DEPARTMENT OF PHYSICS

RATHINAM COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)

Rathinam Techzone, Pollachi Road, Eachanari, Coimbatore – 641021

Syllabus for

B.Sc. Physics (I & VI Semester)

2017-2018 Batch on-wards

Approved in the BOS meeting held on 11.04.2019

Vision and Mission of the Institution:

VISION
A world renowned INDUSTRY-INTEGRATED INSTITUTION that imparts knowledge, skill, and research culture in young men and women to suit emerging young India.

MISSION
To provide quality education at affordable cost, and to maintain academic and research excellence with a keen focus on INDUSTRY-INTEGRATED RESEARCH AND EDUCATION.

MOTTO
Meaningful INDUSTRY-READY education and research by all means

Vision and Mission of the Department:

VISION The department focus aims build a foundation for excellence in education develops the student community of the Institution as per the need of Industry by igniting and promoting Interest and Passion in the field of Physics through teaching, experimenting and also Research.

MISSION

1. To provide Quality Education and Research by Providing Higher Education in Physics with necessary needs by the industry.
2. The Department strives to provide the most up-to-date and purposeful curriculum and the highest quality laboratory facilities for the education of our students in a "student centric" approach to empower them in finding suitable employment with continuous improvement.

Program Educational Objectives (PEO)

PEO1 : Students will be able to get higher education with foundation level knowledge in the curriculum content by practical approach along with theory as an integrated course.

PEO2 : Students will get hands on training from industry, through Imparting innovative methods of active learning experience as an outset through class room, internship, industry/institutional visit

PEO3 : Students will understand the importance of research culture and self – learning activity through conducting workshops, seminar, conference, symposium and guest lecture for knowledge propagation and subject enlightenment.

PEO4 : Students will have Persistence in Profession in learning throughout life, research and other creative pursuit in their specialized area.

Mapping of Institute Mission to PEO

Institute Mission	**PEO's**
Imparting Knowledge and Skill	PEO1, PEO2
Industry Connectivity	PEO2
Research Culture	PEO3, PEO4

Mapping of Department Mission to PEO

Department Mission	**PEO's**
Imparting Knowledge and Skill	PEO1, PEO3
Experimenting facts with Industry collaboration	PEO2
Research Culture	PEO3, PEO4
Career growth	PEO4

Program Outcomes (PO):

PO1 **:** Ability to identify, formulate and solve the complex problem in the field of theoretical and experimental physics

PO2 **:** Ability to Recognize the need and have an ability to engage in life – long learning and be able to demonstrate knowledge of contemporary issues.

PO3 **:** The program will provide a fundamental knowledge of core of physics supported by interdisplinary course such as mathematics and Physics.

PO4 **:** Able to Develop rudimentary skills and knowledge to handle instrument effective and perform measurements efficiently.

PO5 **:** Ability to Inculcate an innate thrust to pursue for higher education and research.

PO6 **:** Able to Be proficient in arriving at innovative solution to a problem with due considerations to society and environment

Correlation between the POs and the PEOs

Program Outcomes		PEO1	PEO2	PEO3	PEO4
PO1	:	√			
PO2	:	√			
PO3	:	√	√		√
PO4	:	√			
PO5	:	√		√	√
PO6	:	√	√	√	

Components considered for Course Delivery is listed below:

1. Class room Lecture
2. Laboratory class and demo
3. Assignments
4. Mini Project
5. Project
6. Online Course
7. External Participation
8. Seminar
9. Internship

Mapping of POs with Course Delivery:

Program Outcomes	Course Delivery								
	1	2	3	4	5	6	7	8	9
PO1	√	√	√					√	√
PO2		√			√		√		√
PO3	√	√	√			√		√	
PO4	√	√	√	√	√			√	
PO5	√	√		√	√			√	
PO6	√	√			√				

RATHINAM COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)

Scheme of curriculum for B.Sc. Physics
for the students admitted in the Batch during 2017 - 2018 Board of Studies –Physics (UG)

S.No	Sem	Part	Type	Subject	Credit	Hour	Int	Ext	Total
1	1	I	L1	Language – I	3	6	40	60	100
2	1	II	E1	English for Communication	3	6	40	60	100
3	1	III	C1	Core - I : Mechanics, properties of matter and sound	5	6	40	60	100
4	1	III	CP1	Core Practical – I : Major Practical – I	4	3	40	60	100
5	1	III	A1	Allied – I : Mathematics - I	4	7	40	60	100
6	1	IV	AEC1	Ability Enhancement Compulsory Course-I : Environmental Studies @	2	2	50	0	50
7	1	VI	VAC	Value Added Course - I@	2	-	100	-	100
1	2	I	L2	Language – II	3	6	40	60	100
2	2	II	E2	English for Physics	3	6	40	60	100
3	2	III	C2	Core - II : Heat and Thermodynamics	5	6	40	60	100
4	2	III	CP2	Core Practical - II : Major Practical – II	4	3	40	60	100
5	2	III	A2	Allied – II : Mathematics - II	4	7	40	60	100
6	2	IV	AEC2	Ability Enhancement Compulsory Course-II	2	2	50	-	50
7	2	VI	VAC	Value Added Course - II@	2	-	100	-	100
1	3	III	C3	Core III : Optics	5	7	40	60	100
2	3	III	CP3	Core Practical – III : Major Practical – III	4	3	40	60	100
3	3	III	A3	Allied - III: Chemistry – I	4	7	40	60	100
4	3	III	AP1	Allied Practical - I: Allied Chemistry Lab – I	4	3	40	60	100
5	3	IV	S1	Skill Enhancement Courses – I : MS Office & C	4	6	40	60	100
6	3	IV	AEC3	Ability Enhancement Compulsory Course-III – (Tamil / Advanced Tamil (OR) Non- major elective-1 (Yoga for Human Excellence) / Women‘s Rights / Career Enhancement – I) @	2	2	50	-	50
7	3	VI	VAC	Value Added Course - III@	2	-	100	-	100
8	3	VI	IDL	Inter Department Learning – I#	2	2	-	100	100

1	4	III	C4	Core - IV : Electricity and Magnetism	4	6	40	60	100
2	4	III	CP4	Core Practical – IV : Major Practical – IV	4	4	40	60	100
3	4	III	A4	Allied - IV : Chemistry – II	4	6	40	60	100
4	4	IV	AP2	Allied Practical - II: Allied Chemistry Lab – II	4	4	40	60	100
5	4	IV	SP1	Skill Enhancement Courses lab – II : Ms- office and Programming in C	4	6	40	60	100
6	4	IV	AEC4	Ability Enhancement Compulsory Course-IV - (Tamil / Advanced Tamil (OR) Non- major elective-II (General Awareness) / Career Enhancement – II) @	2	2	50	-	50
7	4	VI	VAC	Value Added Course - IV@	2	-	100	-	100
8	4	VI	IDL	Inter Department Learning – II#	2	2	-	100	100
1	5	III	C5	Core - V : Mathematical Physics and Classical mechanics	4	6	40	60	100
2	5	III	C6	Core - VI: Solid state physics	4	5	40	60	100
3	5	III	EL1	Elective - I	4	5	40	60	100
4	5	III	EL2	Elective - II	4	6	40	60	100
5	5	III	CP5	Core Practical – V : Major Practical – V- Electronics	4	3	40	60	100
6	5	III	CP6	Core Practical – VI : Industrial Training Report	2	-	-	50	50
7	5	IV	S3	Skill Enhancement Courses – III :Concepts of Physics	4	5	40	60	100
8	5	VI	VAC	Value Added Course - V@	2	-	100	-	100
1	6	III	C7	Core - VII: Quantum mechanics and relativity	5	6	40	60	100
2	6	III	C8	Core - VIII : Atomic and Nuclear Physics	4	5	40	60	100
3	6	III	EL3	Elective – III	4	5	40	60	100
4	6	III	CP7	Core Practical – VI :Major Practical – VI :Digital electronics and Microprocessor	4	3	40	60	100
5	6	III	CP8	Core Project	4	5	40	60	100
6	6	IV	S4	Skill Enhancement Courses – IV: Internet of Things and Arduino	4	6	40	60	100
7	6	V	EX	Extension Activity	2	-	50	-	50
Overall Total					140 + 14	180	2030	2170	4200

@ - No End Semester Examination, only Internal Exam.

- No Internal Examination, only End Semester Exam.

