handbook of Weather, Climateand Water,* Wiley Interscience, 2003.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15E02	LOW TEMPERATURE PHYSICS	4	0	0	4	4

INSTRUCTIONAL OBJECTIVES

1.	To understand the general scientific concepts of low temperature physics.
2.	To understand the properties of materials at low temperature.
3.	To educate the new techniques available to produce and measure low temperatures.
4.	To understand the concept of specific heat and hyperfine properties.

UNIT I - PRODUCTION OF LOW TEMPERATURE

Introduction - Joule Thomson effect - Regenerative cooling - Vacuum pumps - liquefaction of air - Hydrogen - Helium - Maintenance of low temperature -production of temperature below 1 K - Adiabatic demagnetization - Evaporative cooling of He-3 - Dilution refrigeration - Laser cooling - Nuclear demagnetization.

UNIT II – MEASUREMENT OF LOW TEMPERATURE

The gas thermometer and it corrections - Secondary thermometers- resistance thermometers, thermocouples- vapour pressure thermometers- magnetic thermometers.

UNIT III - LIQUID AND SOLID CRYOGENS

Liquid Nitrogen - Liquid oxygen - Liquid hydrogen - Liquid He -4 and He -3 - Solid He–4 and He -3 - Lamda point - Superfluidity - Density - Compressibility factor - viscosity and thermal properties - Velocity of sound in liquid helium.

UNIT IV - ELECTRICAL AND MAGNETIC PROPERTIES

Experimental observations - Theories of sommerfield and block - Superconductivity - magnetic properties of superconductors - Thermal properties of superconductors - penetration depth and high frequency resistance - Ferromagnetism - Diamagnetism - paramagnetism - Paramagnetic saturation.

UNIT V – SPECIFIC HEATS, SPECTROSCOPIC AND HYPERFINE PROPERTIES

Specific heats - Rotational specific heat of Hydrogen - Einstein's and Debye's theories -Schottky effect - Anomalies in specific heats at low temperature - Infrared- visible spectra - Zeeman spectra at low temperature - Dielectric constant and its measurement - Magnetic susceptibility - NMR and electron paramagnetic resonance at low temperature - Nuclear magnetic properties - Mossbauer effect and other hyperfine properties at low temperature.

TEXT BOOKS

1. Cornelis Jacobus Gorter, D. F. Brewer, *Progress in* Low Temperature *Physics*, Elsevier Ltd, 2011.
2. Christian E. and Siegfried H, *Low Temperature Physics*, Springer, 2005.

REFERENCES

2. Jack Ekin, *Experimental Techniques for Low-Temperature Measurements*, Oxford, 2006
1. Charles P. Poole Jr., Horacio A. Farach, Richard J. Creswick and Ruslan Prozorov,*Superconductivity* Elsevier Ltd, 2007.
2. John Wilks, *Properties of Liquid and Solid Helium*, Oxford University Press, 1967.
3. Jackson L.C., *Low Temperature Physics*, Methuen and Company,1962.
4. Ching Wu Chu and J.Woollam, *High Pressure and Low TemperaturePhysics*, Plenum Press, 1978.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15E03	RADIATION PHYSICS	4	0	0	4	4

INSTRUCTIONAL OBJECTIVES	
1.	To make the student understand the principles of atomic and nuclear physics.
2.	To enable the student to explore the field of atomic and nuclear structure.
3.	To make the student understand the basic concepts in atom models and radioactive decay.
4.	To allow the student to have a deep knowledge of the fundamentals of radiation physics, radiation generators, dosimeters and therapy

UNIT I - STRUCTURE OF MATTER, NUCLEAR TRANSFORMATION AND X-RAYS

Structure of matter - Structure of matter-atom - Nucleus, atomic mass and energy units - Distribution of orbital electrons - Atomic energy levels-Nuclear forces - Nuclear energy levels - Particle radiation - Elementary particles - Electromagnetic radiation-wave model and quantum model. Nuclear Transformation - Nuclear transformation-radioactivity - Decay constant – Activity - Radioactive series - Radioactive equilibrium -Activation of nuclides.X-Rays-Production of X-rays - X-ray tube - X-ray circuit - voltage rectification - Physics of X-ray production - X-ray energy spectra - Operating characteristics.

UNIT II - CLINICAL RADIATION GENERATORS

Kilo-voltage units- Grenz-ray therapy - Contact therapy - Superficial therapy - Orthovoltage therapy or deep therapy - Super voltage therapy - Resonant transformer units - Megavoltage therapy - Van de graff generator - Linear accelerator - Betatron - Cyclotron - Microtron - Machines using radionuclides-Cobalt-60 unit - Heavy particle beams.

UNIT III -IONIZING RADIATION, QUALITY OF X-RAY BEAMS, MEASUREMENT OF ABSORBED DOSE

Ionizing Radiation - Interaction of ionizing radiation-Ionization - Photon beam description - Photon beam attenuation - Attenuation coefficient - Energy transfer-energy absorption coefficient - Interaction of photons with matter - Coherent scattering - The Roentgen - Free air ionization chamber - String electrometer - Ion

collection-Saturation and collection efficiency - Measurement of exposure.Quality of X-Ray Beams- Half value layer and its measurement - Peak voltage-Direct indirect measurement - Effective energy.Measurement of Absorbed Dose- Radiation absorbed dose - Relation between Kerma - Exposure - Absorbed dose.

UNIT IV - CLASSICAL RADIATION THERAPY

Dose distribution and scatter analysis-Phantoms - Depth dose distribution - percentage depth dose-Dependence on beam quality and depth - Tissue air ratio (TAR)-relationship between TAR and percent depth dose- Dose calculationparameters- Collimator Scatter Factor - Phantom Scatter Factor - Tissue-Phantom and Tissue-Maximum Ratios - Scatter-Maximum Ratio- Practical Applications - Accelerator Calculations- SSD Technique - Cobalt 60 Calculations. Treatment planning-Acquisition of Patient Data- Internal Structures- Computed Tomography - Magnetic Resonance Imaging-Ultrasound.Skin Dose.Electron beam therapy - Brachytherapy.

