

B.Sc PHYSICS

(For students admitted from the academic year 2014-2015 onwards) CURRICULUM AND SYLLABUS

> FACULTY OF SCIENCE AND HUMANITIES SRM UNIVERSITY SRM NAGAR, KATTANKULATHUR – 603 203

B.Sc PHYSICS (For students admitted from the academic year 2014-2015 onwards) CURRICULUM AND SYLLABUS

Component	Course	Total number of credits
Part I	Language	6
Part II	English	6
Part III	Major, Allied Subjects and Core Based Electives	95
Part IV	Skill Based and Supportive Courses	21
Part IV	Value Added Course and General (Excluding English and Language)	11
Part V	Extension Activity	01
	Total	140

DETAILS OF THE CREDITS

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)

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		SEMES	ter i				
Course Code	Category	Course Name	L	Т	Ρ	Total L+T+P	C
ULH14101/	G	Language-I	3	2	-	5	3
ULF14101/		(Hindi/French/Tamil)					
ULT14101							
ULE14101	G	English-I	3	2	-	5	3
UPY14101	MC	Properties of Matter and Acoustics	4	1	-	5	4
UPY14102	MC	Elements of Optics	4	1	I	5	4
UPY14103	MC	Physics Practicals-I	-	-	4	4	2
UMA14161	AS	Allied Mathematics-I	4	-	-	4	4
CDC14101	VC	Communication Skills	2	-	-	2	2
		Total	20	6	4	30	22
		SEMES	fer II				
Course Code	Category	Course Name	L	Т	Ρ	Total L+T+P	С
ULH14201/ ULF14201/ ULT14201	G	Language-II (Hindi/French/Tamil)	3	2	-	5	3
ULE14201	G	English-II	3	2	-	5	3
UPY14201	MC	Electricity and Magnetism	4	1	-	5	4
UPY14202	MC	Physics Practicals-II	-	-	4	4	2
UMA14261	AS	Allied Mathematics II	4	-	-	4	4
UES14201	G	Environmental Studies	2	-	-	2	2
UCA14281	SS	Computer Literacy	2	-	2	4	4
CDC14201	VC	Soft Skills	1	-	-	1	1
UNS14201/	Extn.	NSS/NCC	-	-	-	-	1
UNC14201							
		Total	19	5	6	30	24

		SEMESTE	R III				
Course Code	Category	Course Name	L	Т	Ρ	Total L+T+P	C
UPY14301	MC	Classical Mechanics and Relativity	4	1	-	5	4
UPY14302	MC	Heat and Thermodynamics	it and 4 1 - 5 irmodynamics				4
UPY14303	MC	Physics Practicals-III	-	-	4	4	2
UCY14361	AS	Allied Chemistry-I	4	1	-	5	4
UCY14362	AS	Allied Chemistry Practicals-I	-	-	4	4	2
UPY14304	SS	Unix and C Programming	3	-	2	5	4
CDC14301	VC	Verbal Aptitude	1	-	-	1	1
UVE14301/ UYG14301	VC	Value Education/ Yoga for Human Excellence	1	-	-	1	1
	•	Tota	ul 17	3	10	30	22
		SEMESTE	RIV				
Course Code	Category	Course Name	L	Т	Р	Total L+T+P	C
UPY14401	MC	Laser Physics and Spectroscopy	4	1	-	5	4
UPY14402	MC	Solid State Physics	4	1	-	5	4
UPY14403	MC	Physics Practicals-IV	-	-	4	4	2
	CE- I	Core Based Elective - I	3	-	-	3	3
	SE-I	Skilled Based Elective - I	3	-	-	3	3
UCY14461	AS	Allied Chemistry-II	4	-	-	4	4
UCY14462	AS	Allied Chemistry Practicals-II	-	-	4	4	2
CDC14401	VC	Quantitative Aptitude and Logical Reasoning - I	2	-	-	2	2
		Total	20	2	8	30	24

		SEMES ⁻	ter v				
Course Code	Category	Course Name	L	т	Р	Total L+T+P	C
UPY14501	MC	Quantum Mechanics	4	1	-	5	4
UPY14502	MC	Atomic and Nuclear Physics	4	1	-	5	4
UPY14503	MC	Analog Electronics	4	1	-	5	4
	CE - II	Core Based Elective	- 3	-	-	3	3
	SE -II	Skilled Based Elective - II	e 3	-	-	3	3
UPY14504	SS	Programming Using Matlab	1	-	2	3	2
UPY14505	MC	Electronics Laboratory-l	-	-	4	4	2
CDC14501	VC	Quantitative Aptitude and Logical Reasoning - II	2	-	-	2	2
		Tot	al 21	3	6	30	24
		SEMEST	ier VI				
Course Code	Category	Course Name	L	Т	Ρ	Total L+T+P	С
UPY14601	MC	Elements of Nano Science and Nanotechnology	4	1	-	5	4
UPY14602	MC	Digital Electronics and Microprocessors	4	1	-	5	4
UPY14603	MC	Physics of Biological systems	4	1	-	5	4
	CE - III Core Based Elective-III		3	-	-	3	3
	SE -III	Skilled Based Elective -III	3	-	-	3	3
UPY14604	MC	Electronics Laboratory-II	-	-	4	4	2

B.Sc (Physics) 2014-2015

UPY14605	MC	Core Based Project	-	-	3	3	2
UHR14601	VC	Human Rights and Professional Ethics	2	-	-	2	2
	To	tal	20	3	7	30	24
Total Credits				140			

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

Category of courses:

G - General

- MC Major Core
- CE-Core Based Elective
- SE Skill Based Elective
- AS-Allied Subjects
- VC-Value Added Course
- SS-Skill Based Supportive Course

CORE BASED ELECTIVES

Course Code	Course Name
UPY14E01	Elements of Earth Atmosphere
UPY14E02	Energy Physics
UPY14E03	Low Temperature Physics
UPY14E04	Radiation Physics
UPY14E05	Plasma Physics
UPY14E06	Astrophysics
UPY14E07	Computational Physics
UPY14E08	Nonlinear Optics
UPY14E09	Introduction to Forensic
	Sciences

SKILL BASED ELECTIVES

Course Code	Course Name
UPY14E51	Electrical Appliances
UPY14E52	Electronic Instrumentation
UPY14E53	Medical Physics
UPY14E54	Electronic Communication
UPY14E55	Laser Technology
UPY14E56	Computer Networks
UPY14E57	Wireless Technology
UPY14E58	Solar Technology
UPY14E59	Cell Phone Servicing

SEMESTER I

CO C	OURSE COURSE TITLE CODE				Ρ	Total L+T+P	С
ULH	14101	HINDI-I	3	2	0	5	3
INST	ructio	NAL OBJECTIVES					
1.	То ехр	ress and communicate literature which is pa	art o	f life)		
2.	To ind	corporate day to day personal and profe	essi	onal	life	's needed	to
	comm	unicate in the language.					
3.	To hel	o the students to imagine and express their r	nine	d thr	ougł	1 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. Preethi.S., Islam MD., Razia Begum S., *Hindi I*, Department of Hindi, FSH,SRM University

REFERENCE

1. Madhav Sontakke , *Prayajon Mulak Hindi*

COURSE CODE			CO	URSE T	ITLE			L	Т	Ρ	Total L+T+P	C
ULF	14101			FRENCH	 -			3	2	0	5	3
INST	FRUCTIO	onal ob	JECTIVE	S								
1.	To en compo	courage osition w	greater riting.	written	skills	throug	h co	mpi	rehe	nsio	n writing a	and
2.	Improv practic	ve their (ce.	oral and	written	skills	through	ac	oml	binat	ion	of theory a	and
3.	Extend and te	l and ex chniques	band the by prac	ir savoi tical trai	r-faire ning	through	the	acq	uisit	ion	of latest sk	ills

Unité-I

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

Unité-II

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.

Unité-III

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.

Unité-IV

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.

Unité-V

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.

REFERENCE

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

பாடகுறியீடு	பாடத் தலைப்பு	L	Т	Р	Total	С
எண்					LTP	
ULT14101	தமிழ்- I	3	2	0	5	3

பகுதி 1. தமிழ் இலக்கிய வரலாறு

(நூல் – தமிழ் இலக்கிய வரலாறு- முனைவர் சு.ஆனந்தன், கண்மணி பதிப்பகம், திருச்சி, 2010.)

சிற்றிலக்கியம் - தோற்றமும் வளர்ச்சியும்

புதுக்கவிதை - தோற்றமும் வளர்ச்சியும்

- சிறுகதை தோற்றமும் வளர்ச்சியும்
- புதினம் தோற்றமும் வளர்ச்சியும்
- உரைநடை தோற்றமும் வளர்ச்சியும்

பகுதி 2. இலக்கியம்

அ. இக்காலக்கவிதைகள்

- பாரதியார் நெஞ்சு பொறுக்கு திலையே …என்று தொடங்கும் கவிதை
- 2. பாரதிதாசன்

உலக ஒற்றுமை - தன்பெண்டு தன்பிள்ளை …என்று தொடங்கும் கவிதை

- 3. ந.பிச்சமூர்த்தி கிளிக்கூண்டு
- இன்குலாப் மரங்களின் சுற்றம்
 சந்திக்கச் செல்வதில்லை...என்று தொடங்கும் கவிதை
- நா. காமராசன் கருப்பு மலர்கள் காகிதப் பூக்கள் - கால மழைத்தூறலிலே... என்று தொடங்கும் கவிதை
- சு.வில்வரெத்தினம் --வேற்றாகி நின்ற வெளி நிலவின் எதிரொலி – பறம்பு மலை …என்று தொடங்கும் கவிதை

- பாரதி புத்திரன் மாரிக்கால இரவுகள் சிவகாசி சிசுக்கள் – மகனே அன்றொரு நாள் ...என்று தொடங்கும் கவிதை
- து நரசிம்மன் வானம் பிறந்தது ஒரு பிஞ்சின் வேண்டுகோள்…என்று தொடங்கும் கவிதை
- 9. பொன்மணி வைரமுத்து- தாய்ப்பல்லாண்டு
- ப.கல்பனா- வானம் பிறந்தது கீறல் விழுந்த மாலைக்காலங்கள்- இன்று வர… என்று தொடங்கும் கவிதை

ஆ. சிற்றிலக்கியம்

கலிங்கத்துப்பரணி- போர் பாடியது: 404 -- 408 பாடல்கள் குற்றாலக்குறவஞ்சி – மலைவளம்

- வானரங்கள் கனிக்கொடுத்து என்று தொடங்கும் பாடல்
- முழங்கு திரைப் புனலருவி கழங்கென முத்தாடும் என்று தொடங்கும் பாடல்

இ. காப்பியங்கள்

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

பகுதி 3 உரைநடைப் பகுதி

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

பாட நூல்கள் :

- முனைவர் சு.ஆனந்தன் தமிழ் இலக்கிய வரலாறு-,கண்மணி பதிப்பகம், திருச்சி, 2010.
- எம்.எஸ்.உதயமூர்த்தி, *'எண்ணங்கள்*', கங்கை புத்தக நிலையம், 2005.
- செய்யுள் புத்தகம், தமிழ்த்துறை, அறிவியல் மற்றும் மானுடவியல் புலம், எஸ். ஆர். எம். வெளியீடு. 2014.