List of Value added course

Type	Subject code	Subject
VAC - I	17BPH1VA	Ms – office
VAC – II	17BPH2VA	MATlab
VAC – III	17BPH3VA	Biomedical instrumentation
VAC – IV	17BPH4VA	Space Science
VAC – V	17BPH5VA	Basics of Electrical wiring

List of Skill based subject

Type	Subject code	Subject
SBS -I	17BPH3ZA	Skill enhancement courses – I MS office and C
SBS –II	17BPH4ZP	Skill Enhancement courses lab –II : MS office and Programming in C
SBS –III	17BPH5ZC	Skill Enhancement courses lab –III: Concept of Basic Physics
SBS -IV	17BPH6ZD	Skill Enhancement courses lab –IV Internet of Things and Arduino

List of Interdepartmental course

Type	Subject code	Subject
IDC - I	17BPH3LA	Principles of Electronics
	17BPH3LB	Basic Embedded systems and Microcontroller
	17BPH3LC	Digital Electronics
	17BPH3LD	Fibre Optics Communication Systems
IDC - II	17BPH4LA	Applied Electronics
	17BPH4LB	Space Science
	17BPH4LC	Biomedical instrumentation
	17BPH4LD	Agriculture Physics

List of Elective papers

Type	Subject code	Subject
Elective – I	17BPH5EA	Electronics
	17BPH5EB	Fibre optic communication systems
	17BPH5EC	Principles of Communication Systems
Elective – II	17BPH5ED	Nano science
	17BPH5EE	Energy Physics
	17BPH5EF	Characterizations of nano materials and its applications
Elective – III	17BPH6EA	Biophysics
	17BPH6EB	Digital electronics and microprocessor
	17BPH6EC	Geo physics

Mapping of Courses and POs:

S – Strong Correlation **M – Medium Correlation** **B-Blank**

Course code	Course Name	Program Outcomes					
		PO1	PO2	PO3	PO4	PO5	PO6
17BPH13A	Mechanics, Properties of Matter and Sound	S	M	M	S	M	M
17BPH13P	Major Practical - I	S	S	M	S	S	S
17BPH1AA	Allied – I : Mathematics -I	S	S	S	S	M	S
17BPH23A	Heat and Thermodynamics	S	S	S	S	S	M
17BPH23P	Major Practical - II	S	S	S	S	M	S
17BPH2AB	Allied –II: Mathematics - II	S	S	M	S	M	S
17BPH33A	Core III : Optics	S	S	M	S	S	M
17BPH33P	Core Practical – III : Major Practical – III	M	M	M	S	M	M
17BPH3AC	Allied - III: Chemistry – I	S	M	M	S	S	M
17BPH3AP	Allied Practical - I: Allied Chemistry Lab – I	S	M	M	S	S	M
17BPH3ZA	Skill Enhancement Courses – I : MS Office & C	S	M	M	S	S	M
17BPH43A	Core - IV : Electricity and Magnetism	S	M	S	M	S	M
17BPH43P	Core Practical – IV : Major Practical – IV	S	M	S	M	S	M
17BPH4AD	Allied - IV : Chemistry – II	S	M	S	M	S	M
17BPH4AP	Allied Practical - II: Allied Chemistry Lab – II	S	M	S	M	S	M
17BPH4ZP	Skill Enhancement Courses lab – II : Ms- office and Programming in C	S	M	S	M	S	M
17BPH53A	Core - V : Mathematical Physics and Classical mechanics	S	M	S	M	S	M
17BPH53B	Core - VI: Solid state physics	S	M	S	M	S	M
Elec - I	Elective - I	S	M	S	M	S	M
Elec - II	Elective - II	S	M	S	M	S	M
17BPH53P	Core Practical – V Major Practical – V Electronics	S	M	S	S	M	S
17BPH5ZC	Skill Enhancement Courses – III :Concepts of Physics	S	M	S	M	S	S
17BPH63A	Core - VII: Quantum mechanics and relativity	S	M	S	M	S	M
17BPH63B	Core - VIII : Atomic and Nuclear Physics	S	M	S	M	S	M
Elec-III	Elective – III	S	M	S	M	S	M
17BPH63P	Core Practical – VI :Major Practical – VI Digital electronics and Microprocessor	S	M	S	S	M	S
17BPH63V	Core Project	S	M	S	S	S	S
17BPH6ZD	Skill Enhancement Courses – IV: Internet of Things and Arduino	S	M	S	M	S	S

Semester: I

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH13A	**Core - I - Mechanics, properties of matter and sound**	**5**	**5**	**1**	**-**	**C1**

Subject Description :

This paper presents the principle of motion of rigid bodies, laws of Gravitation, elasticity, viscosity, surface tension, sound and their applications.

Course Outcome:

CO1	:	To Demonstrate and understand the Conservation Law through applying kinetic energy.
CO2	:	To gain knowledge about inertia in Rectangular, Triangular lamina for the verification motion of rigid body.
CO3	:	To be able to understand the importance of gravitational force, elasticity of material.
CO4	:	To acquire knowledge on viscosity and surface tension of fluids.
CO5	:	To know about the properties and application of sound waves.

Unit I: **[15 Periods]**

Conservation Law – Impulse – Impact – Direct and oblique impact – Final velocity and loss of kinetic energy –Motion of a particle in a vertical circle – friction – Laws of friction – angle of friction – resultant reaction – cone of friction – Equilibrium of a body on a rough inclined plane to the horizontal and when the inclination in greater than the angle of friction.

Unit II: **[15 Periods]**

Motion of rigid body

Moment of inertia (M.I) – Parallel and perpendicular axes theorem – M.I. of rectangular Lamina and triangular lamina – M. I of a solid sphere about an axis through it C.G. – Compound pendulum – torque and angular momentum – Relation – Kinetic rotation – conservation of angular momentum

Unit III: **[15 Periods]**

Gravitation: Kepler's Law of Planetary motion – Laws of gravitation – Boy's method for G –Gravitational potential – Gravitational field at a point due to spherical shell – Variation of 'g' with latitude, altitude and depth.

Elasticity: Elastic modules – Poisson's ratio – relation between them – Expression for bending moment – determination of Young's modulus by uniform and non-uniform bending I section girders – Static Torsion – Expression for couple per unit twist – Torsional oscillation.

Unit IV: **[15 Periods]**

Surface Tension: Definition and dimension of surface Tension – Excess of Pressure over a curved surface – Variation of S.T. with temperature – Jaeger's Experiment.

Viscosity: Definition – Rotation viscometer- viscosity of gases, Meyer's Modification of Poiseuille's formula – Rankine's method for viscosity of a gas.

Unit V: **[15 Periods]**

Sound: Simple Harmonic vibration – Progressive waves – properties – Composition of two S.H.M. and beats – stationary waves – Properties Melde's Experiment for the frequency of electrically maintained tuning fork – Transverse and longitudinal modes – Ultrasonics – Properties and application

Book for Study:

1. Brijlal and N. Subramaniam " Properties of Matter", Eurasia Publishing House Limited, 1993 (Unit I to Unit-IV)
2. Brijlal and N. Subramaniam "Text Book of Sound", Vikas Publishing, 1992.(Unit-V)

Book for Reference :

1. Murugesan "Properties of matter", S. Chand and Co, 2015.
2. Sears Semansky and Ground University Physics "Mechanics", Pearson 2011.
3. D.S. Mathur "Elements of Properties of Matter" S. Chand and Co, Edi 2014
4. D.S. Mathur and P.S.Hemne "Mechanics", S. Chand and Co, Edi 2015.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1				H		
CO2		L		H		
CO3	H		L			
CO4	H				L	H
CO5	H			H		L

Semester: I

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH13P	**Core Practical –I** **Major Practical - I**	**4**	**-**	**-**	**3**	**CP1**

Subject Description :

The Major Practical's aim is to provide the basic knowledge about the practical and handling of instruments. To understand the theoretical aspects by practical methods.

Course Outcome:

CO1	:	To gain knowledge about elasticity of a materials by Young's modulus method.
CO2	:	To demonstrate the wavelength of various spectral lines using prism and spectrometer.
CO3	:	To understand the viscosity of liquid.
CO4	:	To know the rigidity modulus and gravitation effort of various material.
CO5	:	To determine the frequency of Alternating Current.

Any eight experiments from the list

1. Young's modulus – uniform bending –Pin and microscope.
2. Young's modulus – Non uniform bending –Pin and microscope.
3. Refractive index of a solid prism – Spectrometer
4. Wavelength of a spectral lines- Grating – Normal incidence method- Spectrometer
5. Viscosity by capillary flow method
6. Rigidity modulus and moment of inertia – Torsional Pendulum
7. Acceleration due to gravity – Compound Pendulum
8. Rigidity Modulus – Static Torsion
9. Measurement of Terminal velocity for different liquids by stokes method
10. Determination of surface tension and interfacial surface tension of a liquid by drop weight method.
11. Sonometer AC Frequency.

Mapping of Course Outcomes with Program Outcomes:

	Program Outcomes					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	H					
CO2		H			H	
CO3		H		H	H	
CO4			L	H		H
CO5	H	H				H

Semester: I

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH1AA	**Allied - I - Mathematics - I**	**4**	**6**	**1**	**-**	**A1**

Subject Description :

This course presents a study on theory of equations, matrices, trigonometry, Laplace transform and Fourier series.
On completion of this course the students should gain knowledge about solving equations, solving first and second order differential equations using Laplace transforms, Fourier series which will be useful in their field of study

Course Outcome:

CO1	:	To be able to understand the various types of roots of an equation.
CO2	:	To understand the elementary ideas of Matrices and its operations.
CO3	:	To gain knowledge about Trigonometric identities and hyperbolic functions.
CO4	:	To acquire knowledge about Laplace transforms and its derivatives.
CO5	:	To apply and understand first and second order differential equation and functions of Fourier series.

Unit I: **[12 Periods]**

Theory of Equations:

Polynomial Equations with real coefficients irrational roots, complex roots - symmetric function of roots – Transformation of equations by increasing or decreasing roots by a constant – Reciprocal Equations - Newton's method to find a root approximately.

Unit II: **[12 Periods]**

Matrices:

Eigen Values and Eigen vectors, Cayley-Hamilton theorem (without proof) – Verification and computation of inverse.

Unit III: **[12 Periods]**

Trigonometry:

Expansion in Series – Expansion of $\cos^n \theta$, $\sin^n \theta$, in a series of cosines and sines of multiples of θ – Expansions of $\cos n\theta$ and $\sin n\theta$ in powers of sines and cosines - hyperbolic functions and inverse hyperbolic functions.

Unit IV: **[12 Periods]**

Laplace Transforms:

Definition – Laplace Transform of Standard function s – Linearity property – First shifting theorem – Transform of *tf(t), f(t) / t* and derivatives – Inverse Laplace transforms of standard functions.