UNIT V- MODERN RADIATION THERAPY, DOSIMETRY AND RADIATION PROTECTION

Modern Radiation Therapy-Image-Guided Radiation Therapy - Proton BeamTherapy.Dosimetry-Dosimeter - Film badge dosimeter - Pocket dosimeter.Radiation Protection-Radiation Protection - Dose Equivalent - Effective DoseEquivalent - Background Radiation - Low-Level Radiation Effects - Effective Dose-Equivalent Limits- Occupational and Public Dose Limits.

TEXT BOOKS

1. Fiaz.M.Khan, *The Physics of Radiation Therapy*, Lippincott Williams and Wilkins, 4th Edition, 2010.
2. Meredith W.J. and J.B. Massey, *Fundamental Physics of Radiology*, A. John Wright and Sons Ltd.,3rd Edition, 1983.

REFERENCES

1. William.R.Hendee, Geoffery.S.Ibbott and Eric.G.Hendee, *Radiation TherapyPhysics*, A.John Wiley and Sons.,Inc, 3rdEdition, 2005.
2. Smith F.A., *A Primer in Applied Radiation Physics*, World scientific publishing Co., 2000.
3. Podgarsak E.B., *Radiation Physics for Medical Physicists*, Springer, 2006..
4. Evans R. D., *Atomic Nucleu*s, Textbook Publications, 2003.
5. Lappp R. E., *Nuclear Radiation Physics* Prentice-Hall Inc, 1948.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15E04	PLASMA PHYSICS	4	0	0	4	4

INSTRUCTIONAL OBJECTIVES	
1.	To understand the Basic concepts of Plasma and its relevant topics.
2.	To understand the basic mechanism of single particle motion and its kinetic theory.
3.	To educate scientifically the new developments in engineering and technology.
4.	To understand the various methods of Plasma diagnostics.

UNIT I - BASICS OF PLASMA

Plasma - Its definition - Composition and characteristics - Microscopic and macroscopic description of plasma-Motion of charged particle in uniform magnetic field - Motion of charged particle in uniform electric and magnetic field (E x B-drift) - curvature drift - Magnetic confinement of plasma-Collision processes in Plasma-NonCoulomb collisions -Pinch effect - Solar corona and Solar wind - Van Allen radiation belt.

UNIT II - KINETIC THEORY

The Distribution Function - Differential Flux - Velocity Distribution Functions - The meaning of f (v) Equations using Kinetic theory – Derivations of the fluid equation Vlasov Equation - Collisions - plasma Oscillations and Landau damping – Derivation of Landau Damping – BGK and van Kampen modes - Experimental verification - Kinetic effects in a Magnetic field.

UNIT III - FLUID THEORY AND WAVES

Fluid Equations and Drifts - Non-neutral plasmas - Plasma Oscillations-Sound Waves - Ion Acoustic Waves - Electrostatic Waves - Electromagnetic waves - MHD Waves - Alfven and Magnetosonic - Wave-Particle Interactions – Instabilities-Two Stream Instabilities - Drift waves K-H Instability - Interchange Instability - Mirror Instability - Penrose Criterion - Magnetospheric and Astrophysical Applications - Plasma Processing Applications - Dusty Plasma Waves.

UNIT IV - MAGNETOHYDRODYNAMIC FLUIDS

Introduction - The Equations of MHD Equations - Ideal MHD - Hydromagnetic Equilibria - Magnetic Pressure - Magnetic Field Convection and Diffusion - Flux

Freezing - MHD Waves - The Solar Wind - Parker Model of Solar Wind - Interplanetary Magnetic Field - Mass and Angular Momentum Loss - MHD Dynamo Theory - Homopolar Generators - Slow and Fast Dynamos - Magnetic Reconnection- MHD Shocks.

UNIT V - PLASMA DIAGNOSTICS

Remote Diagnostics-Optical spectroscopy - Microwave interferometry - Laser Induced Fluorescence (LIF)- Langmuir Probes: - Construction and circuit - The electron characteristic - Electron saturation - Space potential - Ion saturation current - Distribution functions - RF compensation - Double probes and hot probe. Other Local Diagnostics: Magnetic probes-Energy analyzers- RF current probe-Plasma oscillation probe.

TEXT BOOKS

1. Gurnett D. A. and A. Bhattacharjee, *Introduction to Plasma Physics,*Cambridge, 2005.
2. Paul M. Bellan, *Fundamentals of Plasma Physics*, Cambridge University Press, 2006.

REFERENCES

1. Bittencourt J. A, *Fundamentals of Plasma Physics*, Springer, 2004.
2. Marcel Goossens, *An Introduction to Plasma Astrophysics andMagnetohydrodynamics*, Springer, 2003.
3. Frencies F chen, *Introduction to Plasma and Controlled Fusion*, Plenum Press, 1974.
4. Podgomyl I M, *Topics in Plasma Diagnostics*, Plenum Press, 1971.
5. Hazeltine, Richard D., and François L. Waelbroeck, *The Framework ofPlasma Physics,* Westview, 2004.
6. George Parks, *Physics of Space Plasmas: An Introduction, Westview*Press, 2003.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15504	PHYSICS PRACTICALS - V	0	0	3	3	2

INSTRUCTIONAL OBJECTIVES

1.	To gain knowledge in the scientific methods and learn the process of measuring different Physical variables.
2.	To enable the student to explore the field of properties of matter.
3.	To allow the student to have a deep knowledge of the fundamentals of optics.
4.	To make the student understand the basic concepts in Electricity and Magnetism.