COU CO	rse De	COURSE TITLE	L	Т	Ρ	Total L+T+P	C
ULE1	4101	ENGLISH-I	3	2	-	5	3
INSTR	UCTIO	NAL OBJECTIVES					
1.	To er	hance students' proficiency in English lang	uage	Э.			
2.	To enable the students to think in English.						
3.	To b	e abreast with the world literature.					
4.	To eo study	quip students with the awareness and strate / of English as a lifelong process.	egies	s nee	ded	to enable	e the
5.	To e teach	ngage in ongoing professional developm ing and research.	ent	with	res	pect to	both

UNIT I - POETRY

- 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

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

UNIT III - SHORT STORIES

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

UNIT IV - MOVIE REVIEW

- 1. Whose Life is it Anyway?
- 2. The Accused- Feature Film
- 3. Water

UNIT V - LANGUAGE COMPONENT

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

TEXT BOOKS

- 1. Raymond Murphy, *Essential Grammar in Use*, 3rd Edition, Cambridge University Press, 2010.
- 2. Shanthichitra, *English-I and II*, Published by Department of English, FSH,SRM University, 2014.

CO C	URSE ODE		COUR	SE TITLE		L	Τ	Ρ	Total L+T+P	C
UPY14101		PR	PROPERTIES OF MATTER AND ACOUSTICS			4	1	-	5	4
INSTRUCTIONAL OBJECTIVES										
1.	To und	lerstand th	ne different	kinds of mod	uli via exp	perir	nent	al m	ethods.	
2.	To und	lerstand th	ne surface ⁻	tension i.e.bou	undary pr	ope	rty a	nd v	iscosity.	
3.	To understand the wave phenomena, in general and sound wav						nd wave	in		
	particular.									
4.	To und	lerstand u	Itrasonics a	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.

00 00	JRSE)De	COURSE TITLE	L	T	Ρ	Total L+T+P	C
UPY14102		ELEMENTS OF OPTICS	4	1	-	5	4
INSTRUCTIONAL OBJECTIVES							
1.	To unde	erstand the concepts of optics.					
2.	To apply the Physics Principles in optical s			S.			
3.	To study interference and diffraction of light.						
4.	To unde	erstand the ray theory and wave theor	y of (optic	s.		

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 - Wave

field 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, Hologramsconventional 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 Physical Optics Notebook: Tutorials in Fourier Optics*, Vol. 61, SPIE Optical Engineering Press, 1989.
- 5. Herzberger Max, *Modern Geometrical Optics*, Wiley, 1958.

COU	RSE CODE	COURSE TITLE	L	Т	Ρ	Total L+T+P	C
UPY14103		PHYSICS PRACTICAL I	-	-	4	4	2
INST	INSTRUCTIONAL OBJECTIVES						
1.	To gain k	nowledge in the scientific meth	ods ai	nd le	arn t	he process	s of
	measuring	different Physical variables.					
2.	To enable	the student to explore the field of p	propert	ies o	f mat	ter.	
3.	To make the student understand the basic c			s in a	cous	tics.	
4.	To allow fundament	the student to have a deep kn als of optics.	owled	ge of	f the		

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.
- 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.

COU	IRSE	COURSE TITLE	L	Τ	Ρ	Total	C		
COD)E					L+T+P			
UMA14161 ALLIED MATHEMATICS I 4						4	4		
INS	NSTRUCTIONAL 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- Tautologycontradiction- 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, 4^{th} Edition Reprint, Margham Publications, 2013.
- 2. Venkatachalapathy, S.G.,Allied Mathematics, 1st Edition Reprint, Margham Publications, 2007.

CC	URSE CODE	COURSE TITLE	L	Т	Ρ	Total L+T+P	C
	CDC14101	COMMUNICATION SKILLS	2	-	-	2	2
INST	RUCTIONAL OE	BJECTIVES					
1.	To cater to the Listening, Spe class room atne free flow of ind	ne four essential aspects of co aking, Reading and Writing and nosphere, leaving enough scope ividual thoughts.	omm I the for c	unica reby onfid	tion crea ent ii	skills nan te a cong nteractions	nely, enial and

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 – Pitfalls in the direct translation of words and essential phrases to English language through short conversations- Formal speech - Paper presentation- Essential aspects of Business communication – Address- Tone- Choice of words (language)- Style- Deciding the target audience.

UNIT III - READING SKILL

Reading Comprehension - Poems- passages(stories- essays- articles- reports)conversations- Short messages- e-mails- Formal/informal letters – Purpose -Phonemic awareness- Phonics- Vocabulary development- Reading fluency-Including oral reading skills- Reading comprehension strategies.

UNIT IV - WRITING SKILL

Letter writing – Formats and language – Types – Personal- Business-Applications- Thanks- Invitation- Condolence- Requisition- Complaint - E-mail etiquette - Reports – Oral report – Periodical report – Progress report – Field report - Essay writing- essential elements of an essay – Structure – Coherence – Relevance.

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 - Survey and reporting (Role of IT in Environment and human health).

SEMESTER II

CO	OURSE CODE	C	DURS	ETITLE		L	Т	Ρ	Total L+T+P	C
l	ULH14201		HIN	DI-II		3	2	-	5	3
INST	RUCTIONAL OF	JECTIVES								
1.	To express and	communi	cate li	iterature wl	hich is	part	of lif	е		
2.	To incorporate communicate i	e day to n the langu	day age.	personal	and	profe	essio	nal	life's nee	d to
3.	To help the stu	idents to ii	magir	ie and expi	ress th	neir m	nind t	hrou	gh Literatu	re .

UNIT - I POETRY

- 1. Suprashid Dohey Kabir, Rahim, Bihari, Surdas
- 2. Nar Ho Na Nirash Karo Mann Ko Maithlisharan gupt
- 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

2. Preethi.S., Islam MD., Razia Begum S., *Hindi I*, Department of Hindi, FSH,SRM University

REFERENCES

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

CC	OURSE CODE	COURSE TITLE	L	Т	Ρ	Total L+T+P	C
	ULF14201	FRENCH-II	3	2	-	5	3
INST	RUCTIONAL OE	BJECTIVES					
1.	Consolidate the examples provi day conversation	e knowledge of theoretical aspe ided from different angles: from on.	cts o pres	of Fre ent d	ench ay lit	grammar erature, da	with ay to
2.	Improve their practice.	oral and written skills through a	l cor	nbina	ation	of theory	and

UNITE-I

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

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

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

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

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.

REFERENCE

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

பாடகுறியீடு எண் பாடத் தலைப்பு ULT14201 தமிழ்- II		L	т	Р	Total LTP	С
ULT14201	தமிழ்- II	3	2	-	5	3

பகுதி -1 தமிழ் இலக்கிய வரலாறு

(நூல் – தமிழ் இலக்கிய வரலாறு- முனைவர் சு.ஆனந்தன், கண்மணி பதிப்பகம், திருச்சி, 2010.)

- சங்க இலக்கியங்கள்
- நீதி இலக்கியங்கள்
- பக்தி இலக்கியங்கள்
- 4. காப்பியங்கள்

பகுதி -2 அ. சங்க இலக்கியம்

- முளி தயிர் பிசைந்த... என்று தொடங்கும் குறுந்தொகை (167) பாடல் முல்லை, செவிலித்தாய் கூற்று).
- மனை நடு வயலை வேழம் சுற்று... என்று தொடங்கும் ஐங்குறுநூறு (11) பாடல் (மருதம், ஐங்குறுநூறு- வேழப்பத்து.)
- எம் வெங் காமம் இயைவது ஆயின்என்று தொடங்கும் அகநானூறு (15) பாடல் (பாலை , மகட் போக்கிய தாய் சொல்லியது)

- சுடர் தொடீஇ கேளாய்..... என்று தொடங்கும் கலித்தொகை (51) பாடல் (குறிஞ்சி, தலைவி கூற்று)
- மண்டு அமர் அட்ட ... என்று தொடங்கும் புறநானூறு (213) பாடல், பாடியவர் : புல்லாற்றூர் எயிற்றியனார், பாடப்பட்டோன் : கோப்பெருஞ்சோழன்; திணை : வஞ்சி; துறை- துணைவஞ்சி.
- நறவுவாய் உறைக்கும் நாகுமுதிர் ... என்று தொடங்கும்
 பத்துப்பாட்டு சிறுபாணற்றுப்படை (51-67) பாடல்
- கலந்தோர் உவப்ப எயில் பல கடையி... என்று தொடங்கும் பத்துப்பாட்டு -- மதுரைக் காஞ்சி (220-237) பாடல்.

ஆ. நீதி இலக்கியம்

1. திருக்குறள் - நட்பாராய்தல்

புலவி நுணுக்கம் (2 அதிகாரம்)

நாலடியார்- பொருட்பால்- மேன்மக்கள் – 5 பாடல்

இ. பக்தி இலக்கியம்

சைவம் – பன்னிரு திருமுறைகள்

- திருஞானசம்பந்தர் தேவாரம் முதலாம் திருமுறை காதல் ஆகி, கசிந்து … என்று தொடங்கும் பாடல்
- திருநாவுக்கரசர் தேவாரம் ஐந்தாம் திருமுறை மாசில் வீணையும் மாலை … என்று தொடங்கும் பாடல்
- சுந்தரர் தேவாரம் ஏழாம் திருமுறை பொன்னார் மேனியனே … என்று தொடங்கும் பாடல்
- மாணிக்கவாசகர் திருவாசகம் பிடித்த பத்து பால் நினைந்து ஊட்டும் தாயினும் சாலப் … என்று தொடங்கும் பாடல்
- திருமூலர் திருமந்திரம் மரத்தை மறைத்தது மாமத யானை … என்று தொடங்கும் பாடல்

வைணவம் – நாலாயிரத்திவ்யப் பிரபந்தம்

- பூதத்தாழ்வார் பெருகு மத வேழம் மாப்பிடிக்கு ... என்று தொடங்கும் பாடல்
- குலசேகராழ்வார் ஆனாத செல்வத்து அரம்பையர்கள் தற்சூழ ...என்று தொடங்கும் பாடல்
- பெரியாழ்வார் எந்நாள் எம்பெருமான் ...என்று தொடங்கும் பாடல்
- ஆண்டாள் ஓங்கி உலகளந்த உத்தமன் … என்று தொடங்கும் பாடல்
- திருப்பாணாழ்வார் சதுர மாமதில் சூழ் இலங்கைக்கு … என்று தொடங்கும் பாடல்
- இஸ்லாம்

குணங்குடி மஸ்தான் சாகிபு பாடல்கள் –தவமே பெற வேண்டுமெனல்- 3 பாடல்கள்

கிறித்துவம்

ஆதிநந்தாவனப் பிரளயம் – ஏதேன் தோட்டம்- 3 பாடல்கள்

பகுதி 3: சிறுகதை

"ஒ**ற்றைச் சிறகு**", இலக்கியச் சிந்தனை 2012 ஆம் ஆண்டின் சிறந்த சிறுகதைகள் தொகுப்பு.