Unit V: **[12 Periods]**

Applications of Laplace transforms and Fourier Series:

Applications of Laplace transforms of differential equations of first and second order – Fourier series of functions in $(0, 2\pi)$

Book for Study:

1. P. Kandasamy, K .S.Thilagavathi, "Allied Mathematics", Volume I and II, by Chand and Company Ltd, New Delhi, (2004). (Unit -I to Unit-V)

Book for Reference :

1. T.K. Manichavasagam Pillai and S.Narayanan, Viswanathan "Trigonometry" Publishers and Printers Pvt. Ltd. (2006).
2. S. Narayan and T.K. Manicavachagam Pillay Viswanathan "Ancillary Mathematics", Publishers and Printers Pvt. Ltd. (2012).

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	H			L	L	
CO2		H				
CO3	H		H	H		
CO4	L		H	H		H
CO5	H	H				H

Semester I

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH1VA	**Ms-office**	**2**	**-**	**-**	**-**	**VAC**

Subject Description: This paper provides the knowledge about Ms-Office

Goal: To enable students to acquire basic knowledge on Computers.

Objective: On successful completion of this paper the students gain the knowledge about MS-Word, excel, PowerPoint, Access.

UNIT-I

MS-WORD: Word processing overview-creating and editing documents-formatting document-working with header and footnotes.

UNIT-II

Creating report and news letter-creating table and merging document-creating web page-macros-keyboard shortcuts-menus-custom toolbars.

UNIT-III

MS-EXCEL: Spread sheet overview-creating worksheet-managing and analyzing complex worksheet-creating charts form template-sharing data between applications.

UNIT-IV

MS-ACCESS: Data base over view-creating data base – modifying table and creating form-filtering and quering tables-creating reports and mailing lables-sharing information between applications.

UNIT-V

MS-POWERPOINT: Basics-using text-adding visual elements-charts and tables-drawing- clip art-sounds-animation-apply time transitions to slides.

Book for Study:

1. E. Balagurusamy, “Programming in ANSI C”, Mcgraw Higher Ed., 6thEdition, 2012 (Unit-III to Unit-V)

Semester-II

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH22E	**English for Physics**	**3**	**5**	**1**	**-**	**E2**

LISTENING- Listening to audio(Sound, Phonetics) – Listening to video lecture,talks – Listening to audio files and answering questions – **SPEAKING** – 5 minutes speech on the related topics – article/speech/mind mapping technique. **WRITING** - free writing on any given topic- sentence completion. **VOCABULARY**-word formation-Word Expansion(root words/etymology – related computers). **READING** – Skimming and scanning information – picture based activities.

Note: For each topic in all the units, the instructor should follow the above five activities.

Unit-I **[9 Periods]**

Introduction to Physics – History – Scalar – Vector – The moment Of a force – the principle of moments – Motions – Centre of gravity.

Unit-II **[9 Periods]**

Displacement – speed – velocity- acceleration – amplitude- wave particles.

Unit – III **[9 Periods]**

Energy – Temperature – Electrical resistance-Resistivity- conductivity- voltage- current.

Unit-IV **[9Periods]**

Light- electromagnetism – A puzzling inconsistency- Atoms and Molecules – The Quantum Leap – A cosmic Perspective.

Unit-V **[9 Periods]**

Science and Physics – Matter and Measurement – International system of units- Elementary particles – Photoelectric effect.

Book for study:

1. Gareth Kelly, “English for Physics”.
2. Ho Huyen, “ English for students of Physics”
3. Matthew Raspanti, “Physics for Beginners”.

Semester: II

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH23A	**Core - II - Heat and Thermodynamics**	**5**	**5**	**1**	**-**	**C2**

Subject Description :
This paper presents the principles of heat and Thermodynamics. The aim is to provide the students to understand the principles of calorimetry, laws of thermodynamics and concepts of entropy.

Course Outcome:

CO1	:	To gain knowledge about gases by applying Newton law of Cooling.
CO2	:	To understand the mathematical computation procedure for gas and to determine the thermal conductivity through black body radiation.
CO3	:	To acquire knowledge about transmission of particle by kinetic theory of gases.
CO4	:	To demonstrate the law of Thermodynamics.
CO5	:	To understand the concepts of entropy and to know about Joule & Kelvin theory.

Unit I: **[15 Periods]**

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 Joly's differential steam calorimeter – Regnault's method – Dulong and Petit's law – variation of specific heat ad atomic heat with temperature.

Unit II: **[15 Periods]**

Transmission of heat : Conduction – Co-efficient of the thermal conductivity – Cylindrical flow of heat- Determination of thermal conductivity of rubber and bad conductor – Lee's disc method-Convection – Radiation- Black body –Wein's law – Rayleigh and Jean's law –Stefan' s law – Experimental Determination of Stefan's constant – Mathematical derivation of Stefan's law

Unit III: **[15 Periods]**

Kinetic theory of gases: Maxwell's law of distribution of molecular velocities – Experimental verification – equilibrium speed distribution of velocities. Mean free path – transport phenomena – Diffusion – viscosity and thermal conduction of gases – van der Waals equation – relation between van der Waal's constant and critical constants.

Unit IV: **[15 Periods]**

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 γ by Clement and Desorme's method – second law of thermodynamics – Carnot's engine- Working efficiency – Carnot's refrigerator – Carnot's Theorem.

Unit V: **[15 Periods]**

Concept of entropy: 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)- Clausius and Clapeyron equation

Book for Study:

1. Brijlal, N. Subramaniam and P.S.Hemne "Heat and Thermodynamics &Statistical Physics", S.Chand & co, 2015.(Unit-I to Unit-V)

Book for Reference :

1. Brijlal & N. Subramaniam "Heat & Thermodynamics", S.Chand &co 2006.
2. R. Murugesan "Thermal Physics", I Edi, 2002

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	H		H	H	H	
CO2		L		H	H	
CO3	L	H	H	H		H
CO4	H		L	H		L
CO5	H	H			H	L

Semester: II

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH23P	**Core Practical II - Major Practical-II**	**4**	**-**	**-**	**3**	**CP2**

Subject Description:

This paper makes the student to understand about the Circuit connections and basics of electronics. To know about the usage of bread board, multimeter, voltmeter, ammeter etc. To gain knowledge about thermal conductivity.

Course Outcome:

CO1	:	To understand the characteristics of junction diode.
CO2	:	To understand and calibrate the range of potentiometer with voltmeter and ammeter.
CO3	:	To determine the frequency of given tuning fork.
CO4	:	To demonstrate the thermal conductivity and band gap of a semiconductor
CO5	:	To determine the strength of the material by Young's Modulus method

Any Eight Experiments

1. Characteristic of a PN junction diode
2. Calibration of low range voltmeter – Potentiometer
3. Young's Modulus– Cantilever – Static method
4. Co-efficient of Thermal conductivity – Lee's disc method
5. Characteristics of Zener diode
6. Spectrometer – hollow prism
7. Sonometer frequency of the tuning fork
8. Melde's string – frequency of vibrator
9. Spherical calorimeter
10. Bandgap of semiconductor
11. Calibration of low range ammeter – Potentiometer

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	H		H	H		
CO2		H			L	
CO3		H		H	L	
CO4			H	H		H
CO5	H	H		H		H

Semester: II

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH2AB	**Allied II-Mathematics - II**	**4**	**6**	**1**	**-**	**A2**

Subject Description :
This course presents the idea of curvature, multiple integrals, partial differential equations and vectors. On successful completion of course the students should have series of knowledge about the curvature, Beta, Gamma functions and its application. Learn the partial differential equation types and integration of vectors

Course Outcome:

CO1	:	To be able to understand application of integration for finding area of curves.
CO2	:	To evaluate triple integrals and also to identify the relation between Beta and Gamma functions using multiple integrals.
CO3	:	To gain knowledge about linear differential equations and its application.
CO4	:	To acquire knowledge on partial differential equations and Lagrange's differential equation by the method of eliminating the arbitrary constants and functions
CO5	:	To be able to understand application of integration for finding area of curves.

Unit I: **[12 Periods]**
Curvature – Radius of curvature – center of curvature – circle of curvature – Evaluation of double integrals - change of order of integration in double integrals- Application of double integral to find the area between curves.

Unit II: **[12 Periods]**
Evaluation of triple integrals – Beta and Gamma functions – relations between them – Evaluation of multiple integrals using Beta and Gamma functions.

Unit III: **[12 Periods]**
Solving second order linear differential equations with constant coefficients whose R.H.S is of the form ve^{mx}, where v is any function of x - Linear equations with variable coefficients.

Unit IV: **[12 Periods]**
Formation of partial differential equations by elimination of arbitrary constants and functions - Definitions of general, particular and complete solutions - solving standard forms f(p, q) = 0, f(x,p,q) = 0, f(y,p,q) = 0, f(z, p, q) = 0, f(x,p) = f(y,q), z = px +qy + f(p,q) - Lagrange's Differential equations Pp+Qq = R.

Unit V: **[12 Periods]**
Scalar and vector fields –Differentiation of vector s – Gradient, Divergence and Curl -Integration of vectors – line integral – surface integral – Green's theorem in the plane – Gauss divergence theorem – Strokes theorem – (Statements only).

Books for study:
1. P. Kandasamy, K .S.Thilagavathi, "Allied Mathematics", Volume I and II, by Chand and Company Ltd, New Delhi, 2004 (Unit -I to Unit-V)

Books for Reference :
1. S. Narayan and T.K. Manicavachagam Pillay Viswanathan "Ancillary Mathematics", Publishers and Printers Pvt. Ltd. – 2012

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H			H	L	
CO2		H				
CO3	H		L	H		
CO4	H		L	H		H
CO5	H	H				H

Semester II

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH2VA	**MATlab**	**2**	**-**	**-**	**-**	**VAC**

Subject Description:
This paper aims to provide a first approach to the subject of Mechanics, which is one of the important aspects of advanced mathematics.

Objectives:
To Study this Paper is to introduce you to the software MATLAB for numerical computations and in particular familiarizing yourself with the Matlab Desktop, basic commands through the Command window and output through the Graph window.