LIST OF EXPERIMENTS

1. Young's modulus - Koenig's method - non uniform bending.
2. Young's modulus - cantilever - depression - (Static method)-(Scale and telescope)
3. EMF of a thermocouple-Mirror galvanometer(or table galvanometer)
4. Spectrometer - Narrow angled prism
5. Spectrometer – refractive index of the liquid
6. Spectrometer - Cauchy's constants
7. Determination of wavelength of sodium light – Newton's Rings
8. B.G.-Absolute capacitance of a capacitor.
9. Ballistic Galvanometer – comparison of emf's of two cells.

TEXT BOOKS

1. R. K. Shukla & Anchal Srivastava. *Practical Physics*, NEW AGE INTERNATIONAL (P) Ltd, Publishers, (Formerly Wiley Eastern Limited), 4835/24, Ansari Raod, Daryagani, New Delhi-11002. 2006.
2. C. L. Arora, *B.Sc., Practical Physics,* S. Chand & Company Ltd. Ram nagar, New Delhi-110055. 2007.

REFERENCES

1. G. L. Squires, *Practical Physics*, Fourth edition, Cambridge University Press, 2001.
2. D. Halliday, R. Resnick and J. Walker, *Fundamentals of Physics*, 6th Ed., John
3. Wiley and Sons, Inc., New York, 2001.
4. F.A. Jenkins and H.E. White, *Fundamentals of Optics*, 4th Ed., Reprint

McGraw-Hill Book Co., 2007.

5. Geeta Sanon, *B. Sc., Practical Physics*, 1st Edition. R. Chand & Co, 2007.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15505	ELECTRONICS LABORATORY - I	0	0	3	3	2

INSTRUCTIONAL OBJECTIVES

1.	To familiarize the electronic components and basic electronic instruments.
2.	To impart hands on experience in verification of circuit laws and theorems.
3.	To study experimentally the characteristics of diodes, BJT's and FET's.
4.	To study circuit characteristics and simulation of time response and to explore the concepts involved in oscillators.

LIST OF EXPERIMENTS (ANY NINE)

1. To measure DC/AC voltage and frequency using CRO and FG.
2. To verify the Thevenin theorem.
3. To verify the Superposition theorem.
4. To obtain the static characteristics of a PN junction diode and then obtain the forward resistance of the diode at a given operating point.
5. To obtain V-I characteristics of a Zener diode and note down its breakdown potential.
6. Study of characteristics curves of BJT and FET.
7. CE amplifier and make the (i) Upper cut off (ii) Lower cutoff frequencies and hence estimate the BW.
8. Study of class A and class B power amplifiers.
9. Study of class C and Push-Pull amplifiers.
10. Study of Colpitt's Oscillators.
11. Study of Hartley Oscillators.
12. Study of Diode as clipper and clamper.
13. Study of timer circuit using IC555 and configuration for monostable and astable multivibrator.
14. Realization of a V-to-I and I-to-V converter using Op-Amps.
15. Study of ripple and regulation characteristics of full wave rectifier without and with filters.
16. Study of Switched Mode Power Supply and construction of a linear voltage regulator using regulator IC chip.

TEXT BOOKS

1. David A. Bell, *Laboratory Manual for Electronic Devices and Circuits*, 4th Edition, Oxford University Press, 2009.

2. Maheswari.L.K and Anand.M.M.S, *Laboratory Manual for IntroductoryElectronic Experiments*, New Age, 2010.

REFERENCES

1. Gaykwad A., *Operational Amplifier and Linear Integrated Circuits,* Prentice Hall, 2006.
2. David A Bell, Fundamentals *of Electrical Circuits: Lab Manua*l, 4th Edition, Oxford University Press, 2009.
3. Ouseph C.C, Rangarajan C., Balakrishnan R., *A Text Book of PracticalPhysics*, S.Viswanathan Publisher-Part II, 2005.
4. Sedha R S., *A Text Book of Applied Electronics*, S. Chand and Co., 2008.
5. Chattopadhyaya D.and Rakshith, Electronics Fundamentals and Applications, New Age Publishers, 2008.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+ P	C
UES15501	ENVIRONMENTAL STUDIES	3	0	0	3	3

INSTRUCTIONAL OBJECTIVES

1.	To gain knowledge on the importance of natural resources and energy.
2.	To understand the structure and function of an ecosystem.
3.	To imbibe an aesthetic value with respect to biodiversity, understand the threats and its conservation and appreciate the concept of interdependence
4.	To understand the causes of types of pollution and disaster management.
5.	To observe and discover the surrounding environment through field work.

UNIT I: INTRODUCTION TO NATURAL RESOURCES/ENERGY

Environmental Studies: Definition, scope, objectives and awareness- Introduction to natural resources: food, forest, water and energy – Renewable and non renewable resources-coal, oil, tidal, wind, geothermal, solar, biomass(over view)

– nuclear fission and fusion-nuclear energy.

UNIT II: ECOSYSTEMS

Concept of an ecosystem-structure and function of an ecosystem-producers, consumers and decomposers- ecological succession- food chains(any 2 eg)-food webs(any 2 eg)-ecological pyramids.

UNIT III: BIODIVERSITY AND ITS CONSERVATION

Introduction, definition: genetic, species and ecosystem diversity-Values of biodiversity: consumptive, productive, social, ethical, aesthetic and option values-hot spots of biodiversity-Threats to biodiversity: habitat loss, poaching of wildlife - endangered species and endemic species of India -conservation of biodiversity: in –situ and ex-situ conservation of biodiversity.

UNIT IV: ENVIRONMENTAL POLLUTION /DISASTER MANAGEMENT

Definition-causes, effects and control measures of : Air, Water and Soil pollution-e-waste management- Disaster management: Natural and man made-food/earthquake/cyclone, tsunami and landslides.