பாட நூல்கள் :

- முனைவர் சு.ஆனந்தன் (2010), தமிழ் இலக்கிய வரலாறு-, கண்மணி பதிப்பகம், திருச்சி, 2010.
- ஒற்றைச் சிறகு, இலக்கியச் சிந்தனை 2012 ஆம் ஆண்டின் சிறந்த சிறுகதைகள் தொகுப்பு, 2012.
- செய்யுள் புத்தகம், தமிழ்த்துறை, அறிவியல் மற்றும் மானுடவியல் புலம் , எஸ். ஆர். எம். வெளியீடு, 2014.

24

CC	URSE CODE	COURSE TITLE	L	Т	Ρ	Total L+T+P	C
	ULE14201	ENGLISH-II	3	2	I	5	3
INST	STRUCTIONAL OBJECTIVES						
1.	1. To enhance students' proficiency in English language.						
2.	2. To enable the students to think in English.						
3.	To be abreast	with the world literature.					
4.	To equip stude study of Englis	ents with the awareness and strate sh as a lifelong process.	egies	need	led to	o enable t	he
5.	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. Raymond Murphy, *Essential Grammar in Use*, Cambridge University Press, 3rd Edition 2010.
- 2. Shanthichitra, *English-I and II*, Department of English, FSH, SRM University, 2014.

00 CO	urse Dde	COURSE TITLE	L	T	Ρ	Total L+T+P	C		
UPY14201		ELECTRICITY AND MAGNETISM	4	1	-	5	4		
INSTRU	NSTRUCTIONAL OBJECTIVES								
1.	To under	stand the general concepts in Electrost	atics.						
2.	To apply	the Physics concepts in solving proble	ms.						
3.	To educa	To educate scientifically the principles in Magnetism.							
4.	To emph	asize the significance of Electromagnet	ic the	ory.					

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 and cylindrical 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 of emf 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 and Magnetism*, Wiley India Pvt Ltd , 2011.
- 5. Edward M Purcell, *Electricity and Magnetism,* Berkeley Physics Course, Volume 2, 2nd Edition, 2011.

C	OURSE CODE	COUR	SE TITLE		L	Т	Ρ	Total L+T+P	C
UPY14202		PHYSICS PR	RACTICALS - II		-	-	4	4	2
INSTRUCTIONA		. OBJECTIVES							
1.	To gain k	nowledge in the	e scientific me	ethod	ls ar	ıd le	arn t	he process	s of
	measuring	ı different Physic	al variables.						
2.	To enable	the student to ex	plore the field c	of ele	ectric	ity.			
3.	To make the student understand the basic concepts in magnetism.								
4.	To allow	the student to	have a deep	kno	wled	ge o	f the	fundamen	tals
	electroma	gnetic 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 in Practical Physics*, 8th Edition, 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.

COU COD	JRSE)e	COURSE TITLE	L	Τ	Ρ	Total L+T+P	C	
UM/	A14261	ALLIED MATHEMATICS- II	4	•		4	4	
INST	FRUCTIONA	L 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- $\int \sin^n x \, dx$

$$-\int \cos^{n} x \, dx - \int_{0}^{\frac{\pi}{2}} \sin^{n} x \, dx - \int_{0}^{\frac{\pi}{2}} \cos^{n} x \, dx$$

UNIT II - TRIGONOMETRY

Trigonomery – Expansion of Sin n, Cos n and tan n – 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

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 Pr*inters and Publishers Pv*t. Ltd., Chennai.

COURSE CODE		CO	URSE TITLE		L	Т	Ρ	Total	C
								L+T+P	
UES14201		ENVIRON	MENTAL STU	JDIES	2	-	-	2	2
INSTRUCTIONAL OBJECTIVES									
1.	To gain knowledge on the importance of environmental education and								
	ecosystem.								
2.	To acquire knowledge about environmental pollution- sources, effects and							Ind	
	control measures of environmental pollution.								
3.	To understand the various energy sources, exploitation and need of alternate							ate	
	energy resources. Disaster management.								
4.	To acquire kn	owledge w	vith respect	to bio	diversi	ty, it	s th	reats and	its
	conservation an	nd appreciat	e the concep	ot of inte	erdepei	ndenc	e.		
5.	To be aware o	f the natior	nal and inter	nationa	l conc	ern fo	or er	ivironment	for
	protecting the e	nvironment							

UNIT I - ENVIRONMENTAL EDUCATION AND ECOSYSTEMS

Environmental education - Definition and objective - Structure and function of an ecosystem – Ecological succession –Primary and secondary succession - Ecological pyramids – Pyramid of number, pyramid of energy and pyramid of biomass.

UNIT II - ENVIRONMENTAL POLLUTION

Pollution – Air, water, soil – Causes and effects and control measures. Specifically: acid rain, ozone layer depletion, green house gas effect and global warming. Waste management: prevention and control measures of solid waste (General) National concern for environment: Important environmental protection Acts in India – Water, air (prevention and control of pollution) act, wild life conservation and forest act. Functions of central and state pollution control boards. Issues involved in enforcement of environmental legislation.

UNIT III - BIODIVERSITY AND ITS CONSERVATION

Introduction - Definition - Genetic, species and ecosystem diversity – Bio diversity hot spots – Values of biodiversity: Consumptive use, productive use, social, ethical, aesthetic and option values - Threats to biodiversity: habitat loss, poaching of wildlife – Endangered and endemic species of India, Conservation of biodiversity: in-situ and ex-situ conservations.

UNIT IV - ENERGY RESOURCES AND CONSERVATION

Energy resources and their exploitation - Conventional energy sources: -coal, oil, biomass and nature gas (overview) - over- utilization. Non-conventional energy sources: hydroelectric power, tidal, wind, geothermal energy, solar collectors, photovoltaic, nuclear-fission and fusion. Energy use pattern and future need projection in different parts of the world, energy conservation policies.

UNIT V - NATURAL HAZARDS AND DISASTER MANAGEMENT

Natural and Man made disasters - Types, causes, onset, impacts. (viz. earthquake, flood, drought, cyclone, tsunamic, volcanics, landslide, industrial accidents.). Forecasting and managements

TEXT BOOKS

- 1. Jeyalakshmi.R, *Principles of Environmental Science*, 1st Edition, Devi Publications, Chennai, 2006.
- 2. De.A.K., *Environmental Chemistry*, New Age International, New Delhi, 1996.
- 3. Sharma. B. K. and Kaur, *Environmental Chemistry,* Goel Publishing House, Meerut, 1994.

REFERENCES

- 1. Dara S.S., *A Text Book of Environmental Chemistry and Pollution control*, S.Chand and Company Ltd., New Delhi, 2004.
- 2. Rahavan Nambiar, Textbook of *Environmental Studies*, Scitech Publication (India) Pvt.Ltd, 2nd Edition, 2007.

COURSE CODE		COURSE TITLE		Т	Ρ	Total L+T+P	C		
UCA14281		COMPUTER LITERACY	2	I	2	4	4		
INSTRUCTIONAL OBJECTIVES									
1.	To gain knowledge in the concepts and working of MS Office.								
2.	To understand the working of MS Excel.								
3.	To be aware with the fundamentals of MS Power Point.								

UNIT I - INTRODUCTION TO MS OFFICE

MS Word - Working with Documents-Opening and Saving files, Editing text documents, Inserting, Deleting, Cut, Copy, Paste, Undo, Redo, Find, Search, Replace, Formatting page and setting Margins, Converting files to different formats, Importing and Exporting documents, Sending files to others, Using Tool bars, Ruler, Using Icons, using help, Formatting Documents- Setting Font styles, Font selection- Style, size, colour etc, Type face- Bold, Italic, Underline, Case settings, Highlighting, Special symbols, Setting Paragraph style, Alignments, Indents, Line Space, Margins, Bullets and Numbering - Setting Page style-Formatting Page, Page tab, Margins, Layout settings, Paper tray, Border and Shading, Columns, Header and footer, Setting Footnotes and end notes – Shortcut Keys; Inserting manual page break, Column break and line break, Creating sections and frames, Anchoring and Wrapping, Setting Document styles, Table of Contents, Index, Page Numbering, date and Time, Author etc., Creating Master Documents, Web page. Creating Tables- Table settings, Borders, Alignments, Insertion, deletion, Merging, Splitting, Sorting, and Formula, Drawing- Inserting Clip Arts, Pictures/Files etc., Tools - Word Completion, Spell Checks, , Mail merge, Templates, Creating contents for books, Creating Letter/Faxes, Creating Web pages, Using Wizards, Tracking Changes, Security, Digital Signature, Printing Documents Shortcut kevs.

UNIT II - INTRODUCTION TO MS EXCEL

MS Excel - Spread Sheet and its Applications, Opening Spreadsheet, Menus-main menu, Formula Editing, Formatting, Toolbars, Using Icons, Using help, Shortcuts, Spreadsheet types - Working with Spreadsheets - Opening, Saving files, setting Margins, Converting files to different formats (importing, exporting, sending files to others), Spread sheet addressing - Rows, Columns and Cells, Referring Cells and Selecting Cells – Shortcut Keys - Entering and Deleting Data- Entering data, Cut, Copy, Paste, Undo, Redo, Filling Continuous rows, columns, Highlighting values, Find, Search and replace, Inserting Data, Insert Cells, Column, rows and

sheets, Symbols, Data from external files, Frames, Clipart, Pictures, Files etc, Inserting Functions, Manual breaks, Setting Formula-finding total in a column or row, Mathematical operations (Addition, Subtraction, Multiplication, Division, Exponentiation), Using other Formulae- Formatting Spreadsheets- Labelling columns and rows, Formatting- Cell, row, column and Sheet, Category-Alignment, Font, Border and Shading, Hiding /Locking Cells, Anchoring objects, Formatting layout for Graphics, Clipart etc., Worksheet Row and Column Headers, Sheet Name, Row height and Column width, Visibility- Row, Column, Sheet, Security, Sheet Formatting and style, Sheet background, Colour etc, Borders and Shading – Shortcut keys.

UNIT III - INTRODUCTION TO MS ACCESS

MS Access - Introduction, Planning a Database, Starting Access, Access Screen, Creating a New Database, Creating Tables, Working with Forms, Creating queries, Finding Information in Databases, Creating Reports, Types of Reports, Printing and Print Preview – Importing data from other databases viz. MS Excel etc.

UNIT IV - INTRODUCTION TO MS POWER POINT

MS Power point - Introduction to presentation – Opening new presentation, Different presentation templates, Setting backgrounds, Selecting presentation layouts- Creating a presentation - Setting Presentation style, Adding text to the Presentation - Formatting a Presentation - Adding style, Colour, gradient fills, Arranging objects, Adding Header and Footer, Slide Background, Slide layout -Adding Graphics to the Presentation- Inserting pictures, movies, tables etc into presentation, Drawing Pictures using Draw - Adding Effects to the Presentation-Setting Animation and transition effect - Printing Handouts, Generating Standalone Presentation viewer.