Unit I

Introduction- Basics of MATLAB, Input – Output, File types – Platform dependence – General commands.
Interactive Computation: Matrices and Vectors – Matrix and Array operations

Unit II

Programming in MATLAB: Scripts and Functions – Script files – Functions files.

Unit III

Plotting: Two-dimensional plots - Three-dimensional plot.

Books for Reference:

1. William John Palm “Introduction to Matlab 7 for Engineers”, McGraw-Hill Professional, 2005.

2. Dolores M. Etter, David C. Kuncicky “Introduction to MATLAB 7”, Prentice Hall, 2004

Semester: III

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH33A	**Core - III- Optics**	**5**	**6**	**1**	**0**	**C3**

Subject Description

The paper aims to provide knowledge on optical instrument, nature and behavior of light, propagation of light, vibration of light laser and its application. To inspire interest for the knowledge of concepts is physical and geometrical optics

Course Outcome:

CO1	:	To develop an understanding of the Dispersion of light by prism and lens.
CO2	:	To acquire knowledge about interference using Newton's ring.
CO3	:	To demonstrate the resolving power by diffraction grating.
CO4	:	To study about the optical activity by half shape polarimeter.
CO5	:	To develop problem solving methods and application in Laser, Maser and Holography

Unit I: **[15 Periods]**

Geometrical Optics

Dispersion by a prism - Cauchy's dispersion formula - dispersive power- achromatism in prism - deviation without dispersion - dispersion without deviation - Aberrations - Spherical aberrations in lens - chromatic aberration - chromatic aberrations in a lens - circle of least confusion - achromatic lens - condition for achromatism of two thin lenses separated by a finite distances- coma - Astigmatism.

Unit II: **[15 Periods]**

Interference

Fresnel's Biprism – Interference in thin films due to reflected light – Fringes due to wedge shaped thin film – Newton's rings - Theory – Refractive index of the Liquid – Michelson interferometer – Determination of a wave length of monochromatic light – difference in Wave length between two neighbouring spectral lines – Fabry Perot Interferometer.

Unit III: **[15 Periods]**

Diffraction

Fresnel's assumptions – rectilinear propagation of light – half period zone – Zone Plates – Action and Construction – comparison with a convex lens – Fresnel and Fraunhofer diffraction – Fraunhofer diffraction at a Single slit – Double slit and n-slit - Diffraction grating – Resolving power & Dispersive power of Grating.

Unit IV: **[15 Periods]**

Polarization

Double Refraction – Huygen's explanation – optic axis in the plane of incidence, inclined and perpendicular to the crystal surface – production and detection of plane, circularly and elliptically polarized light –optical activity – Fresnel's explanation – Specific rotation – Half shade polarimeter.

Unit V: **[15 Periods]**

Quantum Optics

Light quanta and their origin – Resonance radiation – Metastable states – Population Inverse – Optical pumping – Spontaneous and Stimulated emission – Einstein's coefficient – Ruby laser- He- Ne Laser - CO_2 laser – Resonant cavities — Threshold condition for laser – MASER Introduction - Holography (Introduction) -Principle and construction -Reconstruction of Holography.

Book for Study:

1. Brijlal, M.N.Avadhanulu and N. Subrahmanyam, "A text book of optics", 4th edition, S. Chand & Co Publishers, New Delhi (2012) (Unit- I to Unit-IV)
2. K. Thyagarajan, Ajoy Ghatak," Lasers: Fundamentals and Applications" Springer Science & BusinessMedia, (2010) (Unit-V)

Book for Reference :

1. R.Murugesan," Optics and spectroscopy", S.Chand & Company Ltd , New Delhi (2003).
2. R.Murugesan,Er.Kiruthiga Sivaprsath" Modern physics", S.Chand & Company Ltd , New Delhi (2016)

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	H		L	H		
CO2		H		H	H	
CO3	H	H	L		H	
CO4	H			H		L
CO5	H	H			H	L

Semester: III

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH33P	**Core Practical - III - Major Practical – III**	**4**	**-**	**-**	**3**	**CP3**

Subject Description

The experiment of this lab demonstrates the concept of optics, elasticity and electricity.

Course Outcome:

CO1	:	To understand the refractive index of Prism.
CO2	:	To calculate the acceleration due to gravity by using compound pendulum.
CO3	:	To calibrate the different range of potentiometer by using ammeter and voltmeter.
CO4	:	To verify the principles temperature co-efficient by using Carey foster's bridge.
CO5	:	To evaluate depression of cantilever.

Any Eight of the experiments from the list

1. Thickness of a thin wire – Air wedge method
2. Newton's ring – refractive index of lens
3. Wavelength of Mercury Spectral lines – grating – minimum deviation – Spectrometer
4. Cauchy's constant – Spectrometer grating
5. Refractive index of a solid prism (i-d) curve – spectrometer
6. Calibration of high range voltmeter – Potentiometer
7. Potentiometer – Specific resistance of given coil
8. Young' modulus – non – uniform bending method – optic lever
9. Dispersive power of grating – spectrometer
10. Temperature co- efficient of a resistance of a thermistor – post office box
11. Temperature co- efficient of resistance – Carey Foster's bridge

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	L		L	H		
CO2		L			L	
CO3		L		H	L	
CO4			L			L
CO5	L			H		L

Semester: III

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH3AC	**Allied-I - Chemistry – I**	**4**	**6**	**1**	**-**	**A3**

Subject Description :

To introduce the concepts which gives knowledge about industrial chemistry

On successful completion of this paper the students should gain the knowledge about Bonding, Dye, Fertilizers, industrial chemistry, Chromatography and Stereoisomerism

Course Outcome:

CO1	:	To investigate and understand chemical bonding of various structures.
CO2	:	To develop an ability to understanding about gases and nature of fertilizers.
CO3	:	To acquire knowledge about Molecule bonding and their symmetric properties.
CO4	:	To analyze and interpret experimentation of coloring in dyes.
CO5	:	To develop an understanding solutions and different types of liquids and kinetic energy

Unit I: **[12 Periods]**

Chemical Bonding

1. Molecular orbital theory, bonding, antibonding and non-bonding orbitals. Molecular orbitals. MO configuration of H_2, N_2, O_2, F_2. Bond order. Diamagnetism and paramagnetism.
2. Diborane: Preparation and properties, structure, preparation and uses of $NaHB_4$, Borazole-Chemistry.
3. Interhalogen compounds: ICl, BrF_3, IF_3- Preparation, properties, hybridization and structure, shape. Basic properties of iodine.
4. sodium hydrosulphite, peracids of sulphur: preparation, properties and uses. Structure.

Unit II: **[12 Periods]**

1. **Industrial Chemistry**

Synthesis, properties and uses of silicones. Fuel gases: natural gas, water gas, semi water gas, carburetted water gas, producer gas, oil gas (manufacturing details not required)

2. fertilizers

urea, ammonium sulphate, ammonium nitrate, potassium nitrate NPK fertilizer. Triple superphosphate. Pollution of air, water and soil-sources, remedies.

Unit III: **[12 Periods]**

1. **covalent bond:** orbital overlap, hybridization, geometry of organic molecules-CH_4,C_2H_4,C_2H_2, C_6H_6. Inductive effect. Electrometric, mesomeric, hyperconjucative and steric effects. Effect in properties of compounds.
2. **Stereoisomerism:** Optical isomerism: symmetry, elements of symmetry. Cause of optical activity, tartaric acid, Racemisation, Resolution. Geometric isomerism of maleic and fumaric acids. Keto-enol tautomerism in Acetoacetic esters.

Unit IV: **[12 Periods]**

1. **Terms:** chromophore, auxochrome, bathochromic shift, hypsochromic shift, hyperchromic effect, hypsochromic effect.
2. **Dyes:** azo and triphenylmethane dyes- Preparation one example.

Unit V: **[12 Periods]**

1. Solutions

Types. Liquid in Liquid. Raoult's law. Deviation from ideal behaviour. Binary liquid mixtures. Fractional distillation.

2. Kinetics

Rate, order, moleculality, pseudo first order, determination of order. Measurement of reaction. Effect of temperature on the rate. Energy of activation.

3**. Chromatography**

Principle and application of column, paper and thin layer chromatography.

Book for Study*:*

1. Dr. V. Veeraiyan.,"Text book of Ancillary chemistry", Volume I, High mount Publishing house, Chennai-14,Edition-2008 (Unit-I to Unit-V)

Book for Reference *:*

1. P.L. Soni, "Text Book of Inorganic Chemistry", Sultan Chand &Sons, New Delhi, 2013.
2. Puri and Sharma, "Text book of Inorganic Chemistry", Vishal publishing, 2014

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	H				H	
CO2	H	L		H		
CO3			L	H		
CO4	L				H	H
CO5	H					L

Semester: III

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH3AP	**Allied Practical -I - Allied Chemistry Lab**	**4**	**-**	**-**	**3**	**AP1**

Subject Description:

To understand and to determine the dissolving rate of a solution, demonstrate the reaction of acid with base and to apply the problems solving, critical thinking and analytical reasoning.

Course Outcome:

CO1	:	To understand and carry out, record and analyze the results of chemical experiments.
CO2	:	To understand and apply volumetric analysis for standard solution.
CO3	:	To determine the dissolving rate of a solution
CO4	:	To demonstrate the reaction of acid with base
CO5	:	To apply the problems solving, critical thinking and analytical reasoning.

I. VOLUMETRIC ANALYSIS:

2. Estimation of sodium hydroxide using standard sodium carbonate.
3. Estimation of hydrochloric acid- standard oxalic acid.
4. Estimation of oxalic acid- standard sulphuric acid.
5. Estimation of ferrous sulphate- standard Mohr salt solution.
6. Estimation of oxalic acid- standard ferrous sulphate.
7. Estimation of potassium permanganate- standard sodium hydroxide.