UNIT V: SOCIAL ISSUES AND THE ENVIRONMENT

Sustainable development- Climate change: global warming, acid rain, ozone layer

depletion and nuclear radiation- Environment Protection Act (any imp 2) air, water, wildlife and forest.

FIELD WORK

1. Students will visit any one of the following place of interest and submit a written report by the end of the semester:
2. Visit to a hospital/industry/canteen for solid waste management
3. Visit to a chemical industry to study about the practices followed there for waste disposal
4. Visit to Vandalur zoo for study of animal conservation/plants- flora and fauna
5. Study of simple ecosystems-lake/hill slopes
6. Naming the trees in the campus at SRM
7. Study of common plants, insects, birds in the neighbourhood
8. Study of common diseases and their prevention
9. Optional: Street plays and rally for awareness of obesity/diabetes/ vitamin D deficiency/health issues/ waste management/ solid waste management/ no plastics/ energy consumption/wild life protection.

TEXT BOOK

1. Sharma B.K. (2001). Environmental Chemistry. Goel Publ. House, Meerut
2. Jeyalakshmi R. (2014), Text book of Environmental Studies, Devi publications, Chennai.

BOOKS FOR REFERENCE

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. De A.K., Environmental Chemistry, Wiley Eastern Ltd.

e-BOOK

1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380013, India, Email:mapin@icenet.net (R)

SEMESTER VI

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15601	ELEMENTS OF NANOSCIENCE AND NANOTECHNOLOGY	4	1	0	5	4

INSTRUCTIONAL OBJECTIVES	
1.	To make the student understand the basic concepts in nanoscience.
2.	To enable the student to explore the field of nanomaterials.
3.	To make the student understand the principles of nanotechnology.
4.	To acquire knowledge on the various applications of nanotechnology.

UNIT I - BASICS OF NANOSCIENCE

Nano revolution of the 20th century - Difference between bulk and nanoscale materials and their significance - Properties at the nanoscale - Optical property - Magnetic property and electronic property - Size dependent behavior – Scaling - Mechanical properties of Nano materials and Chemical properties of Nanoparticles.

UNIT II - CLASSES OF NANOMATERIALS

Metals and Semiconductor Nanomaterials - Quantum dots - Nano wells - Nano ribbons and Nano Wires - Bucky balls - Carbon nanotubes - Single walled and Multi walled CNT-Structure - Synthesis- Properties- Functionalization and applications - Fullerenes/Bucky Balls/ C60- Synthesis - Properties - Functionalization and application

UNIT III - SYNTHESIS OF NANOMATERIALS

Top-down approach – Nanolithography - Soft lithography and hard lithography - Physical Vapor deposition (PVD) - Chemical Vapor Deposition(CVD) – E-beam lithography - Bottom-up approach- Sol-gel processing and chemical methods - Self assembly.

UNIT IV - CHARACTERIZATION OF NANOMATERIALS

Scanning Electron Microscope (SEM) - Transmission Electron Microscope (TEM) - Atomic Force Microscope (AFM) - Scanning Tunneling Microscopy (STM) – Types- Manipulating atoms and Molecules with STM - Scanning Tunneling Spectroscopy and Dip pen Nanolithography.

UNIT V - APPLICATIONS OF NANOTECHNOLOGY

Nanotechnology in Energy systems - Electronics - Environment - Space and Aviation - Textiles - Food and Agriculture - Automotive Industry - Solar Technology - Chemical engineering - Building and Construction - Biotech and Biomedical Engineering - Pharmaceutical and drugs - Molecular Nanoelectronics - Nanobots - Photonic crystals - NEMS(Nano Electro Mechanical Systems) based device - Nanosensors and Devices.

TEXT BOOKS

1. Pradeep T.,*Fundamentals of Nanoscience and Nanotechnology,* Mc Graw Hill, 2012.
2. Chris Binns, *Introduction to Nanoscience and Nanotechnology,* 1st Edition, Willey- Publication, 2010.

REFERENCES

1. Gabor L.Hornyak, H.F.Tibbals, Joydeep Dutta, John J.Moore, *Introductionto Nanoscience and Nanotechnology*, CRC Press, 2008.
2. Chattopadhay K.K., *Introduction to Nanoscience and Nanotechnology-,* APH Publishing Corporation, 2006.
3. Robert W. Kelsall, Ian W. Hamley and Mark Geoghegan, *NanoscaleScience and Technology*, John Wiley and Sons, Ltd., 2005.
4. Charles P. Poole Jr and Frank J. Owens, *Introduction to Nanotechnology*, Wiley Interscience, 2007.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15602	DIGITAL ELECTRONICS AND MICROPROCESSORS	4	1	0	5	4

INSTRUCTIONAL OBJECTIVES	
1.	To understand the basic concepts of number systems.
2.	To develop the digital concepts using logic gates.
3.	To apply digital concepts in sequential logic systems.
4.	To understand the architecture of 8085 and to impart the knowledge about the instruction set.

UNIT I - NUMBER SYSTEMS AND LOGIC GATES

Introduction to decimal- Binary- Octal- Hexadecimal number systems-Inter conversions-BCD code- Excess -3 code- Gray code –One's complement and two's complements- Arithmetic operations- Addition- Subtraction- Multiplication and division- Basic and derived logic gates- Symbols and their truth tables- AND-OR-NOT- NAND- NOR- XOR- XNOR- Universal NAND and NOR gates-Boolean algebra – Basic laws of Boolean algebra – De- Morgan's theorems- Reducing Boolean expressions using Boolean laws- SOP and POS forms of expressions-Min term and max terms- Karnaugh map simplification.