UNIT V - INTRODUCTION TO INTERNET

Creating an e-mail id using yahoo.com - Creating a text file and sent email -Downloading files, text, picture from email - Checking email - Searching search engine - Insert a text file into web - Composing a email - Sending a group of members to different user - Chatting.

COMPUTER LITERACY (OFFICE AUTOMATION) LAB SYLLABUS

MS-WORD

- 1. Text Manipulations.
- 2. Usage of Numbering, Bullets, Tools and Headers.
- 3. Usage of Spell Check and Find and Replace.
- 4. Text Formatting.
- 5. Picture Insertion and Alignment.
- 6. Creation of Documents Using Templates.
- 7. Creation of Templates.
- 8. Mail Merge Concept.
- 9. Copying Text and Picture from Excel.
- 10. Creation of Tables, Formatting Tables.
- 11. Splitting the Screen.
- 12. Opening Multiple Document, Inserting Symbols in Documents.

MS-EXCEL

- 1. Creation of Worksheet and Entering Information.
- 2. Aligning, Editing Data in Cell.
- 3. Excel Function (Date, Time, Statistical, Mathematical, Financial Functions).
- 4. Changing of Column Width and Row Height (Column and Range of Column).
- 5. Moving, copying, Inserting and Deleting Rows and Columns.
- 6. Formatting Numbers and Other Numeric Formats.
- 7. Drawing Borders Around Cells.
- 8. Creation of Charts Raising Moving.
- 9. Changing Chart Type.
- 10. Controlling the Appearance of a Chart.

MS-POWER POINT

Working with Slides

- 1. Creating, saving, and closing presentation.
- 2. Adding Headers and footers.
- 3. Changing slide layout.
- 4. Working fonts and bullets.
- 5. Inserting Clipart.

- 5.1 Working with Clipart.
- 5.2 Applying Transition and animation effects.
- 6. Run and Slide Show.

INTERNET

- 1. Creating an E-mail ID.
- 2. Creating a text file and send to E-mail.
- 3. Downloading files, text, pictures from E-mail.
- 4. Checking E-mail.
- 5. Searching Search Engine.
- 6. Inserting a text file into web.
- 7. Sending a group of members to different user.
- 8. Chatting.
- 9. Create a simple webpage using HTML.
- 10. Use frames to Include Image and Videos.
- 11. Add a Cascading Style sheet for designing the web page.
- 12. Design a simple online test web page in PHP.
- 13. Design of a website.

TEXT BOOKS

- 1. Curtin D.P., Foley K., Sen K. and Mortin C., *Information Technology the Breaking Wave*, 3rd Edition, 1999.
- 2. Sawyer William A, *Hutchinson using Information Technology Brief version,* McGraw Hill International Edition, 1999.

REFERENCES

- 1. Alexis Leon and Mathew Leon, *Fundamental of Information Technology*, Vikas Publishing.
- 2. James A Senn, *Principles, Practices and Opportunities*, Prentice Hall.
- 3. Patsy Fulton-Calkins, *Technology and Procedures for Administrative Professionals*, Thomson Learning.
| CO
C |)URSE
CODE | COURSE TITLE | L | Т | Ρ | Total
L+T+P | C |
|---------|----------------------------------|--|--------------|--------------|---------------|----------------------------|---------------|
| CDC | C14201 | SOFT SKILLS | 1 | I | - | 1 | - |
| INSTR | RUCTIONA | L OBJECTIVES | | | | | |
| 1. | To equip
confidenc
career. | the students with the required sof
ce and courage in them, to take up n | 't sk
1ew | dills
opp | that
ortui | would ins
nities for th | still
1eir |

SELF ANALYSIS

Attitude- perceptions – Positive approach to challenges - Change management – ideas and approach, Goal setting – Vision, Time management - Planning, Entrepreneurial skills - Leadership skills, People management – Team work, leadership - Decision making - Problem identification.

INTERVIEW SKILLS

Getting familiar with one's CV – Presentation and performance - Giving and receiving feedback, setting expectations and exhibiting professional behavior.

JOB SEARCH

Scope of job opportunities / higher education for the courses undertaken – Knowledge of all prominent companies/ concerns related to the respective fields/departments – Employer's expectations – Practical exposure through industrial visits.

SEMESTER III

CO C	URSE ODE	COURSE TITLE	L	Т	Ρ	Total L+T+P	C	
UPY	(14301	CLASSICAL MECHANICS AND RELATIVITY	4	1	I	5	4	
INSTR	UCTIONA	L OBJECTIVES						
1.	To under	stand the general principles of Classical	Mec	hanio	cs ar	ıd Relativ	ity.	
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 of zero rest mass

TEXT BOOKS

- 1. Rana N. C.and Joag P.S., *Classical Mechanics*, 1st Edition, McGraw Hill, 2011.
- Herbert Goldstein, Charles P. Poole and John L. Safko, *Classical Mechanics*, 3rd Edition, Pearson, 2011.

- 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.
- 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.
- Frank H. Berkshire, T. W. B. Kibble and Tom W. B. Kibble, *Classical Mechanics*, 5th Edition, World Scientific Publishing Company, 2004.

COURSE CODE		COURSE TITLE	L	Т	Ρ	Total L+T+P	C		
UPY	14302	HEAT AND THERMODYNAMICS	4	1	•	5	4		
INSTRL	JCTIONAL	. OBJECTIVES							
1.	To know	the fundamentals of heat.							
2.	To under	stand the concepts involved in transmiss	sion c	of hea	at.				
3.	To understand the basic principle and laws of thermodynamics.								
4.	To under	stand 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 and Statistical Physics*, Revised Edition, S. Chand and Company, 2010.
- 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.

COU	RSE CODE	COURSE TITLE	L	Τ	Р	Total L+T+P	С				
UP	Y14303	PHYSICS PRACTICAL-III	-	-	4	4	2				
INST	INSTRUCTIONAL OBJECTIVES										
1.	To gain k	nowledge in the scientific method	ds ar	nd le	arn t	he process	of				
	measuring	different Physical variables.									
2.	To enable	the student to explore the field of the	erma	l phy	sics.						
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.

- 1. Chattopadhyay, D., Rakshit, P. C. and Saha, B., *An Advanced Course in Practical Physics*, 8th Edition, 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	Т	Ρ	Total L+T+P	C
UCY14361		ALLIED CHEMISTRY- I	4	1	•	5	4
INSTRUCTIONAL OBJECTIVES							
1.	To gair	n knowledge on the importance of basic org	janic	che	emis	try.	
2.	To acq	uire knowledge about hydrocarbons and the	eir re	eacti	ons.		
3.	To und	erstand the importance of silicon and meta	ls.				
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	Т	Ρ	Total L+T+P	C
UCY	′14362	ALLIED CHEMISTRY PRACTICALS-I	1	1	4	4	2
INST	ructio	NAL OBJECTIVES					
1.	To gair	n knowledge on the importance of basic aci	dime	etry.			
2.	To acq	uire knowledge about permanganametry.					
3.	3. To understand the importance of dichrometry.						
4.	To acq	uire knowledge in iodimetry.					

VOLUMETRIC ANALYSIS

Acidimetry and Alkalimetry

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

Permanganametry

- 1) Estimation of FAS using standard oxalic acid
- 2) Estimation of KMnO₄ using standard potassium dichromate

Dichrometry

1) Estimation of FeSO₄ using standard FAS.

Complexometric or EDTA titration

1) Estimation of Zn/Mg

lodimetry

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

TEXT BOOK

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

REFERENCE

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

COURSE		COURSE TITLE	L	Τ	Ρ	Total	С
	14204		0		0		
UPT	14304	UNIX AND C PROGRAMIMING	3	-	2	5	4
INSTRU	ICTIONAL	OBJECTIVES					
1.	To under	stand the command in Unix operating S	ysten	n.			
2.	To under	stand the basics of Programming conce	ept.				
3.	To understand the different statements in C.						
4.	To emphasize the significance of programming.						

UNIT I - UNIX

Introduction - History - Basic Commands - Working with Files - Working with Directories - Filename Substitution - Standard Input / Output and I/O Redirection - Pipes - Standard Error - More on Commands.

UNIT II - C LANGUAGE - INTRODUCTION

Introduction- Identifiers and keywords, Constants and variables, Declarations – Expressions and statements, Types of operators - Library functions Input statements - Output statements.

UNIT III - CONDITIONAL STATEMENTS

Conditional statements-If ...else - Switch. Case - Looping - While, Do while - Break and continue, Comma operator, go to statement.

UNIT IV - FUNCTIONS

Functions-Definitions and prototypes - Passing arguments to a function - Storage class variables,

UNIT V - ARRAYS

Arrays –single dimension- Arrays with two dimensions- Matrix manipulations - String operations.

LIST OF EXPERIMENTS

- 1. Working with Unix Simple Commands.
- 2. Working with Unix File -Directory Commands.
- 3. A Simple C program.
- 4. Program using if else statement.
- 5. Program using switch-case statement.
- 6. Program using looping statement.

- 7. Program using Functions with parameters.
- 8. Program using Recursive function.
- 9. Program using One dimensional array.
- 10. Program to implement Matrix operations.

TEXT BOOKS

- 1. Stephen G. Kochan and Patrick Wood, *Unix Shell Programming*, Sams Publishing, 2003.
- 2. Balagurusamy E., *Programming in ANSI C*, Tata McGraw Hill, 2008.

REFERENCES

- 1. Arnold Robbins, Unix in a Nutshell, O'Reilly, 2005.
- 2. Kanetkar Y, *Let us C*, BPB Publications, 1995.
- 3. Deitel H.M. and Deitel .P.J, *How to Program C*, Prentice Hall India, 2001.
- 4. Kamthane, Ashok N, *Programming in C*, Pearson Education, 2013.
- 5. Yashavant Kanetkar, *Exploring C*, BPB Publications, 2003.

CO	URSE	COURSE TITLE	L	Τ	Ρ	Total	С	
CODE						L+T+P		
CDC	14301	VERBAL APTITUDE	1	-	-	1	1	
INSTRL	JCTIONAL	OBJECTIVES						
1.	Proposed	d with an integral focus on Campus Pl	acem	ient,	this	course v	vould	
train the students on a variety of question types used by the companies a								
improve their language skill.								

Synonyms, Antonyms, Idioms and phrases, Sentence completion, Spotting errors, Error correction, Sentence correction, Reading comprehension, Writing Curriculum Vitae, Group discussion / Case studies (Topics: Current affairs across all related fields and other such topics of the general criteria)

COL	URSE	COURSE TITLE	L	Τ	Ρ	Total	С
CODE						L+T+P	
UVE	14301	VALUE EDUCATION	1	-	•	1	1
INSTRU	ICTIONAL	OBJECTIVES					
1.	Proposed	I with an integral focus on Campus PI	acen	nent,	this	course v	vould
	train the	students on a variety of question types	used	l by i	the c	ompanie	s and
	improve	their language skill.					