Mapping of Course Outcomes with Program Outcomes:

	Program Outcomes					
Course Outcomes	**P01**	**PO2**	**P03**	**P04**	**P05**	**P06**
CO1	H				H	
CO2	H	L		H		
CO3			L	H	H	
CO4	L		H		H	L
CO5	H			H		H

Semester: III

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH3ZA	**Skill Enhancement Course-I MS Office and C**	**4**	**5**	**1**	**-**	**S1**

Subject Description

This subject deals with MS office and the programming concepts of C language**.** On successful completion of this subject the student should have to writing programming ability on scientific and mathematical problems It is very useful to the students in many ways like their higher studies and research etc., because of its versatility.

Course Outcome:

CO1	:	To acquire knowledge on Formatting documents while creating web pages.
CO2	:	To apply and understand the need of spreadsheet for sharing the data.
CO3	:	To analyze operators and variables to write C - program.
CO4	:	To understand the need of loops and its types such as if, else, nested for completion of program.
CO5	:	To apply the Array statements to write down C – Program.

Unit I: **[12 Periods]**

MS-WORD

Word processing overview-creating and editing documents-formatting document-working with header and footnotes.

Creating report and news letter-creating table and merging document-creating web page-macros-keyboard shortcuts-menus-custom toolbars.

Unit II: **[12 Periods]**

MS-EXCEL:

Spread sheet overview-creating worksheet-managing and analyzing complex worksheet-creating charts form template-sharing data between applications.

MS-POWERPOINT:

Basics-using text-adding visual elements-charts and tables-drawing- clip art-sounds-animation-apply time transitions to slides.

Unit III: **[12 Periods]**

Introduction – character sets – constants – keywords and identifiers – variables – variables – data types – declaration of variables –assigning values to variables – defining symbolic constants – Arithmetic operators – relational operators – logical operators – assignment operators – increment and decrement operators – conditional operators – special operators – arithmetic expression – evaluation of expression – precedence of arithmetic operators – some computer problems – type conversion in expression – operator mathematical functions

Unit IV: **[12 Periods]**

Reading and writing character – formatted input an d output – decision making : IF statement : Simple IF – IF ELSE – Nesting of IF- ELSE - IF Ladder – Switch Statement– operator – go to statement – while – do - while – For loop – Jumps in loops – simple programs

Unit V: **[12 Periods]**

Arrays : Introduction – One dimensional array – declaration of array – Initiating on two and multidimensional arrays – declaring and initializing string variables – reading strings from terminal – writing strings on the screen – Arithmetic operations on characters – simple programs. Need for user defined functions – A multifunction program – RETURN values and their types – functions calls – category of functions – no arguments and no return values – simple programs.

Book for Study :

1. E. Balagurusamy, "Programming in ANSI C", Mcgraw Higher Ed., 6thEdition, 2012 (Unit-III to Unit-V)
2. Joan Lambert, Curtis Frye,"Microsoft Office 2016 Step by Step", Microsoft Press, Washington, 2015, (Unit-I and Unit-II)

Book for Reference :

1. Ashok N. Kamthane ,"Programming in C", Pearson, First Indian Print 2004

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes					
	P01	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	H				H	
CO2	H	L		H		
CO3			H	L	H	
CO4	H		L		H	L
CO5	L			H		L

Semester: III

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH3VA	**Biomedical instrumentation**	**2**	**-**	**-**	**-**	**VAC**

Subject Description

To give a complete exposure of various recording mechanism and physiological parameters measured for diagnostic application.

OBJECTIVES

- To study different types of electrodes used in biopotential recording.
- To understand the characteristics of bioamplifiers and different types of recorders.
- To understand how to measure various biochemical and nonelectrical parameters of human system.
- To study the instrumentation concerned with measuring the blood flow volume, velocity and number of particles in the blood.

Unit I

Introduction – Cells and their structures –Nature of cancer cells –Transport of ions through the cell membrane –Resting and acting potentials – Bio electric potentials –Difficult system of human body

Unit II

Electro - Cardiography (ECG) - Electromyography (EMG) - Electro -Encephalograph (EEG) - Phonocardiography

Unit III

Pacemakers - introduction - external and internal pacemakers -artificial heart valves - (principle - block diagram and operation)

Unit IV

Anesthesia machine - recording fetal heart movements and blood circulation using Doppler ultrasonic method - laser based Doppler blood flow meter - Blood cell counter - B.P. measurement - direct and indirect method - Haemocytometer - counting of RBCs and WBCs.

Unit V

Radiation safety instrumentation - effects of radiation exposure –radiation monitoring instruments - pocket dosimeter - pocket type radiation alarm

Book for Study:

1. Dr. M. Arumugam, Bio-medical Instrumentation, Anuradha Agencies (2002)

Book for Reference :

1. John G. Webster, Medical Instrumentation: Application and Design, John Wiley &Sons Inc (2009)
2. P.K. Bajpai, Biological Instrumentation and methodology, S Chand & Co (2010

Semester III

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH3LA	**IDL- Principles of Electronics**	**2**	**2**	**-**	**-**	**IDL**

Subject Description: This subject is the introductory for electronics, it presents the basic components theorems, devices and circuits

Objectives: Upon completion of the subject, the student should understand the Basic components and its operations Gain knowledge about Electric and Electronic circuits and Network theorems

Unit I Semiconductor Devices **[6 Periods]**

Conductor – Semiconductor – Intrinsic semiconductor – Extrinsic semiconductor – P type and N -type semiconductor – PN junction diode V-I characteristics - Zener diode V-I characteristics – Insulator.

Unit II Passive Circuit Components **[6 Periods]**

Resistors: Types of resistor- Fixed resistor– Variable resistor– Color coding. **Capacitors:** Basic structure and symbol – Fixed capacitor – Variable capacitors. **Inductors:** Inductance of the coil – Fixed inductors Variable inductors.

Unit III AC and DC Circuits Fundamentals **[6 Periods]**

Alternating current – peak value – average value – rms value – frequency – time period – wavelength – phase - phase difference - Ohm's law – Kirchoff's law – Voltage divider – Current divider.

Unit IV Network Theorem **[6 Periods]**

Superposition theorem – Thevenin's theorem –Norton theorem – Millman's theorem – Maximum power transfer theorem- applications of the Maximum power transfer theorem- Simple problems.

Unit V **[6 Periods]**

Introduction – V-I characteristics of JFET– MOSFET – SCR– DIAC–TRIAC– UJT.

Book for Study:

1. R.S.Sedha "A Text Book Of Applied Electronics" S. Chand and Company Ltd., 2005 Unit(1-5)

Book for Reference :

1. Bernard Grob "Basic Electronics" Tata McGraw – Hill, 9th edition 2003.

Semester III

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH3LB	**IDL - Basic Embedded System and Microcontroller**	**2**	**2**	**-**	**-**	**IDL**

Subject Description

The aim of this course to provide the student with a detailed understanding of to Microcontrollers and Embedded systems. The course covers fundamentals, The 8051 Architecture, Assembly Language Programming, Instruction set, Serial Communication and Interfacing techniques of 8051 Microcontroller

Unit I **[6 Periods]**

Introduction to Microcontrollers and Embedded Processors – Microcontrollers survey-four bit, eight bit, sixteen bit, thirty two bit Microcontrollers --Comparing Microprocessors and Microcontrollers-Overview of the 8051 family

Unit II **[6 Periods]**

The 8051 Architecture- Hardware- Oscillator and clock-program counter –data pointer registers-stack and stack pointer-special function registers- -memory organization-program memory-data memory -Input / Output Ports –External memory-counter and timer-serial data Input / output-Interrupts

Unit III **[6 Periods]**

8051 Assembly Language Programming-Structure of Assembly language-Assembling and running an 8051 program

Unit IV **[6 Periods]**

Addressing modes-Accessing memory using various addressing modes- Instruction set- Arithmetic operations and Programs-Logical operations and Programs -Jump and Call instructions.

Unit V **[6 Periods]**

Microcontroller Interfacing -Key Board - Displays- Pulse Measurement - D / A and A/D conversion –stepper motor-traffic light signals-DC motors

Book for Study:

1. Kenneth .J.Ayala, " The 8051 Microcontrollers Architecture, programming & Applications", Cengage learning India (P) ltd, India (2010). (Unit V)

Book for Reference :

1. Muhammed Ali Mazidi, "The 8051 Microcontrollers and Embedded Systems", Pearson Education India(2007).

Semester III

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH3LC	**IDL - Digital electronics**	**2**	**2**	**-**	**-**	**IDL**

Subject Description

This paper presents basic principles of digital electronics. Students can acquire knowledge regarding number systems, arithmetic building blocks, memories and data processing circuits

Objectives

To give description for the students in order to
ɪrn the circuits

- Acquire basic knowledge of binary addition
- Understand the action and application of counters

Unit I **[6 Periods]**

Number System, Binary Arithmetic and Binary Codes

Decimal, Binary , Octal , Hexadecimal number system – Conversion from one system to another system-Binary arithmetic operations- -Binary subtraction using 1's and 2's compliment

Unit II **[6 Periods]**

Logic gate, Logic circuits, Boolean algebra and Karnaugh map

Basic Logic gates (NOT,OR,AND) – Universal building blocks (NAND and NOR gates) – EX-OR and EX-NOR gates- construction of basic gates using discrete components - Law of Boolean algebra- DeMorgan's theorems– Simplifications of Boolean expressions

Unit III **[6 Periods]**

Flip- flops and Counters

R-S flip flop – D flip flop- JK flip flop – Master slave J-K flip flop –Edge triggered flip flops. Asynchronous and synchronous counters - Ring counters

Unit IV **[6 Periods]**

Arithmetic, Data processing circuits and Shift Register

Half and full adder – half and full subtractor – parallel binary adder and subtractor –Multiplexer- De- multiplexer-Encoder-Decoder-Serial in serial out shift register-Parallel in parallel out shift registers.