UNIT II - COMBINATIONAL LOGIC GATES

Half and full adders- Half and full subtractors- Binary adders and subtractors-Two's complement adder/subtractor circuits- Binary Coded Decimal (BCD) adder-Decoder-Encoder-Multiplexer-Demultiplexer-Analog to digital (A/D) conversion-Successive approximation- Digital to analog (D/A) conversion-R-2R ladder method.

UNIT III - SEQUENTIAL LOGIC SYSTEMS

Flip flop-RS flip flop - Clocked RS flip flop-D flip flops – JK flip flop - JK as master slave flip flops-Registers- Shift registers-Shift left and Shift right registers-Counters-Synchronous and asynchronous counters-Ripple counter-Ring counter-Down counter – Decade counter-.SISO and SIPO Shift registers

UNIT IV - ARCHITECTURE AND PROGRAMMING OF 8085 MICROPROCESSOR

Architecture of 8085- Register organization of 8085- Accumulator- General purpose Registers- Special purpose Registers - Bus structure (address, data and control buses) -Control signals-Pin configuration of 8085-Arithmetic and logic units-Flags (zero, sign, parity, carry, auxiliary carry) -Addressing modes (register, Immediate, direct, indirect, implicit) of 8085.

UNIT V - INSTRUCTION SET OF MICROPROCESSOR 8085

Instruction Set-Types of instructions- Based on the number of bytes of operations-Data transfer instructions - Arithmetic and logic instructions - Branch instructions-Subroutines-Stack – I/O instructions-Machine cycle- Halt and Wait state- Timing

diagram for opcode fetch- Memory read and write cycle - Assembly language programming-Simple programs using arithmetic and logic operations-Interrupts-Maskable and Non maskable interrupts.

TEXT BOOKS

1. Malvino A.P.and Leach D.P.,*Digital Principles and Applications* , 4th Edition, McGraw Hill ,2007.
2. Ramesh Goyankar, *Microprocessor Architecture- Programming andApplications – 8085*, Prentice Hall, 2011.

REFERENCES

1. Gothmann W.H., *Digital Electronics*, Prentice Hall of India, Pvt,1996.
2. Anokh singh, A.K. Chhabra, *Fundamentals of Digital electronics andMicroprocessors*, S. Chand, 2011.
3. Metha V.K., Mehta R.*, Principles of Electronics*, S. Chand and Company Ltd, 2008.
4. Anil. K. Mani, *Digital Electronics- Principles and Integrated Circuits*, Wiley Precise, 1st Edition, 2008.
5. Tabak.D*, Advanced Microprocessors*, McGraw-Hill,1995.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15E05	ASTROPHYSICS	4	0	0	4	4
INSTRUCTIONAL OBJECTIVES						
1.	Describe the nature, structure, distribution, and formation of astronomical objects, including planets, stars, and galaxies, and the history of the universe.					
2.	Demonstrate an appreciation of the universality of physical laws and apply these laws to explain phenomena in astronomical systems and the universe					
3.	Define and interpret the observational properties of astronomical objects.					
4.	Propose, plan, and conduct astronomical observations with professional telescopes.					

UNIT I – FROM NEWTON TO HUBBLE

Solar System Overview- Constituents **-** Historical Cosmology-Inertial Frames - Cosmological Principle - Kepler's laws - Universal gravitation - Review of Newton's laws - Derivation of Kepler's laws - Olbers' Paradox - Hubble's Law - The Age Of The Universe - Expansion In A Newtonian World - Thermal History of the Universe - Photons- Adiabatic Expansion - Electroweak Interactions - The Early Radiation Era - Photon and Lepton Decoupling - Big Bang Nucleosynthesis.

UNIT II - LIGHT AND THE ATMOSPHERE

Scattered light - twilight - Polarization of light - Rainbows - Cloudy skies - Halos – Essential- Useful and Frivolous Light **-** Light For Life - Patterns of Sunlight - Equinoxes And Eccentricity - The Length Of A Day - The Length Of Daylight - The Length Of A Second - Solar Calendar - Eclipses - Time Zones - The International Date Line.

UNIT III - THE TOOLS OF ASTRONOMY

The Celestial Sphere - Celestial Mechanics - The Continuous Spectrum of Light - The Theory of Special Relativity - The Interaction of Light and Matter - Telescopes - The Nature of Stars - Binary Systems - Stellar Parameters - The Classification of Stellar Spectra - Stellar Atmospheres - The Sun- The Interiors of Stars - The Process of Star Formation - Post-Main-Sequence Stellar Evolution - Stellar Pulsation- Supernovae - The Degenerate Remnants of Stars - Black Holes - Close Binary Star Systems.

UNIT IV - EXPLORING THE SOLAR SYSTEM

Physical Processes in the Solar System - The Planets - The Moon – Comets-Meteors, and Meteorites - The Terrestrial Planets - The Jovian Worlds - Minor Bodies Of The Solar System - The Formation Of Planetary Systems - Dwarf Planets - Life on Other Worlds? - Milky Way - Other galaxies - Galaxies in the expanding Universe - The Structure of the Universe - Mapping Our Milky Way - The origin and fate of the Universe - The solar neighborhood - The stars in the Galaxy - Galactic rotation - Milky Way meteorology - The interstellar gas - Large distribution of galaxies - Intergalactic gas.

UNIT V - STELLAR PHYSICS

Review of Black Body Radiation - Measurement of Stellar Parameters - The

Hertzsprung-Russell Diagram - Mass Continuity - Radiative Energy Transport - Energy Conservation - The Equations of Stellar Structure - Opacity - Scaling Relations On The Main Sequence - Nuclear Energy Production - Nuclear Reaction Rates - Solution Of The Equations of Stellar Structure - High Energy Phenomena - Novae And Supernovae - Pulsars - Quasars - Gamma ray bursts - Accreting black hole.

TEXT BOOKS

1. Matts Roos,*Introduction to Cosmology, 3rd Edition,* John Wiley and Sons Ltd, 2003.
2. Bradley W. Carroll, Dale A. Ostlie, *An Introduction to Modern Astrophysics*, 2nd Edition, Pearson, 2013.