UNIT I - ETHICS (AXIOLOGY)

- 1. To familiarize the students with the concepts of "right" and "good" in individual and social context.
- 2. Help him/her determine what action or life is best to do or live.
- 3. Right conduct and good life.
- Explications for how a highly, or at least relatively highly, valuable action may be regarded as ethically "good", and an action of low, or at least relatively low,value may be regarded as "bad".
- 5. Value systems- Positive and negative value.

UNIT II - BEHAVIOURAL PSYCHOLOGY

- 1. Perceptual, Cognitive and Emotional Development (friendships, peers, moral development).
- 2. Emotions revealed and Emotions assessed.
- 3. EQ Tests.

UNIT III - HUMANISM

- 1. Cross Cultural Learning.
- 2. Inclusive humanism.
- 3. The inclusive sensibility of all species, planet and lives.
- 4. Animalism- theory of evolution.
- 5. Religious Values (Reference to World Religion).

UNIT IV - ETHNICAL AND SOCIAL ISSUES

- 1. Perspective Discussions.
- 2. Movies related to ethnical and social issues will be aired.
- 3. Videos related to value inculcation will be aired.

TEXT BOOK

1. Shanthichitra, *Moral Element*, Department of English, FSH, SRM University, 2014.

REFERENCES

- 1. Valerie A.Brown and Judith A.Lambert, *Collective Learning for Transformational Change*.
- 2. Robert Proctor, *Defining the Humanities*.
- 3. Robert Wright, *The Moral Animal*.

COURSE CODE	COURSE TITLE	L	T	Ρ	Total of LTP	C		
UYG14301	YOGA FOR HUMAN EXCELLENCE	1	-	I	1	1		
INSTRUCTIONAL OBJECTIVES								
1	1 To gain knowledge about the physical health, life force and mental health.							
2	To have clear understanding about the nature.							

UNIT I - SIMPLIFIED PHYSICAL EXERCISES

Physical exercises – Hand exercises – Leg exercises – Breathing exercises – Eye exercises – Kapalabathi – Makarasana 1 – Makarasana 2 - Body massage – Acupressure – Relaxation

UNIT II - KAYA KALPA

Maintaining the youthfulness - Postponing the ageing process - Sex and Spirituality - Significance of sexual vital fluid - Methods for concentration - Kaya Kalpa Exercise – Aswini Mudhra – Moola Bandha – Ojas Breath

UNIT III - MEDITATION

Aagenai - Shanthi – Clearness – Thuriyam – Thuriyatheetham Purpose and philosophy of life - Analysis of thought – Mindand thought- Greatness of the thought force - Practice for analysis of thoughts with tabulation.

UNIT IV - SUBLIMATION

Moralization of desire - Root causes for desire-three kinds of desires - Attachment anddetachment- valuable desire- Practice for moralization of desires with the tabulation – Neutralization of anger – Root causes of anger- chain reaction-evil affects of anger in the body, mind, inter relationship, society - Neutralization of anger with the tabulation - Eradication of worries – Root causes of worries – Worry and wisdom – evil effect – Four types of worries - Practices for eradication of worries with tabulation.

UNIT V - HUMAN RESOURCE DEVELOPMENT

Benefits of Blessings - Greatness of Friendship - Individual Peace and World Peace - Law of Nature Unified force - Cause and Effect system - Purity of Thought and Deed and Genetic centre

TEXT BOOKS

- 1. Thathuvagnani Vethathiri Maharishi, *Simplified Physical Exercises*, (UNIT I, II)
- 2. Thathuvagnani Vethathiri Maharishi, *Bio Magnetism,* (UNIT III,IV,V)

REFERENCE

1. Chandrasekaran K, *Sound health through yoga*

SEMESTER IV

C	OURSE CODE	COURSE TITLE	L	T	Ρ	Total L+T+P	C		
UP	Y14401	LASER PHYSICS AND SPECTROSCOPY	4	1	I	5	4		
INST	RUCTIONAL	. OBJECTIVES							
1.	To enable t	he students to understand the basic cor	icept	s of l	ase	rs.			
2.	To emphas	ize the principles involved in various spe	ectro	scop	ies.				
3.	To comprehend the instrumentation and working of different Laser systems.								
4.	To develop expertise in applying the spectroscopic techniques in appropri								
	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-CO₂ 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 Vibrational

Frequencies- 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.
- Sune Svanbag, Atomic and Molecular Spectroscopy: Basic Aspects and Practical Applications, Springer, 3rd Edition, 2001.

- 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.
- 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			(Course ti	TLE		L	Τ	Ρ	Total	С
CODE										L+T+P	
UF	Y14402		SOL	D STATE P	HYS	ICS	4	1	-	5	4
INSTRUCTIONAL OBJECTIVES											
1.	1. The course is to understand the basic knowledge on crystal structures							s and			
	crystal syst	tems.									
2.	To understa	and the	vario	us techniqu	les a	available in	X-Ra	y Cry	/stall	ography.	
3.	3. To acquire the knowledge of bonding in solids and Lattice waves.										
4.	To comprehend the concepts of dielectri						prop	pertie	S 0	f solids	and
	supercondu	uctivity.									

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.an*d 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.

C	OURSE CODE	COURSE TITLE			L	Τ	Ρ	Total L+T+P	C		
UP	Y14403		PHYSICS	PRACTICA	ls - I	V	-	-	4	4	2
INST	RUCTIONAL OBJECTIVES										
1.	To make the student familiarize with the basics of materials science								nce		
	experimen	IS.									
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	e the	e student	s understan	d the	conc	epts	n cry	'stal p	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 Matter Physics*. Vol. 1. Cambridge University Press, 2000.
- 5. Shackelford, James F., and William Alexander, *CRC Materials Science and Engineering Handbook*, CRC Press, 2010.

COURSE CODE		COURSE TITLE	L	Т	Ρ	Total L+T+P	C
UCY	′14461	ALLIED CHEMISTRY - II	4	-	-	4	4
INSTRUCTIONAL OBJECTIVES							
1.	1. To gain knowledge on the importance of carbohydrates and heterocycl						
2.	To acq	uire knowledge about coordination compou	nds				
3.	. To promote the importance of industrial chemistry.						
4.	4. To acquire knowledge in phase rule and adsorption.						
5.	5. To gain knowledge in fundamentals in electrochemistry.						

UNIT I - CARBOHYDRATES, BENZENE AND HETEROCYCLIC COMPOUNDS

Classification of carbohydrates–Properties and uses of glucose and fructosemutarotation - 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	Т	Ρ	Total L+T+P	C	
UCY	14462	ALLIED CHEMISTRY PRACTICALS-II	-	•	4	4	2	
INST	ructio	NAL OBJECTIVES						
1.	To gair	h knowledge on the importance of analysis	of oi	rgan	ic co	mpounds.		
2.	To acq	uire knowledge about detection of elements	S.					
3.	To understand the importance of identification of functional groups.							
4.	. To acquire knowledge in analytical tests.							

LIST OF EXPERIMENTS

Systematic analysis of organic compounds containing one functional group and characterization by confirmatory tests.

- a) Test for aliphatic and aromatic nature.
- b) Test for saturation and unsaturation.
- c) Detection of elements (N, S, Halogens).
- d) Identification of functional group.
 - Phenols
 - Carboxylic acid (mono, di)
 - Aldehydes
 - Ketones
 - Carbohydrates
 - Primary amines
 - Amides

TEXT BOOK

 Venkateswaran V., Veeraswamy R., Kulandaivelu A.R., Basic Principles of Practical Chemistry, 2nd Edition, Sultan Chand and Sons, 1997.

REFERENCE

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

COL CC	JRSE)De		C	OURS	E TII	ſLE		L	Т	Ρ	Total L+T+P	C
CDC14401 QUANTITATIVE APTITUDE AND LOGICAL REASONING - I						2	I	-	2	2		
INST	RUCTIO	NAL OB	JECTIV	ES								
1.	This	module	would	train	the	studen	its on t	he (quic	k w	ays to so	lve
	quantitative aptitude problems and questions					estions a	pply	ing	logi	cal reasonii	ng,	
	within a short time span given during the placement drives.											

QUANTITATIVE APTITUDE

Partnership, Simple Interest, Compound Interest, Profit and Loss, Problems on Clock, Calendar and Cubes, Permutation and Combination, Allegation and mixtures

LOGICAL REASONING

Letter and Symbol series, Number series, analyzing arguments, making judgments

SEMESTER V

00 0	DURSE CODE	COURSE TITLE	L	Т	Ρ	Total L+T+P	C
UP	Y14501	QUANTUM MECHANICS	4	1	-	5	4
INSTR	NSTRUCTIONAL OBJECTIVES						
1.	To understand the dual nature of matter wave.						
2.	To apply t	he Schrodinger equation to different po	otentia	l.			
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 equation and 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.
- Satya Prakash, *Advanced Quantum Mechanics*, 5th Edition, Kedar Nath Ram Nath Publishing Ltd, 2013.

- 1. Merzbacher E., *Quantum Mechanics*, 3rd edition, Wiley Publishing, 1998.
- 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.
- 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		COL	JRSE TITL	E		L	Т	Ρ	Total L+T+P	C
UP	Y14502	ATOMIC AND	NUCLEA	r ph	YSICS	4	1	-	5	4
INSTR	NSTRUCTIONAL OBJECTIVES									
1.	To make t	he student unde	rstand the	e prino	ciples of	atom	nic ar	nd nu	iclear phy	/sics.
2.	To enable	the student to e	xplore the	e field	of atom	ic and	d nuc	lear	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 fundame					ndamenta	uls 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 - Nuclear reaction 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

- 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 TITI	.E	L	Т	Ρ	Total L+T+P	C
UPY	14503	ANALOG ELECTR	ONICS	4	1	•	5	4
INSTRU	ISTRUCTIONAL OOBJECTIVES							
1.	To understand the concept of networks and semiconductors.							
2.	To under	stand the working princip	les of a transis	stors.				
3.	To famili	rize the operation of amp	lifiers and to s	study	the v	work	ing 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 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 and Synthesis*, 4th Edition, 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 and Circuits*, Tata McGraw Hill, 2010.
- 2. Millman and Halkias , *Electronics Devices and Circuits*, Tata Mc Graw Hill, 2008.
- William H.Hyte, Jr, J.E.Kemmerly and Steven M.Durban, *Engineering Circuit* Analysis, 7th Edition, McGraw Hill, 2010.
- 4. Robert L. Boylestad and Louis Nashelsky, *Electronic Devices and Circuit Theory*, Pearson Education, 9th Edition, 2009.
- 5. Deshpande N.P., *Electronic Devices and Circuits Principles and Applications*, Tata McGraw Hill, 2012.

CC	DURSE	COURSE TITLE	L	Τ	Ρ	Total	С		
C	CODE					L+T+P			
UPY14504 PROGRAMMING USING MATLAB 1 - 2							2		
INSTR	NSTRUCTIONAL OBJECTIVES								
1.	To learn the MATLAB environment and its programming fundamentals.								
2.	Ability to write Programs using commands and functions.								
3.	Able to ha	ndle polynomials, and use 2D Graphic c	comn	nand	s.				