Unit V **[6 Periods]**

Memory devices

Classification of memories – ROM - ROM organization - PROM – EPROM – EEPROM – RAM — Write operation – Read operation – Memory cycle - Timing wave forms – Memory decoding – memory expansion – Static RAM Cell- Bipolar RAM cell – MOSFET RAM cell.

Book for Study:

1. Floyd," Digital fundamentals", Tata McGraw Hill, New Delhi(1995). Unit(1-5)
2. Albert Paul Malvino & Donald P Leach," Digital principles and applications", Tata McGraw Hill, New Delhi I(1999).

Book for Reference :

1. V.Vijayendaran," Introduction to Integrated electronics digital and Analog", S.Vishwanathan Printers and Publishers Pvt.Ltd (reprint 2011).
2. M.Morris Mano ,"Digital logic and computer design", Prentice-Hall of India Pvt.Ltd, NewDelhi (2006).

Semester III

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH3LD	**IDC - Fibre Optic Communication Systems**	**2**	**2**	**-**	**-**	**Theory**

Subject Description

This paper presents basic principles of digital electronics. Students can acquire knowledge regarding number systems, arithmetic building blocks, memories and data processing circuits

Unit I **[6 Periods]**

Fibre Classification

Propagation of light waves in an optical fibre – Acceptance angle and Acceptance cone of a fibre – Numerical Aperture (NA) – NA of a graded Index Fibre - Fibre classification – stepped index fibre – Graded index fibre – Comparison of step and graded index fibres.

Unit II **[6 Periods]**

Fibre Fabrication and Cables

Classification of Techniques – External chemical vapour deposition – Characteristics – Internal chemical vapour deposition (1^{st} method only) – Characteristics –Axial Vapour Deposition– Phasil system – Multi-element– Fibre cable construction– Testing of cables.

Unit III **[6 Periods]**

Fibre Losses and Dispersion In Optics

Attenuation in optic fibre– Impurity losses –Rayleigh scattering losses – Radiation induced losses – Inherent defect losses – Core and Cladding losses - Dispersion in an Optical Fibre – Inter-modal dispersion – Material Chromatic Dispersion.

Unit IV **[6 Periods]**

Light Sources for Optical Fibres

LED – The process involved in LEDS – Structures of LED – S-LED – E-LED Modulation bandwidth of LED and Spectral Emission of LEDS and simple problem.

Unit V **[6 Periods]**

Applications

Telecommunications – Active and passive sensors - Temperature and pressure Sensors – displacement sensor - medical endoscope - engineering application-Medical application - advantage of optic fibre communication over radio wave communication.

Book for Study:

1. Dr. Subir Kumar Sarkar, " Optical Fibres and Fibre optics Communication System", S.Chand and Company Pvt. Ltd., New Delhi, 2014. Unit(1-5).

Book for Reference :

1. R.K.Puri and V.K. Babbar, "Optical Fibres and Fibre Optic Communication Systems"

Semester: IV

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH43A	**Core - IV - Electricity and Magnetism**	**4**	**5**	**1**	**-**	**C4**

Subject Description

This paper presents the basic principle of charged body, when they are in rest and also under motion.

This paper gives the knowledge regarding the electrical energy and magnetic energy and to enable the students in order to learn the basic principles theory and concepts of electricity and magnetism.

Course Outcome:

CO1	:	To develop an understanding on Electric intensity by Gaussian approach.
CO2	:	To understand the principles of ballistic galvanometer for charging and discharging of current.
CO3	:	To acquire knowledge about flow EMF in thermo electricity.
CO4	:	To determine the magnetic properties of material by Hall Effect.
CO5	:	To investigate the alternating current in transformers and its applications.

Unit I: **[12 Periods]**

Gauss theorem and its applications

Gauss theorem, application of Guass theorem - Electric intensity at a point immediately adjacent to a charged conductor - Energy stored in unit volume of an electric field

Capacitance and Capacitors

Spherical capacitor: Cylindrical capacitor, Force of attraction between charged plates of a capacitor – capacity of a parallel plate capacitor; effect of introducing a dielectric slab between the plates – Guard ring condenser - polarization in dielectric materials.

Unit II: **[12 Periods]**

Helmholtz equation of varying current

Growth and decay of current in an inductive – resistive circuit – charging and discharging of a capacitor through a resistance – charging and discharging of capacitor through an inductance – oscillatory circuits- Force on a current carrying conductor – Theory of Ballistic Galvanometer- Moving coil Ballistic Galvanometer – Figure of merit of B.G. – Absolute capacitance of a capacitor.

Unit III: **[12 Periods]**

Thermoelectricity: Seeback effect – laws of thermo e.m.f. - Peltier effect; Peltier Co-efficient-determination of Peltier co-efficient – thermo dynamical consideration of Peltier effect – Thomson effect – Thomson Co-efficient – e.m.f generated in a thermocouple taking both Peltier effect and Thomson effect in the metals – Thermo electric power – Application of thermodynamics to Thermocouple – Thermoelectric diagrams and their uses.

Unit IV: **[12 Periods]**

Magnetic Properties of materials

Electron theory of magnetism- dia, para, ferromagnetism and their properties - magnetic field B - magnetization M-magnetic field intensity H- magnetic susceptibility and magnetic permeability- magnetic materials and magnetization- magnetic hysteresis – area of the hysteresis loop; determination of susceptibility by Gouy's method – magnetic circuits – Hall effect – Experiment –Determination of Hall coefficient and hall voltage.

Unit V: **[12 Periods]**

Alternating Current: Concepts of Faraday's law - EMF induced in a coil rotating in a magnetic field – AC circuits containing resistance, inductance and capacitance in series – series resonant circuit – acceptor circuit – voltage magnification –Q-factor – Parallel resonant circuit –Transformer.

Dynamics of charged particles

Maxwell's equations (Basics) - Charged particles in uniform and constant electric field – Charged particles in an alternating electric field – Charged particles in a uniform and constant magnetic field – magnetic focusing – charged particles in combined electric and magnetic field when the fields are parallel and are in mutually perpendicular direction.

Book for Study:

1. R. Murugesan," Electricity and magnetism", S.Chand & Company Publishers, New Delhi (2004), (Unit-I to Unit-V)

Book for Reference :

1. Brijlal and Subramaniam," Electricity and magnetism", RatanPrakashan Mandir, New Delhi, (2000).
2. K.K. Tewari, "Electricity and magnetism with electronics", S. Chand & Company Publishers, New Delhi, (2003)
3. D.S.Mathur, "Mechanics ",S.Chand & Company publishers, New Delhi, (2003).
4. D.N. Vasudeva, "Fundamentals of Electricity and magnetism" McGraw Hill Publishers, Delhi, (1998).

Mapping of Course Outcomes with Program Outcomes:

	Program Outcomes					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	H		H		H	
CO2	H	L		L		
CO3			H	H	H	L
CO4	H		H		H	
CO5	L	H				L

Semester: IV

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH43P	**Core Practical IV – Major Practical IV**	**4**	**-**	**-**	**4**	**CP4**

Subject Description

The experiment of this lab demonstrates the concept of electricity, magnetism charge and discharge of Ballistic galvanometer

Course Outcome:

CO1	:	To understand specific resistance of the coil
CO2	:	To know about the magnetic moment of the magnet.
CO3	:	To determine the refractive index of prism.
CO4	:	To apply the principles of stokes's method to study the viscosity of a liquid
CO5	:	To enable the student to gain knowledge about Ballistic galvanometer

Any seven from the list

1. Refractive index of a prism (i-i') – Spectrometer
2. Moment of magnet Tan C position
3. Potentiometer – E.M.F of a Thermocouple
4. Moment of a magnet – circular coil – Deflection Magnetometer
5. Determination of specific gravity of liquid – Joule's calorimeter
6. Figure of Merit – B.G.
7. Capacity of a condenser – B.G.
8. Determination of high resistance by charging – Ballistic galvanometer
9. Determination of high resistance by leakage – Ballistic galvanometer
10. Young's modulus – uniform bending – Koenig's method
11. Young's modulus – non uniform bending – Koenig's method
12. Determination of mutual inductance – Ballistic Galvanometer
13. Verification of truth table for NOT, AND, OR, NOR, NAND, XOR, XNOR

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	H		H		H	
CO2	H	L			L	
CO3			H	L		H
CO4	H		H		H	
CO5		H			H	H

Semester: IV

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH4AD	**Allied - IV - Chemistry – II**	**4**	**5**	**1**	**-**	**A4**

Subject Description

To introduce the concepts which gives knowledge about industrial chemistry

On successful completion of this paper the students should gain the knowledge about Metals, Aromatic compounds, Heterocyclic, organic acids and electrochemistry.

Course Outcome:

CO1	:	To understand about ore and extraction of ore - various metals.
CO2	:	To understand the preparation of aromatic and heterocyclic components.
CO3	:	To have the knowledge about classification and structures of amino acids and carbohydrates.
CO4	:	To demonstrate the law of Thermodynamics by applying Carnot's theorem.
CO5	:	To determine the ph level by the principle of Electro plating.

Unit I: **[12 Periods]**

1. Metals

General methods of excitation of metals. Types of ores. Methods of ore dressing. Types of furnaces. Reductionn methods, electrical methods, types of refining Van Arkel Zone refining. Extraction of U.

2. Coordination Chemistry.

Nomenclature. Theories of Werner, Sidge Wick, Pauling, Chelation examples. Haemoglobin, chlorophyll. Applications in qualitative and quantitative analysis EDTA.