REFERENCES

1. Dinah L. Moché, *Astronomy: A Self-Teaching Guide,* 7th Edition, John Wiley and Sons, 2009.
2. Linda S. Sparke, and John S. Gallagher, 2nd Edition, *Galaxies in The Universe: An Introduction,* Cambridge University Press, 2007.
3. Richard A. Matzner, *Dictionary of Geophysics, Astrophysics and Astronomy*, 2ndSeries, CRC Press, 2001.
4. David Greene, *Light And Dark,* Institute of Physics Publishing, 2003.
5. Jonathan I. Katz, *High Energy Astrophysics*, The Benjamins/Cummings Publishing Company, Inc., 1986.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15E06	COMPUTATIONAL PHYSICS	4	0	0	4	4

INSTRUCTIONAL OBJECTIVES

1.	To understand the basic programming techniques in MATLAB.
2.	To address analytically intractable problems in physics using computational tools.
3.	To understand various numerical techniques.
4.	To show how physics can be applied in a much broader context than discussed in traditional curriculum.

UNIT I - ERRORS

Definition of error - Absolute error - Relative error - Precision - Addition - Subtraction -Multiplication - Division - Error in numerical methods - Truncation error

- Round off Errors - Error propagation in arithmetic operations - Error propagation in iterated algorithms - Methods for reducing error - Mean - Median - Mode - Standard deviation -Variance - Correlation.

UNIT II - MATLAB

Arrays and Matrices- Creation of arrays and matrices (arange-linspace-zeros-ones-random- reshape- copyingarrays)- Arithmetic Operations- Cross product-Dot product – Saving and Restoring- Matrix inversion- Solution of simultaneous equations-if statement - if-else- nested if-else -The logical operator - the if-else clause - the not operator - Loop Control Structure - while loop - for loop- Nesting of loop- Multiple initializations in the for loop - The break statement - The continue statement and the do-while loop - Switch statement – Functions.

UNIT III - DATA VISUALISATION

Data visualization- The MATLAB plot module – Import export data - Plotting graphs-1D plot – 2D plot – mesh – surf – 3D plots Multiple plots- Polar plots-Pie Charts- Plotting Sine- Log- Exponential- Bessel- Legendre- Gaussian and Gamma functions -Parametric plots- Saving plots as JPG - EPS - Converting multiple plots to movie – Saving movie.

UNIT IV - NUMERICAL METHODS

Inverse of a function- Interpolation with Cubic Spline-Zeros of polynomials- Monte Carlo Methods- Simple integration- Integration by Importance Sampling-Eigenvalues and eigenfunctions - Shooting and relaxation methods- SampledData-Sampling Theorem-Discrete Fourier Transform- Fast Fourier Transform (FFT)

– Inverse Fast Fourier Transform (IFFT).

UNIT V - APPLICATIONS IN PHYSICS

One Dimensional Motion- Falling Objects: Introduction – Formulation- from Analytical methods to Numerical Methods - Euler Method- Freely falling body- Fall of a body in viscous medium - Simulation of free fall and numerical integration-Two dimensional motion- Projectile motion (by Euler method)-Motion under an attractive Inverse Square-law force Accuracy considerations (elementary ideas).

TEXT BOOKS

1. Rizwann Butt, *Introduction to Numerical Analysis using MATLAB*, Jones and Bartlett Publishers, 2008.
2. Gupta, Agarwal and Varshney, *Design And Analysis of Algorithms,* PHI Learning, 2008.

REFERENCES

1. Sastry S.S., *Introductory Methods of Numerical Analysis*, Prentice Hall of India, 2005.
2. James B Scarborough, *Numerical Mathematical Analysis*, Oxford and IBH Publishing Company, 1966.
3. Koonin, Steven E., and Dawn C. Meredith, *Computational Physics*. Addison-Wesley, 1990.
4. Thijssen Jos, *Computational Physics,* Cambridge University Press, 2007.
5. Tao Pang, Introduction to computational Physics, Cambridge University Press, 2010.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15E07	NONLINEAR OPTICS	4	0	0	4	4

INSTRUCTIONAL OBJECTIVES

1.	The prime objective is to provide the learners with a full-fledged understanding of integrated optics so that they may be able to develop the sound theoretical and experimental tools to study and control the linear and non-linear optical properties of various optical components.
2.	The students will be able to discuss derive the non-linear equations required for the simple and complexed situations and present a lecture on a topic within: nonlinear optics.
3.	The students could plan and carry out smaller research type projects based on contemporary and modern photophysical phenomena involved in NLO materials and analyse and present the achieved results in form of posters an oral presentation and a technical article.
4.	At the end of the course the graduate should be able to understand and perform simple evaluations of nonlinear phenomena in optics.

UNIT I - INFORMATION IN LIGHT

Light In The Era Of Electronics - Electronics1900–1960 - Principles of Optical Telegraphy - Photophone -Early rectification devices - The solid-state rectifier - The

transistor - New semiconductors for optoelectronics - Optoelectronic semiconductor devices - Bright light from cool solids - Seeing The Light- The human eye - Color vision - Color blindness - Polarization sensitivity - Speed of response - Optical illusions - Contemporary Optics- Waveguides - Optical fibres - Optical amplification - Conveying sound by light - The long and the short of optical communication.

UNIT II – FUNDAMENTAL TOOLS

Electromagnetic Phenomena - Gauss' Law - Gauss Law For Magnetic Fields - Faraday's Law - Ampere's Law - Maxwell's Adjustment To Ampere's Law - Polarization of Materials - Plane Wave Solutions To The Wave Equation - Complex Plane Waves - Real And Complex Indices of Refraction - The Lorentz Model of Dielectrics - Poynting's Theorem - Irradiance of A Plane Wave - Energy Density of Electric And Magnetic Fields.