LIST OF EXPERIMENTS

- 1. Practicing MATLAB environment with simple exercises to familiarize Command Window, History, Workspace, Current Directory, Figure window, Edit window, Shortcuts, Help files.
- 2. Data types, Constants and Variables, Character constants, operators, Assignment statements.
- 3. Control Structures: For loops, While, If control structures, Switch, Break,Continue statements.
- 4. Input-Output functions, Reading and Storing Data.
- 5. Vectors and Matrices, commands to operate on vectors and matrices, matrix Manipulations.
- 6. Arithmetic operations on Matrices, Relational operations on Matrices, Logical operations on Matrices.
- 7. Polynomial Evaluation, Roots of Polynomial, Arithmetic operations on Polynomials.
- 8. Graphics: 2D plots, Printing labels, Grid and Axes box, Text in plot, Bar and Piechart.

TEXT BOOK

1. Stephen.J.Chapman, *Programming in MATLAB for Engineers*, Cengage Learning, 2011.

REFERENCES

- 1. Amos Gilat, *MATLAB-An Introduction with Applications*, Wiley India, 2009.
- 2. Stephen.J.Chapman, *Programming in MATLAB for Engineers*, Cengage Learning, 2011.

COURSE CODE		COURSE TITLE	L	Τ	Ρ	Total L+T+P	C
UPY	14505	ELECTRONICS LABORATORY - I	-	-	4	4	2
INSTRU	ICTIONAL						
1.	To familia	arize the electronic components and bas	sic el	ectro	nic i	nstrumen	its.
2.	To impar	t hands on experience in verification of	circu	it law	's an	d theorer	ns.
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 Introductory Electronic Experiments*, New Age, 2010.

REFERENCES

- 1. Gaykwad A., *Operational Amplifier and Linear Integrated Circuits,* Prentice Hall, 2006.
- 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 Practical Physics*, 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.

LOGICAL REASONING – II	2	I	I	2	2			
IONAL OBJECTIVES								
 This module is designed to suit the need of the outgoing students and t acquaint them with frequently asked patterns in quantitative aptitude an logical reasoning. 								
1 S IL	Image: Constraint of the	1 LOGICAL REASONING – II 2 TIONAL OBJECTIVES s module is designed to suit the need of the out juaint them with frequently asked patterns in quical reasoning.	1 LOGICAL REASONING – II 2 - TIONAL OBJECTIVES s module is designed to suit the need of the outgoin juaint them with frequently asked patterns in quantitical reasoning. a construction	1 LOGICAL REASONING – II 2 - TIONAL OBJECTIVES s module is designed to suit the need of the outgoing st juaint them with frequently asked patterns in quantitative ical reasoning.	1 LOGICAL REASONING – II 2 - - 2 TIONAL OBJECTIVES s module is designed to suit the need of the outgoing students and juaint them with frequently asked patterns in quantitative aptitude a ical reasoning.			

QUANTITATIVE APTITUDE

Time and Distance, Height and Distance, Problems on Ages, Trains, Pipes and Cistern Boats and Streams, Probability.

LOGICAL REASONING

Direction Sense test, Venn diagrams, Seating arrangements, Cause and effect Blood relation test, Dice, Logical verbal puzzles.

SEMESTER VI

COUR COD	ISE DE	COURSE TITLE	L	Т	Ρ	Total L+T+P	C		
UPY14	601	ELEMENTS OF NANOSCIENCE AND NANOTECHNOLOGY	4	1	-	5	4		
INSTRUCTIONAL OBJECTIVES									
1.	To mak	e the student understand the basic con	cepts	s in r	nanos	science.			
2.	To enab	To enable the student to explore the field of nanomaterials.							
3.	3. To make the student understand the principles of nanotechnology.								
4.	To acqu	o 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.
- 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, *Introduction to 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, *Nanoscale Science and Technology*, John Wiley and Sons, Ltd., 2005.
- 4. Charles P. Poole Jr and Frank J. Owens, *Introduction to Nanotechnology*, Wiley Interscience, 2007.

COL	JRSE	COURSE TITLE	L	Т	Ρ	Total	С
CC	DDE					L+T+P	
UPY1	14602	DIGITAL ELECTRONICS AND MICROPROCESSORS	4	1	-	5	4
INSTRU	NSTRUCTIONAL OBJECTIVES						
1.	To unde	rstand the basic concepts of number sys	tems				
2.	To devel	op 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 ab						
	the instr	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 and Applications – 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 and Microprocessors*, 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	•	Т	Ρ	Total L+T+P	C				
UPY	14603	PH	ysics o	f Bio	LOGI	CA	L SYS	STE	EM	S	4		1	-	5	4
INSTRUCTIONAL OBJECTIVES																
1.	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 allov	v the	studen	t to	have	а	deep	kı	nov	vled	ge	of	the	: fur	ndamenta	als of
	biophys	ics.														

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.

- 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	Т	Ρ	Total L+T+P	C	
UPY1	4604	ELECTRONICS LABORATORY - II	-	-	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) μ P 8085.

TEXT BOOKS

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

- 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		COURSE TITLE	L	Т	Ρ	Total	С		
CODE						L+1+P			
UHR1	4601	HUMAN RIGHTS AND	2	-	-	2	2		
		PROFESSIONAL ETHICS							
INSTF	INSTRUCTIONAL OBJECTIVE								
1.	This course on professional ethics introduces the students to ethical								
	practices around the world. It will help the students to understand and								
	imbibe within them ethical values which are important in furthering one's								
	professional life in their workplaces.								

UNIT I

Human values – Types - Morals – Ethics – Integrity – Work ethics – Service learning –Virtues – Respect for others – Honesty – Courage - Commitment – Empathy – Challenges in the workplace – Character – Spirituality – Corporate excellence.

UNIT II

Variety of moral issues – Types of inquiry – Moral dilemmas – Moral autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles – Theories about right action.

UNIT III

Self interest – Customs and religion – Use of ethical theories – Valuing time – Cooperation Codes of ethics – Outlook on law – The challenger case study.

UNIT IV

Safety and risk – Assessment – Responsibility and rights - Risk benefit analysis – reducing risk – The three mile island and Chernobyl case studies.

UNIT V

Global issues – Multinational corporations – Environmental ethics – Computer ethics – Weapons development and ethics – Moral leadership.

- 1. Naagarazan. R.S., *A Textbook on Professional Ethics and Human values*, New Age International, 2006.
- 2. Mike Martin, *Ethics in Engineering*, McGraw Hill, 1996.

CORE BASED ELECTIVES
COURSE CODE		COURSE TITLE		Т	Ρ	Total L+T+P	C	
UPY1	4E01	ELEMENTS OF EARTH'S ATMOSPHERE	3	-	-	3	3	
INSTRUC	TIONAL	OBJECTIVES						
1.	To unde	rstand the basic laws governing the ear	th's (enerç	ју.			
2.	To unde	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 cloudsaltocumulus- 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, Climate and Water,* Wiley Interscience, 2003.

CO C(URSE Ode	CC	URSE TITLE		L	Τ	Ρ	Total L+T+P	С
UPY14E02		ENE	RGY PHYSIC	CS	3	-	-	3	3
INSTRU	NSTRUCTIONAL OBJECTIVES								
1.	To learn the fundamentals of energy sources and applications.								
2.	To learn F	Photothermal b	ased energy	/ systems ar	nd ap	plicat	tions		
3.	To learn basic principles and applications of Photovoltaic systems.								
4.	To learn the principles of energy from biom				ass,	wind	ene	rgy and	other
	sources.	sources.							

UNIT I - INTRODUCTION TO ENERGY SOURCES

World's reserve - Commercial energy sources and their availability-Conventional and non-conventional sources of energy, comparison – Coal- Oil and natural gas - applications - Merits and Demerits-Structure and characteristics of sun-Solar

constant -Solar spectrum-Solar radiations outside earth atmosphere - Solar radiation at the earth surface-Solar Radiation geometry-Solar radiation on tilted surfaces.

UNIT II - PHOTOTHERMAL APPLICATIONS

Basic Principles of Liquid flat plate collector –Materials for flat plate collector -Construction and working-Energy balance equation (without thermal analysis)-Concentrating collectors- Parameters and efficiency of solar concentrators -Advantage and disadvantage-Solar distillation–Solar disinfection - Solar drying-Solar cooker(box type)-Solar water heating systems – Swimming pool heating.

UNIT III - PHOTOVOLTAIC SYSTEMS

Introduction-Photovoltaic principle-Basic Silicon Solar cell- Power output and conversion efficiency-Limitation to photovoltaic efficiency-Basic photovoltaic system for power generation-Advantages and disadvantages-Types of solar cells-Application of solar photovoltaic systems - PV Powered fan – PV powered area lighting system – A Hybrid System.

UNIT IV - ENERGY FROM BIOMASS

Introduction-Biomass conversion technologies-Bio-gas generation-Factors affecting bio-digestion -Working of biogas plant-Advantages and disadvantage of floating and fixed dome type plant-Bio-gas from plant wastes-Methods for obtaining energy from biomass- Thermal gasification of biomass-Working of downdraft gasifier- Advantages and disadvantages of biological conversion of solar energy.

UNIT V - WIND ENERGY AND OTHER ENERGY SOURCES

Wind Energy Conversion-Classification and description of wind machines, wind energy collectors-Energy storage-Wind data-energy audit- Energy from Oceans and Chemical energy resources-Ocean thermal electric conversion-Basic principle tidal power, advantages and limitation of tidal power generation-Energy and power from waves- wave energy conversion devices- Fuel cells- and application of fuel cells- batteries- advantages of battery for bulk energy storage- Hydrogen as alternative fuel for motor vehicles.

TEXT BOOKS

1. Kothari D.P., K.C. Singal and Rakesh Ranjan, *Renewable energy sources and emerging Technologies*, Prentice Hall of India, 2008.

2. Garg H.P.and Prakash J., *Solar Energy Fundamentals and Application,* TataMcGraw - Hill Publishing, 7th *Reprint 2006.*

REFERENCES

- 1. Chetan Singh Solanki, *Solar Photvoltaics Fundamentals, Technologies and Applications*, 2ndEdition, PHI Learning Private Limited, 2011.
- 2. Rai G. D, *Non conventional Energy sources*, 4th Edition, Khanna Publishers, 2010.
- 3. Jeffrey M. Gordon, *Solar Energy: The State of the Art*, Earthscan, 2013.
- 4. Kalogirou S.A., *Solar Energy Engineering: Processes and Systems*, 2nd Edition, Academic Press, 2013.
- 5. Zobaa A.F.and Ramesh Bansal, *Handbook of Renewable Energy Technology*, World Scientific, 2011.

COURSE CODE		(OURSE TITL	.E	L	T	Р	Total L+T+P	C
UPY	14E03	LOW TEN	IPERATURE	PHYSICS	3	-	-	3	3
INSTRU	JCTIONAL OBJECTIVES								
1.	To understand the general scientific concepts of low temperature physics.								
2.	To under	stand the pro	perties of ma	aterials at low	temp	oerat	ure.		
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.