Unit II: **[12 Periods]**

1.Aromatic Compounds

Electrophilic substitution in benzene mechanism of nitration, halogenation, alkylation, acylation, sulphonation, Preparation, properties and structural education of naphathalene.

2.Heterocyclics:

Preparation and properties of furan, thiophene, pyrrole and pyridine.

Unit III: **[12 Periods]**

1. Amino Acids: Classification, preparation and properties, preparation of peptides. Classification of proteins by physical properties and by biological functions.

2. Carbohydartes: classification, preparation and properties of glucose and fructose. Discussion of open chain ring structures of glucose and fructose. Glucose-fructose interconversion.

Unit IV: **[12 Periods]**

Energetics:

Definition of first law thermodynamics. Types of sytems. Reversible, irreversible. Isothermal and adiabatic processes. Spontaneous processes, Joule-Thomson effect. Enthalpy, bond energy. Need for the second law. Carnot cycle and Carnot theorem. Entropy and its significance. Free energy change.

Unit V: **[12 Periods]**

1. Electrochemistry:

Kohlraush's law. Measurement of conductance. pH determination. Conductometric titrations. Hydrolysis of salts: pH and buffer in living systems. Galvanic cells, e.m.f. standard electrode potentials, reference electrodes. Electrochemical series, its applications. Principles of electroplating. pH determination.

2. Phase Equilibria:

Definition of terms in phase rule. Study of a simple eutectic system Pb-Ag.

Book for Study:

1. Dr. V. Veeraiyan.,"Text book of Ancillary chemistry", Volume I, High mount Publishing house, Chennai-14,Edition-2008 (Unit-I to Unit-V)

Book for Reference *:*

1. P.L. Soni, "Text Book of Inorganic Chemistry", Sultan Chand &Sons, New Delhi, 2013.
2. Puri and Sharma, "Text book of Inorganic Chemistry", Vishal publishing, 2014

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	H		H		H	
CO2	H	L			H	
CO3			H			L
CO4	H		H		H	
CO5	L	H			H	H

Semester: IV

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH4AP	**Allied Practical - II Allied Chemistry Lab-II**	**4**	**-**	**-**	**4**	**AP2**

Subject Description

To understand and apply volumetric analysis for standard solution and to determine the dissolving rate of a solution, demonstrating the reaction of acid with base.

Course Outcome:

CO1	:	To understand and carry out, record and analyze the results of chemical experiments.
CO2	:	To understand and apply volumetric analysis for standard solution.
CO3	:	To determine the dissolving rate of a solution
CO4	:	To demonstrate the reaction of acid with base
CO5	:	To apply the problems solving, critical thinking and analytical reasoning.

ORGANIC ANALYSIS:

Systematic analysis

1. Detection of Elements (N, S, Halogens).
2. To distinguish between aliphatic and Aromatic.
3. To distinguish between saturated and unsaturated.
4. Functional group tests for phenols, acids (mono and di), aromatic primary amine, amide, diamide, carbohydrate,
   Functional groups characterized by confirmatory test.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	H		H		H	
CO2	H	H			H	
CO3			H	H		H
CO4	H		H		H	
CO5	L	L			L	L

Semester: IV

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH4ZP	**Skill enhancement course lab – II- MS Office and Programming in C**	**4**	**-**	**-**	**6**	**SP1**

Subject Description

To make aware of working with documents, editing text, and formatting text in Microsoft Word, Excel, and power point. To write programs that performs operations using derived data types.

Course Outcome:

CO1	:	To demonstrate working with documents, navigating, editing text, and formatting text in Microsoft Word.
CO2	:	To demonstrate working with cells, rows, and columns and using formulas and calculations in Excel
CO3	:	To demonstrate entering data, managing data, and formatting data and cells in Excel.
CO4	:	Demonstrate creating presentations, editing, and formatting text and working with objects in PowerPoint.
CO5	:	To write programs that performs operations using derived data types.

MS- WORD:

1. Illustrate the mail merge concepts to apply for a suitable job for atleast 5 companies.
2. Using ms- word performs the following:

a) Change the font size to 20
B) Change the font type to Garamond
C) Align the text to left, right, justify and center
D) Underline the text

MS- EXCEL:

3. Built a worksheet to perform correlation and regression coefficients using formula and check the answer with built-in functions
4. Worksheet preparation for electricity bill preparation
5. Draw graphs to illustrate class performance

MS-POWER POINT:

6. Prepare an organization chart for a college environment in power point.
7. Perform frame movement by inserting clip arts to illustrate running of a car automatically.
8. Prepare a power point presentation with all the slide translation facilities

MS -ACCESS:

9. Perform sorting on name, place and pincode of student's database and list them in the sorted order.
10. Create mailing labels for employee database.

List of c program

1. Write a program to initialize, assignment and printing variables of different data
2. Write a program to demonstrate arithmetic operators.(+,-,*,/,%)
3. Write a program to convert temperature (Fahrenheit - centigrade and vice – versa)
4. Write a program to calculate electricity bill. Read starting and ending meter reading.

The charges are as follows.
No. Of units consumed rate in (rs)
1-100 1.50 per unit
101 -300 2.00 per unit for excess of 100 units
301-500 2.50 per unit for excess of 300 units
501-above 3.25 per unit for excess of 500 units

5. Write a program to display colours using switch case(VIBGYOR)
6. Write a program to check whether given number is palindrome or not by using while and do –while loop
7. Write a program to perform matrix addition and matrix subtraction
8. Write a program to perform matrix multiplication by checking the compatibility.
9. Calculation of half lifetime of a radioactive element.
10. Verification of Bolyle's law
11. Develop a c program to conversion of distance
12. Develop a c program to conversion of temperature.

Mapping of Course Outcomes with Program Outcomes:

	Program Outcomes					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1			H		H	
CO2	H	L			H	
CO3			H			H
CO4	L		H		H	
CO5		H			H	H

Semester: IV

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH4VA	**Space Science**	**2**	**-**	**-**	**-**	**VAC**

Subject Description:
This paper presents the fundamentals of universe, galaxies, star and solar systems.

Objectives

- To enable the students to acquire the knowledge in electronics and to study the various electronics circuits.
- To motivate the students to apply the concepts of electronics in their day – to – day life.

Unit I: Universe
Planets - interior planets - exterior planets - crust, mantle and core of the earth - different - region of earth's atmosphere - rotation of the earth - magnetosphere - Van Allen belts - Aurora.

Unit II:
Comets, Meteors, Asteroids
Composition and structure of comets - periodic comets – salient features of asteroids, meteors and its use

Unit III:
Sun
Structure of photosphere, chromosphere, corona - sunspots – solar flares - solar prominences - solar piages - satellites of planets -structure, phases and their features of moon.

Unit IV:
Stars
Constellations - binary stars - their origin and types star clusters –globular clusters - types of variable-Stars - types of galaxies.

Unit V:
Origin of Universe
Big bang theory - pulsating theory - steady state theory – composition of universe expansion

Book for study and reference :

1. K.D. Abyankar, “Astrophysics of the solar system, University press”, India (1999)

2. BaidyanathBasu, Sudhindra Nath Biswas and Tanuka Chattopadhyay, “An Introduction To Astrophysics, Prentice Hall Of India”, New Delhi (2010)

3. R.P. Singhal, “Elements of Space Physics”, PHI, (2009)

Semester: IV

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH4LA	**IDL - Applied Electronics**	**2**	**2**	**-**	**-**	**IDL**

Subject Description:
This paper presents the applications of electronics and its usage.

Objectives

- To enable the students to acquire the knowledge in electronics and to study the various electronics circuits.
- To motivate the students to apply the concepts of electronics in their day – to – day life.

Unit I **[6 Periods]**

Operational Amplifier fundamentals:
Characteristics – Op-Amp parameters - inverting amplifier-non-inverting amplifier - unity follower - summing amplifier-difference amplifier - Differentiator, integrator, comparator using OP-Amps.

Unit II **[6 Periods]**

Analog computation and wave form generation:
Solving simultaneous equations and second. order differential equations. Square wave generation (astable operation) and sine wave generation (Wien's Bridge oscillator).

Unit III **[6 Periods]**

Timer and applications:
Timer 555 - Internal block diagram and working - Applications of timer 555 - Schmitt trigger, Astable and Monostable operations.

Unit IV **[6 Periods]**

D/A and A/D converters
DIA converter - binary weighted resistor and R-2R ladder method - A/D converter - Flash - Counter type - Successive approximation techniques.

Unit V **[6 Periods]**

Semiconductor Memories
Basics - ROM, PROM, EPROM, EEPROM - RAM - Dynamic RAM - basic ROM cell - basic RAM cell (both using gates) - block diagram of 2Kx8 ROM and 2Kx8 RAM and different signals associated with these chips

Book for Study:

1. Jacob Millman, Christos Halkias, Chetan D. Pouikh," Integrated Electronics Analog and Digital Criciuts and Systems", Tata Mc Graw Hill Education Pvt. Ltd., New Delhi, 2016.(Unit I –V)

Book for Reference :

1. Dr. R.S. Sedha, "A Textbook of Applied Electronics", S.Chand and Company Pvt. Ltd., New Delhi, 2016.

Semester-IV

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH4LB	**IDL - Space Science**	2	2	-	-	**IDL**

Subject Description:
This paper presents the fundamentals of universe, galaxies, star and solar systems.

Objectives

- To enable the students to acquire the knowledge in electronics and to study the various electronics circuits.
- To motivate the students to apply the concepts of electronics in their day – to – day life.

Unit I: Universe **[6 Periods]**
Planets - interior planets - exterior planets - crust, mantle and core of the earth - different - region of earth's atmosphere - rotation of the earth - magnetosphere - Van Allen belts - Aurora.