UNIT III - PHOTOPHYSICAL PHENOMENA

Optical Propagation in Media - Diffraction and Dispersion effects - Wave Propagation in Homogeneous Linear Isotropic Media - Anisotropic media - The Origin and Modeling of Optical Nonlinearity - A Simple Physical Model for Optical Nonlinearity - Physical Effects of Nonlinear Polarization - Mathematical Modeling of Optical Nonlinearities - An Alternative Approach For Reflection And Refraction:-Refraction at an Interface - The Fresnel Coefficients' - Reflectance - Transmittance - Double-Interface Problem Solved Using Fresnel Coefficients' - Beyond Critical Angle: Tunneling of Evanescent Waves - Multiple Interfaces - Multilayer Coatings.

UNIT IV - PHYSICS OF NON-LINEARITIES

The Physics of Second Harmonic Generation - SHG in Crystals - Frequency Doubling and Mixing - Optical Parametric Generation Amplification - Oscillation -

Mathematical Formulation - Phase Matching in Anisotropic Crystal - Nonlinear Transverse Effects in Second Harmonic Generation - Self-Refraction of Optical/Gaussian Beams - Optical Bistability phenomena - Optical Phase conjugation effects.

UNIT V - OPTICAL COMMUNICATION TODAY

Components - Fabrication And Materials - Light Sources – Coupling- Micro

Components Tapers - Splices/Connectors - Characteristics of optical fibers - Diameter Control And Measurement - Attenuation - NLO Properties In Media - Fiber-Optic Solitons - Magnetic Solitons - Optical Shocks And Self-Steepening Of Pulses - Two-Wave Mixing In Photorefractive Materials - Four-Wave Mixing And Phase Conjugation In Photorefractive Materials - Self-Phase Conjugation And Edge Enhancement - Non-Linearities In Nematic Liquid Crystals - Photonic Bandgap Structures

TEXT BOOKS

1. Sergey A. Ponomarenko, *Fundamentals of Nonlinear Optics ECED 6400Lecture Note*s, Dalhousie University, 2012.
2. Goure P and Verrier I, *Optical Fibre Devices Series in Optics andOptoelectronics,* Institute of Physics Publishing Ltd, 2002.

REFERENCES

1. Justin Peatross and Michael Ware, *Physics of Light and Optics,* 2013.
2. David A. Boas, Constantinos Pitris and Nimmi Ramanujam, *Handbook ofBiomedical Optics,* CRC Press, Taylor and Francis Group, 2011.
3. David Greene, *Light and Dark* Institute of Physics Publishing Ltd, 2003.
4. Richard L Sutherland, *Handbook of Nonlinear Optics, 2nd Edition (Revisedand Expanded),* Marcel Dekker, Inc, 2003.
5. Newell, Alan C., and Jerome V. Moloney, *Nonlinear optics,* Addison-Wesley, 1992.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15E08	INTRODUCTION TO FORENSIC SCIENCES	4	0	0	4	4

INSTRUCTIONAL OBJECTIVES	
1.	Graduates will be able to define forensic science or criminalistics and state human rights
2.	Graduates will be knowledgeable of professional codes of ethics outlined by various professional forensic science organizations
3.	To equip all the students-continually emphasize the foundational principles of this interdisciplinary course in all value-added aspects and could be able to produce a future generation of core competent-credible-professional and ethical forensic scientists
4.	Have the necessary theoretical and practical background in all the sound areas of topics which includes the crime law-causation of crime scenes-types of crime-processing of crime scene-protection and recording of crime scene-search of physical clues-preservation-packing and forwarding of physical clues-crime scene reconstruction-pattern analysis-microscopy-forensic molecular biology-Forensic Statistics-and forensic chemistry

UNIT I-ELEMENTS OF FORENSIC SCIENCE

Chain of Custody-Science and the Legal Process-Litigation as History-Law and Science-Science and the Supreme Court-Scientific advisory boards-Forensic disciplines:-Forensic Pathology-Forensic Anthropology-Forensic Odontology-Forensic Entomology-Forensic Toxicology-Forensic Psychiatry-A Case Study-The Facts-The trace evidence-Development of codes and ethics.

UNIT II – FORENSIC INTELLIGENCE

Semantics-Forensics and Intelligence-Forensic Intelligence-Professor Olivier Ribaux's Definition-A Working Definition-The Concept of Entities in Police Recording System-Forensic Support Resources – The Origins of Forensic Intelligence-Estimating the Number of Current Offenders-Impact on Crime Reduction-Intelligence Handling Codes-The Value of Forensics in Crime Analysis and Intelligence- Intelligence Features of Forensic Evidence Types-Linking Cases and Comparative Case Analysis-the Different Forms of

Case Linking in Criminal Analysis-Varieties of Forms of Case Linking-Receiver-Operator characteristics-Truth and Probability-Case-linking studies-A Footwear Evidence and a Linked Homicide cases.

UNIT III-HUMAN IDENTIFICATION

Identifying The Unknown-Missing and unidentified people-The Coroner's Perspective-Disaster Victim Identification-Recommendations and Best Practice-Child Sex Offender Demographics- Towards an Improved Understanding-Identification From Soft And Hard Tissues-Distinguishing Human from Non-Human Bone-Burnt Human Remains-Fire Dynamics and Body Recovery-Burnt Human Remains-Identification and Laboratory Analysis-Stable Isotopes and Human Provenance.