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

C	OURSE	COURSE TITLE	L	Т	Ρ	Total	С	
CODE						L+T+P		
UF	PY14E04	RADIATION PHYSICS	3	•	•	3	3	
INSTR	RUCTIONAL	OBJECTIVES						
1.	To make the student understand the principles of atomic and nuclear physics.							
2.	To enable t	he student to explore the field of atomic	and	nucl	ear s	tructure.		
3.	To make t	he student understand the basic con	cepts	s in	aton	n models	and	
	radioactive	decay.						
4.	To allow t	he student to have a deep knowled	ge o	f the	; fur	ndamenta	ls 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

lonizing 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 calculation parameters- 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 Beam Therapy. Dosimetry-Dosimeter - Film badge dosimeter - Pocket dosimeter. Radiation Protection-Radiation Protection - Dose Equivalent - Effective Dose Equivalent - 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.
- Meredith W.J. and J.B. Massey, *Fundamental Physics of Radiology*, A. John Wright and Sons Ltd.,3rd Edition, 1983.

- 1. William.R.Hendee, Geoffery.S.Ibbott and Eric.G.Hendee, *Radiation Therapy Physics*, A.John Wiley and Sons.,Inc, 3rd Edition, 2005.
- 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 Nucleus*, Textbook Publications, 2003.
- 5. Lappp R. E., *Nuclear Radiation Physics* Prentice-Hall Inc, 1948.

COURSE		COURSE TITLE	L	Τ	Ρ	Total	С		
CODE						L+T+P			
UPY14E05		PLASMA PHYSICS	3	-	-	3	3		
INSTRU	CTIONAL	OBJECTIVES							
1.	To unders	tand the Basic concepts of Plasma and its relevant topics.							
2.	To unders	stand the basic mechanism of single particle motion and its kinetic							
	theory.								
3.	To educate scientifically the new development			ginee	ering	and			
technolo		JY.							
4.	To unders	stand the various methods of Plasma	diagn	ostic	s.				

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.

- 1. Bittencourt J. A, *Fundamentals of Plasma Physics*, Springer, 2004.
- 2. Marcel Goossens, *An Introduction to Plasma Astrophysics and Magnetohydrodynamics*, 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 of Plasma Physics*, Westview, 2004.
- 6. George Parks, *Physics of Space Plasmas: An Introduction, Westview Press*, 2003.

C	OURSE		COURS	e title		L	Т	Ρ	Total	С
	CODE								L+T+P	
UP	Y14E06		ASTROP	HYSICS		3	-	-	3	3
INSTF	RUCTIONAL	OBJECTI	/ES							
1.	Describe t	he nature,	structure	e, distribution,	and	for	natio	on of	f astrono	mical
	objects, inc	cluding pla	nets, stars	s, and galaxies,	, and	the I	nisto	ry of	the unive	rse.
2.	Demonstra	te an appi	reciation	of the universa	ality	of p	hysic	al la	ws and	apply
	these laws	to explain	phenome	na in astronom	ical s	syste	ms a	and tl	he univers	se.
3.	Define and	interpret th	ne observa	ational propertie	es of	astr	onon	nical	objects.	
4.	Propose, p	olan, and	conduct	astronomical	obs	ervat	ions	with	h profess	sional
	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, 3^d Edition,* John Wiley and Sons Ltd, 2003.
- 2. Bradley W. Carroll, Dale A. Ostlie, *An Introduction to Modern Astrophysics*, 2nd Edition, Pearson, 2013.

- 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*, 2nd Series, 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			CC)URSE ⁻	TITLE			L	Т	Ρ	Total	С
CODE											L+T+P	
UP	Y14E07		COMPUT	ATION	AL PHYS	ICS		3	-	-	3	3
INSTR	UCTIONAL	OBJE	CTIVES									
1.	1. To understand the basic programming technic				que	es in M	ATL	AB.				
2.	To addres	s ana	lytically i	ntractal	ole prob	ems	in	physic	cs us	sing	computa	tional
	tools.											
3.	3. To understand various numerical techniques.											
4.	To show how physics can be applied in a			much	bro	ader	context	than				
	discussed	l in tra	ditional c	urriculu	m.							

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-zerosones- 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- Sampled Data-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.

- 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.

C	OURSE	COURSE TITLE	L	Τ	Ρ	Total	С
CODE						L+T+P	
UPY14E08		NONLINEAR OPTICS	3	-	-	3	3
INSTR	RUCTIONAL	OBJECTIVES					
1.	The prime of	bjective is to provide the learners with	ı a fu	ll-fle	dged	understa	nding
	of integrate	d optics so that they may be able to a	develo	op th	e so	und theor	etical
	and experir	nental tools to study and control the	linea	r and	d noi	n-linear o	ptical
	properties of	of various optical components.					
2.	The studen	ts will be able to discuss derive the r	10n-li	near	equ	ations rec	quired
	for the sim	ple and complexed situations and	orese	nt a	lect	ure on a	topic
	within: non	inear 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 6400 Lecture Notes*, Dalhousie University, 2012.
- 2. Goure P and Verrier I, *Optical Fibre Devices Series in Optics and Optoelectronics,* Institute of Physics Publishing Ltd, 2002.

- 1. Justin Peatross and Michael Ware, *Physics of Light and Optics*, 2013.
- 2. David A. Boas, Constantinos Pitris and Nimmi Ramanujam, *Handbook of Biomedical 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 (Revised and Expanded),* Marcel Dekker, Inc, 2003.
- 5. Newell, Alan C., and Jerome V. Moloney, *Nonlinear optics,* Addison-Wesley, 1992.

C	CODE	COURSE TITLE	L	Т	Ρ	Total	С
U	PY14E09	INTRODUCTION TO FORENSIC SCIENCES	3	-	-	3	3
INST	RUCTIONAL	OBJECTIVES					
1.	Graduates	will be able to define forensic science	e or	crim	inali	stics and	state
	human righ	ts.					
2.	Graduates	will be knowledgeable of professional	code	es of	eth	ics outlin	ed by
	various pro	fessional forensic science organizations	3.				
3.	To equip al	I the students-continually emphasize t	he fo	ounda	ation	al princip	les of
	this interdis	sciplinary course in all value-added as	spect	s an	d co	ould be a	ble to
	produce a	future generation of core compete	nt-cr	edibl	e-pr	ofessiona	l and
	ethical fore	nsic scientists.					
4.	Have the ne	ecessary theoretical and practical back	grour	nd in	all tl	ne sound	areas
	of topics v	hich includes the crime law-causatio	n of	crin	ne s	cenes-typ	es of
crime-processing of crime scene-protection and record				ordin	g of	crime s	cene-
	search of	physical clues-preservation-packing a	and	forw	ardir	ng of ph	ysical
clues-crime scene reconstruction-pattern an				sis-n	nicro	scopy-fo	rensic
molecular biology-Forensic Statistics-and forensic chemi							

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

- 1. Robert Milne, *Forensic Intelligence,* Taylor and Francis Group, 2013.
- 2. Robert Bruce Thompson and Barbara Fritchman Thompson, *An Illustrated Guide to Home Forensic Science Experiments*-DIY Science-O'Reilly Media-Inc., 2012.
- 3. *Forensic Sciences: A Crime Scene Investigation Unit* Current Topics Science Manitoba 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.

SKILL BASED ELECTIVES

COURSE CODE		COURSE TITLE		T	Р	Total L+T+P	C	
UPY14	4E51	ELECTRICAL APPLIANCES	3	1	1	3	3	
INSTRUCTIONAL OBJECTIVES								
1.	To unde	To understand the fundamentals of electrical connections.						
2.	To make	e the learner familiarize with working of	Gen	erato	rs ar	nd Motors		
3.	To acquire knowledge on principles of transformer.							
4.	To unde	o understand the working principle of electrical appliances.						

UNIT I - ELECTRICAL CONNECTIONS

Resistance - Capacitance - Inductance - Electrical charge - Current - Potential and measuring meters –Galvanometer- Ammeter- Voltmeter and multimeter - Electrical energy - Power - Watt - kWh - Consumption of electrical power - AC and Dc - Single phase and three phase connections - RMS and peak values - House wiring - overloading - Earthing - Short circuiting - Fuses - Colour code for insulation wires - Inverter - UPS - Generator - Motor - Circuit breaker - Electrical switches.

UNIT II - HEATING and WELDING

Electric heating - Modes of transfer of heat - Methods of electric heating -Resistance heating - Induction heating - High frequency eddy current heating -Dielectric heating - Resistance - Welding - Electric arc welding - DC and AC -Welding Equipment - Energy storage welding occupational hazards due to chemical reactions - Industrial heating and welding.

UNIT III - DC GENERATORS and MOTORS

Electro-mechanical energy conversion principle and EMF - Electrical machines - DC Generators - Construction and materials used for various parts of DC generator - Functions of various parts of DC Generator - Working Principle of DC motor - back emf - Torque equation for DC motor - DC motor starters - Construction and working of DC motor starters.

UNIT IV - PRINCIPLES AND APPLICATIONS OF TRANSFORMERS

Principle of operation - Constructional details - Core type- Shell type - Classification of transformers - EMF equation - Voltage Ratio - Current ratio - Transformer on no-load - Auto transformer - Principle - Applications. Three phase Transformer - Connections - Star - Star - delta- Delta-star - Parallel

operation of transformers - Load sharing - Cooling of transformers - Protective devices and accessories - Losses in transformer.

UNIT V - DOMESTIC ELECTRIC APPLIANCES

Electrical bulbs - Fluorescent lamps - Street lighting - Flood lighting - Electrical fans - wet grinder - Mixer - Water heater - Storage and instant types - Electric iron box - induction heater- Stabilizer - Refrigerator - Microwave oven - Washing Machine - Air Conditioner.

TEXT BOOKS

- 1. Teraja B.L., *A Text book in Electrical Technology*, S. Chand and Co., 2005.
- 2. Taylor E.O., *Utilisation of Electrical Energy*, Orient Longman Private Ltd., 2006.

- 1. Fitzgerald A. E., David E Higginbothom and Arvin Gabrel, *Basic Electrical Engineering*, Tata McGraw-Hill Education, 2009.
- 2. Roman Malaric, *Instrumentation and Measurement in Electrical Engineerin*g, Brown Walker Press, 2011.
- 3. Clive Maxfield, John Bird, Tim Williams, Walt Kester and Dan Bensky, *Electrical Engineering: Know It All*, Elsevier Inc, 2008.
- 4. Despande, M.V, *Electrical Machines*, PHI Learning, 2011.
- 5. Bhattacharya K, *Electrical Machines,* Tata Mc Graw Hill, 1998.

C	OURSE	COURSE TITLE	L	Т	Ρ	Total	С
	CODE					L+T+P	
UP	Y14E52	ELECTRONIC INSTRUMENTATION	3	•	•	3	3
INSTI	RUCTIONAI	_ OBJECTIVES					
1.	Understan	d and learn the different principles ar	nd in	strur	nent	s adopte	d for
	measurem	ent of current, voltage, power, energy et	C.				
2.	Study diffe	erent methods available for measureme	ent o	f pas	ssive	element	s like
	resistance	, inductance and capacitance.					
3.	Solve prob	lems in the topics mentioned above.					
4.	 Storage of digital signal and analyzers for a 			digita	l sig	inal to pr	ovide
	with mean	ingful 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 operationconstruction- sources of errors and compensations in PMMC- Moving irondynamometer 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 - xy 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 Measurement Techniques*, Dorling Kindersley (India) Pvt Limited, 3rd Edition, 2005.

REFERENCES

- 1. Stout .M. B., *Basic Electrical Measurements*, Prentice Hall of India, 1990.
- 2. Rajendraprasad, *Electrical Measurements and Measuring Instruments,* Khanna Publishers, 1999.
- 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	Т	Ρ	Total L+T+P	C
UPY14E53		MEDICAL PHYSICS	3	-	-	3	3
INSTR	UCTIONAL	OBJECTIVES					
1.	To provide circulation transducer	e an acquaintance of the physiolog and circulation respiration.Biomedi is used.	y of ical	the appli	heai catio	t, lung, ns of dif	blood ferent
2.	I o introduce the student to the various sensing and measurement devi electrical origin and to provide awareness of electrical safety of m equipments.					ety of me	es of edical
3.	. To provide the latest ideas on devices of non-electrical devices.						
4.	To bring out the important and modern meth provide latest knowledge of medical assistance equipments.			ima hniqi	ging Jes a	technique and therap	es. To peutic

UNIT I - PHYSIOLOGY, BIO-POTENTIAL AND TRANSDUCERS

Cell and its structure – Resting and Action Potential – Nervous system- Functional organisation of the nervous system – Structure of nervous system – Neurons - synapse –Transmitters and neural communication – Cardiovascular system – respiratory system – Origin of Biopotential-Electrical activity of cell-Action Potential and its propagation- Basic components of a biomedical system -

Transducers – selection criteria – Piezo electric-Ultrasonic transducers - Temperature measurements - Fibre optic temperature sensors.

UNIT II - ELECTRO – PHYSIOLOGICAL MEASUREMENTS

Bio-potential electrodes- Electrode theory - Electrode - Electrolyte interface – Limb electrodes – Floating electrodes – Pregelled disposable electrodes – Micro-Needle and surface electrodes – Amplifiers- Preamplifiers- Differential amplifiers- Chopper amplifiers – Isolation amplifier. ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms- Electrical safety in medical environment-shock hazards – Leakage current-Instruments for checking safety parameters of biomedical equipments.

UNIT III - CARDIOVASCULAR AND ELECTROCHEMICAL MEASUREMENTS

Measurement of blood pressure – Cardiac output – Heart rate – Heart sound – Pulmonary function measurements – Spirometer – Photo Plethysmography - Body Plethysmography – Blood Gas analysers -pH of blood –Measurement of blood pCO2- pO2- Finger-tip oxymeter – ESR- GSR measurements.

UNIT IV - IMAGING TECHNIQUES

X-Ray Generation and X-ray Machine - Fluoroscopic techniques - Digital X-ray imaging and computed tomography - Image quality - QA of conventional diagnostic X-ray equipment - Magnetic Resonance Imaging - Ultrasonography - Endoscopy - Thermography - Different types of biotelemetry systems and patient monitoring - Introduction to Biometric systems.

UNIT V - THERAPEUTIC AND LIFE SUPPORT SYSTEMS

Pacemakers - Defibrillators - Ventilators - Nerve and muscle stimulators - Diathermy - Heart - Lung machine - Audio meters - Dialysers and Ventilators - Lithotripsy.

TEXT BOOKS

- 1. Khandpur R.S., *Hand Book of Bio-Medical Instrumentation*, Tata McGraw Hill Publishing Co Ltd., 2003.
- 2. Leslie Cromwell, Fred J.Weibell, Erich A.Pfeiffer, *Bio-Medical Instrumentation and Measurements,* 2nd Edition, PHI/Pearson Education, 2010.

REFERENCES

- 1. Joseph J. Carr and John M. Brown, *Introduction to Biomedical Equipment Technology* PHI/Pearson Education, 4th Edition, 2008.
- 2. Laud B.B, *Electromagnetics*. 2nd Edition, New Age International Publication, 2005.
- 3. Mahajan A.S.and Rangwala A.A, *Electricity and Magnetism*, Tata Mc Graw Hill, 1988.
- 4. Kip A.F, *Fundementals of Electricity and Magnetism*, Mc Graw, Hill, International Student Edition, 2008.
- 5. Berkeley, *Physics Course: Electricity and Magnetism*, 2nd Edition, Tata Mc Graw Hill, 2007.

COU	IRSE CODE	COURSE TITLE			L	Т	Ρ	Total L+T+P	C	
U	PY14E54	ELECT	RONIC	COMMUNICA	ATION	3	-	-	3	3
INSTR	INSTRUCTIONAL OBJECTIVES									
1.	To Understa	and the	basic	knowledge	about	am	olitud	e a	nd frequ	iency
	modulation.									
2.	To Impart the knowledge about the transmission lines.									
3.	To Understand the basic idea about the television.									
4.	To develop th	ne knowle	edge in	RADAR and	digital c	omm	unic	ation	systems	

UNIT I - AMPLITUDE AND FREQUENCY MODULATION

Modulation - Definition - Types of modulation AM-FM- PM – Expression for amplitude modulated voltage - Wave form of amplitude modulated wave - Collector modulation circuit - Single side band generation - Balanced modulator - AM transmitter - Block diagram and explanation - Frequency modulation - Expression for frequency modulated voltage - Side bands in FM- AM production by transistor modulator - Comparison of AM-FM- PM.

UNIT II - TRANSMISSION LINES

Demodulation - Definition - Diode detection of AM signals - FM detection - Foster Seely discriminator - Radio receivers - Straight receivers - TRF receivers - Super heterodyne receivers - Block diagram - Explanation of each stage - FM receivers -Block diagram - Single and independent side band receiver- Demodulation of SSB and receiver types - Transmission Lines - Characteristics impedance - Losses in transmission line - Standing waves - Smith chart and its applications.

UNIT III - TELEVISION FUNDAMENTALS

Television systems and standards – Black and white transmission - Black and white reception - Plumbicon - Vidicon - Scanning and interlaced scanning – Block diagram of TV transmitter and receiver - Colour TV - Generation R, G, B signals - Simplified block diagram of colour TV transmitter and receiver – TV transmitting antennas - dipole panel - TV receiving antenna - Yagi antenna - Log antenna - Log periodic antenna.

UNIT IV - RADAR SYSTEMS

RADAR - Principle of radar – Radar performance factors - Radar equation - Radar – Pulsed systems - Basic pulsed radar system - Antennas and scanning -Display methods - Pulsed radar systems - Moving target indication - Radar beacons - Transmitting systems - Radar antennas - Duplexer - Radar receivers uses of radar - Optoelectronic devices - Photoconductive cell - Solar cell -Phototransistor - LED -LCD construction and working and other radar systems.

UNIT V - DIGITAL COMMUNICATIONS

Digital communications - Digital technology - Fundamentals of data communication systems - Binary number system - Digital electronics – Emergence of data communication systems - Characteristics of data transmission circuits – Digital codes - Error detection and correction - Data sets and inter connection - Requirements - Modern classification - Modern interfacing- Network organizations- Switching systems – Network Protocols.

TEXT BOOKS

- 1. Gupta and Kumar, *Hand book of Electronics*, Pragati Prakhasan, 2005.
- 2. Kennedy and Davis, *Electronics Communication Systems*, Kennedy and Davis, TMH, 2009.

- 1. Wayne Tomasi, *Electronic communication systems*, Dorling Kindersely India Pvt Ltd., 2009.
- 2. Roy Blake, Electronic communication system, Delmar/Thomson Learning, 2002.
- 3. Bakshi U.A. and Godse A.P., *Basic Electronics Engineering*, Technical Publication, 2009.
- 4. Godse A.P.and Bakshi U.A., *Basic Electronics* ,Technical Publication,2009.
- 5. Tomasi, Wayne. *Advanced Electronic Communication Systems*. Prentice Hall PTR, 1993.

COURSE		COURSE TITLE	L	Т	Ρ	Total	C
	LODE					L+I+P	
UP	Y14E55	LASER TECHNOLOGY	3	-	-	3	3
INSTR	RUCTIONAL	OBJECTIVES					
1.	. Students will be able to learn about the basic theory of lasers, importan						e of
	optical resonators.						
2.	2. Students will gain knowledge about the lasing actions in different				rent level	laser	
	systems.						
3.	Students will be knowledgeable about the types of lasers.						
4.	Students	will understand the principle involved	in G	as a	ind s	semicond	luctor
	lasers wor	king 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.

- 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			(OURSE TITLE			L	Т	Ρ	Total L+T+	P C
UPY	14E56		COMF	PUTER NETWO)RKS	S	3	-	•	3	3
INSTRU	ICTIONAL	OBJEC	TIVES	6							
1.	To understand the general concepts of data co					lata com	mur	nicati	ons.		
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 netw								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*, 4th Edition , 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		COURSE TITLE	L	Т	Ρ	Total	C
CODE						L+I+P	
UPY14E57		WIRELESS TECHNOLOGY	3	-	-	3	3
INSTR	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	e scientifically the new developments in	ı wire	less	pow	er transfe	r.

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 mechanism - Advantages 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 Network Architectures*, 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 Personal Communications*. Wesley, Addison *LonGman, Incorporated, 1997.*
- 5. Smith Clint, *3G wireless networks. McGr*aw-Hill, Inc., 2006.

COURSE		COURSE TITLE	L	Τ	Ρ	Total	С
			0			L+I+F	0
UPT	14E38	SULAR TECHNOLOGY	3	-	-	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 so	plar 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 design concepts – 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 and Collection*, 3rd Edition, Tata McGraw Hill, 2008.
- 2. *Chetan Singh Solanki, Solar Photovoltatics, Fundamentals, Technologies and Applications*, PHI Learning Private Limited, 2011.

- 1. Peter Würfel, *Physics of Solar Cells: From Basic Principles to Advanced Concepts*, 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.
- Kalogirou S. A., *Solar Energy Engineering: Processes and Systems*, 2nd Edition, Academic Press, 2013.

COURSE		COURSE TITLE	L	Т	Ρ	Total	С		
CODE						L+T+P			
UP	Y14E59	CELL PHONE SERVICING	3	-	-	3	3		
INSTF	NSTRUCTIONAL 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 pra	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, Service Diagrams and Repairing*) BPB Publications, 2010.
- 2. Stetz P. J., *The Cell Phone Handbook*, 2nd Edition, FindTech Ltd, 2006.

- 1. Manahar Lotia, *Modern Mobile Phone Repairing-Computer Software Ke Dware And Service Devices*, BPB Publications, 2010.
- 2. Manahar Lotia, *Modern (GSM) Mobile Phone Practical Troubleshooting and Repairing*, BPB Publications, 2008.