UNIT IV-FORENSIC ASSESSMENT

Essential Understanding:-Problems and Approaches in Understanding Sexual Murder-The Problem of Definition and Terms-Motivation-Distinction between a Sexual Murder and Murder Associated with Sexual Behavior-Phenomenological descriptive vs. Statistical Approaches-The First Case of Murder-Theories of crime-Biological Theories-Psychological Theories-Sociological Theories-Forensic vs. Clinical Psychological Approaches-Epidemiological Aspects-Incidence of Crime and Homicide-Historical Patterns-Age Patterns-Additional Findings-Evaluation methodologies-Psychological Testing-Rorschach Test-Thematic Apperception Test (TAT)-ProjectiveDrawings-PersonalityInventories-Intellectual-CognitiveNeuropsychological Assessment - Neurodiagnostic and Biological Testing - Narcoanalysis-Hypnosis.

UNIT V-INVESTIGATIVE ANALYSES

Digital And Biometric Evidence-Image Analysis-Forensic Facial Comparison-Issues and Misconceptions-Virtual Anthropology and Virtopsy in Human Identification-RNA Profiling- A New Tool in Forensic Science-Atlas of Human Hair-Terminology-human hair types-Individualization of Physical Evidence-Human Hair Microscopic and Macroscopic Characteristics-Numerical Scoring of Hairs-Materials and Methods-Dirty truth-DNA Profiling-Bone Analysis-Dactyloscopy-Handwriting analysis-Soil/Urine Analyses - Cyber forensic and its impacts.

TEXT BOOKS

1. Xanthe Mallet-Teri Blythe and Rachel Berry, *Advances In*

HumanIdentification, Taylor and Francis Group, LLC, 2014.
2. Prahlow. J, Forensic *Pathology for Police-Death Investigators Attorneys andForensic Scientists, S*pringer Science, 2010.

REFERENCES

1. Robert Milne, *Forensic Intelligence,* Taylor and Francis Group, 2013.
2. Robert Bruce Thompson and Barbara Fritchman Thompson, *An IllustratedGuide to Home Forensic Science Experiments*-DIY Science-O'Reilly Media-Inc., 2012.
3. *Forensic Sciences: A Crime Scene Investigation Unit* Current Topics ScienceManitoba Education, 2009.
4. Louis B. Schlesinger, *Sexual Murder Catathymic and Compulsive Homicides*-CRC Press, 2004.
5. Terrence F. Kiely, *Forensic Evidence: Science and The Criminal Law,* CRC Press LLC, 2001.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15604	ELECTRONICS LABORATORY – II	0	0	4	4	2

INSTRUCTIONAL OBJECTIVES	
1.	To understand the basic working of oscillators.
2.	To develop the digital concepts in mod counters.
3.	To apply digital concepts in sequential logic systems.
4.	To develop the basic programming of 8085 using arithmetic operations.

LIST OF EXPERIMENTS (ANY NINE)

1. Logic gates using Discrete components.
2. Logic gates using IC.
3. Universal logic gates using NAND and NOR gates.
4. FlipFlops.
5. Decade counter.
6. Double digit seconds counter – 7 segment.
7. Half adder, Full adder, Half subtractor and Full subtractor using IC.
8. Digital to analog converter.
9. Analog to digital converter.
10. Shift Registers.

11. Ring and Ripple counters.
12. Up and Down counters.
13. ASM programs – Add and subtract (all modes of addressing) - µP 8085.
14. ASM programs – multiply and divide (all modes of addressing) - µP 8085.
15. ASM programs – factorial and square root (all modes of addressing) - µP 8085.

TEXT BOOKS

1. Morries John, *Digital Electronics*, Technical Publications, 2013.
2. Ramesh Goankar, *Microprocessor Architecture - Programming and Applications – 8085*, Prentice Hall, 2011.

REFERENCES

1. Malvino A.P.and Leach D.P., *Digital Principles and Applications*, 4th Edition, McGraw Hill, 2007.
2. Anokh Singh, A.K. Chhabra, *Fundamentals of Digital Electronics and Microprocessors*, S.Chand, 2011.
3. Gaykwad A., *Operational Amplifier and Linear Integrated Circuits*, Prentice Hall, 11th Edition, 1991.
4. Anil. K. Mani, *Digital Electronics- Principles and Integrated Circuits* , Wiley Precise, 1st Edition,2008.
5. Tabak.D, *Advanced Microprocessors*, McGraw-Hill,1995.

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UPY15605	Core Based Project	0	2	4	6	4

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
CDC15601	PERSONALITY DEVELOPMENT (Internal Evaluation)	2	0	2	2	2

INSTRUCTIONAL OBJECTIVES	
At the end of this course, the students will be able to,	
1.	Understand the concept of Personality Development
2.	Summarize the principles of proper courtesy as practiced in the Workplace

UNIT – I

Introduction-Personality –Definition, Determinants of Personality-Personality Characteristics and Behaviour at work-Big Five dimensions of Personality

UNIT – II

Personality Types- Sensation –Intuitive- Feelers & Thinkers category - Filling the GAP- Grooming, Attitude and Personality- Time management-Projective Personality Tests.

UNIT –III

Introduction-Meaning and Definition of Ethics- Nature and objective of Ethics-Ethics and Morality – Ethics and Religion - Morals, Values and Ethics – Integrity – Work Ethic – Honesty – Courage –Empathy – Self-Confidence – Character .

UNIT –IV

Ethical Theories – Classification- Basic Moral theories –Peace - Justice Ethical Decision Making - Structure - competence in professional ethics- How to use ethical reasoning-approaches and methods of resolving ethical dilemmas

UNIT –V

Development of Ethical corporate Behaviour – Factors affecting managerial work - codes of ethics- Importance of attitudes in personal and professional lives.

TEXT BOOKS

1. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi,2003
2. Elizbeth Hurlock, Personality Development, McGraw Hill, 4th Edition,.2007

REFERENCES

1. Stephen P. Robins, Organisational Behavior, PHI Learning / Pearson Education, 15th edition, 2012
2. Subramaniam.R, Professional Ethics, Oxford Publication. 2013