Unit II: Comets, Meteors, Asteroids **[6 Periods]**
Composition and structure of comets - periodic comets – salient features of asteroids, meteors and its use

Unit III: Sun **[6 Periods]**
Structure of photosphere, chromosphere, corona - sunspots – solar flares - solar prominences - solar piages - satellites of planets -structure, phases and their features of moon.

Unit IV: Stars **[6 Periods]**
Constellations - binary stars - their origin and types star clusters –globular clusters - types of variable-Stars - types of galaxies.

Unit V: Origin of Universe **[6 Periods]**
Big bang theory - pulsating theory - steady state theory – composition of universe expansion

Book for study and reference :

1. K.D. Abyankar, “Astrophysics of the solar system, University press”, India (1999)

2. BaidyanathBasu, Sudhindra Nath Biswas and Tanuka Chattopadhyay, “An Introduction To Astrophysics, Prentice Hall Of India”, New Delhi (2010)

Semester: IV

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH4LC	**IDL -Biomedical instrumentation**	**2**	**2**	**-**	**-**	**IDL**

Subject Description
To give a complete exposure of various recording mechanism and physiological parameters measured for diagnostic application.

Objectives
- To study different types of electrodes used in biopotential recording.
- To understand the characteristics of bioamplifiers and different types of recorders.
- To understand how to measure various biochemical and nonelectrical parameters of human system.
- To study the instrumentation concerned with measuring the blood flow volume, velocity and number of particles in the blood.

Unit I **[6 Periods]**
Bio-potential electrodes

Electrode electrolyte interface, half-cell potential, polarisation and non- polarisable electrode, calomel electrode, needle and wire electrode, microelectrode-metal micropipete.

Unit II **[6 Periods]**
Recording system

Low-Noise preamplifier, main amplifier and driver amplifier, inkjet recorder, thermal array recorder, photographic recorder, magnetic tape recorder, X-Y recorder, medical oscilloscope.

Unit III **[6 Periods]**
Bio-chemical measurement

pH, pO_2, pCO_2, $pHCO_3$, Electrophoresis, colorimeter, spectro photometer, flame photometer, auto analyser.

Unit IV **[6 Periods]**
Non-electrical parameter measurements

Respiration, heart rate, temperature, pulse blood pressure, cardiac output, O_2, CO_2 measurements.

Unit V **[6 Periods]**
Blood flow and blood cell counting

Electromagnetic and ultrasonic blood flowmeter - indicator dilution method - thermo dilution method - manual and automatic counting of RBC, WBC and platelets - Electro Cardiography - Electro Myograph (EMG) - Ultrascan.

Book for Study:
1. Leslie Cromwell, “Biomedical Instrumentation and measurement”, Prentice hall of India, New Delhi, 1997.

Book for Reference :
1. John G. Webster, “Medical Instrumentation Application and Design”, John Wiley and sons, New York, 1998.
2. Khandpur R.S, “Handbook of Biomedical Instrumentation”, Tata McGraw-Hill, New Delhi, 1997.
3. Joseph J.carr and John M. Brown, “introduction to Biomedical equipment technology”, John Wiley and sons, New York, 1997.

Semester: IV

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH4LD	**IDL - Agriculture Physics**	**2**	**2**	**-**	**-**	**IDL**

Subject Description:
This paper presents the Fundamentals of soil physics, water physics, hygrometry, pumps and solar collector and their application.

Objectives
To enable the students to acquire the knowledge of Physics in Agriculture.

Unit I **[6 Periods]**
Soil physics
Mechanical composition of soil – physical properties of soil, pore space, bulk density, particle density – classification – significance of clays – plasticity, shrinkage, flocculation and deflocculation – Soil structure – soil colour – Thermal properties of soil and soil temperatures

Unit II **[6 Periods]**
Water physics
Water qualities – Rain fall – Ground water – surface water pollution – instrumentation and sampling – water quality monitoring

Unit III **[6 Periods]**
Principle of production of A.C. – Average value of A.C. voltage or current – R.M.S. value of alternating voltage or current – power consumed in A.C. Circuits – kilo watt hour – A.C. generator – Three phase A.C. – Distribution of three phase A.C. Three phase four system – The choke- The transformer – Transmission of electric power over long distances.

Unit IV **[6 Periods]**
Hygrometry
Absolute Humidity – Relative Humidity – Dew point, Daniell's Hygrometer, Regnault's hygrometer. Advantages of Regnault's hygrometer – wet and Dry and Bulb hygrometer

PUMPS
Water pumps – common pump – force pump – Fire engine, inflator (or) compression pump – pressure after n strokes – Exhaust pump (or) common air pump.

Unit V **[6 Periods]**
Solar Collector and Applications
Solar Air heaters- Application of solar air heaters. Solar Drying with various driers – Heating and Drying of Agricultural products – Theory of solar drying – moisture content and its measurement – solar ponds – Application of solar ponds

Book for Study:

1. H.O. Buckman and Brady, "Nature and properties of Soil" Macmillan (1974). (Unit I – V)

Book for Reference :

1. L.D. Bavar, Walter H. Gardner and Silford R. Gardner, "Soil physics"
2. H. KohnKoe , "Soil physics"
3. John C. Rodda, Richard A. Downing, Frank M. Law, "Systematic Hydrology" Newnes Butterworths (1976).

Semester-V

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH53A	**Core paper V - Mathematical physics and Classical Mechanics**	**4**	**5**	**1**	**-**	**C5**

Subject Description:

This paper presents the fundamentals of matrices, vectors, tensors and classical mechanics which will be used for studies solving problems during research work.

Objectives

To acquire knowledge and apply it to various physical problems

- To apply and develop the problem solving ability.
- To motivate the students to apply matrices or solving problems in spectroscopy, nuclear physics etc.,
- To gain knowledge about basics of classical mechanics.

Course Outcome:

CO1	:	To develop knowledge in the basics of matrix.
CO2	:	To understand the vector and its derivatives.
CO3	:	To acquire knowledge about tensor and its types.
CO4	:	To get knowledge about generalized coordinates and its applications.
CO5	:	To acquire knowledge about the application of Hamiltonian function.

Unit I Vector [**12 Periods]**

Directional derivatives and normal derivatives - Gradient of a scalar field and its geometrical interpretation - Divergence of a vector field- Curl of a vector field - Gauss' divergence theorem(Proof)- Deductions from Gauss' theorem- Simple problems.

Unit II Matrices **[12 Periods]**

Introduction – special types of Matrices – Transpose of a Matrix –Conjugate of a Matrix – Conjugate Transpose of a Matrix – Symmetric and Anti symmetric – Hermitian and skew Hermitian – Orthogonal and Unitary Matrices - Singular and Non-Singular matrices - Trace of a Matrix- Inner product- Properties – Simple problems.

Unit III Tensor **[12 Periods]**

Transformation of Co-ordinates- Einstein's Summation Convention- Kronecker Delta- Contravariant &Covariant Vectors - Contravariant, Covariant and Mixed Tensors- Algebra of Tensors. Sum, Difference & Product of Two Tensors - Quotient Law of Tensors- Symmetric and Antisymmetric Tensors.

Unit IV Classical Mechanics – I **[12 Periods]**

Constraints and Degrees of Freedom – Generalized co-ordinates – Generalized displacement , Velocity, Acceleration , Momentum, Force and Potential Energy – D'Alembert's Principle – Lagrangians equation from D'Alembert's principle – Application of Lagrange's equation of motion to linear harmonic oscillator, simple pendulum and compound pendulum.

Unit V Classical Mechanics – II **[12 Periods]**

Phase Space – Hamiltonian function – Hamiltonian Principle – Hamilton's canonical equations of motion- Physical significance of H – Applications of Hamiltonian equations of motion to simple pendulum, compound pendulum and linear harmonic oscillator.

Books for Study

1. Sathyaprakash, "Mathematical Physics with Classical Mechanics", Sultan & Sons Educational Publishing, New Delhi, 2013.
2. B D Gupta, "Mathematical Physics", Vikas Publishing House Pvt Ltd., Noida, 2016.
3. Gupta, Kumar & Sharma, "Classical Mechanics", Pragati publisher, 2015.

Book for Reference

1. B. S. Rajput, "Mathematical Physics" Pragati Editions, 2015
2. G.Aruldhas, "Classical Mechanics", PHI Learning Pvt. Ltd., New Delhi, 2016.
3. H.K. Dass , Rama Verma "Mathematical Physics", S Chand & Co Ltd**,** eight edition,2018.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	L		H			
CO2		L	H			
CO3		H			L	
CO4	H				L	
CO5			H		L	

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH53B	**Core paper VI - Solid State Physics**	**4**	**5**	**-**	**-**	**C6**

Subject Description:
This paper presents the fundamentals of solids and its bond theory which will be used for studying solids and how they are formed.

Objectives
To acquire knowledge of

- Various bond theory and to know the method of forming different alloys, conducting materials.
- To motivate the students in order to apply the principles of bond theory in their research studies.

Course Outcome:

CO1	:	To know the basic concept of the crystal and study its structure.
CO2	:	To know the characterization technique to study the structure of the material
CO3	:	To acquire knowledge about the different types of bonding between the atoms and the molecules.
CO4	:	To study the basic properties of the crystal by studying its properties by characterization techniques.
CO5	:	To know the basic types of magnetic materials and classification according to its properties.

Unit - I Crystal Structure **[12 Periods]**
Chemical bonding (Qualitative ideas) - Crystal lattice – primitive and unit cell – seven types of crystal – Bravais Lattice –Miller Indices – Structure of crystals – simple cubic, hexagonal close packed structure, face centred cubic structure, body centred cubic structure – Sodium chloride structure - Zinc Blende structure - Diamond structure.

Unit – II Dielectric Properties **[12 Periods]**
Dielectric materials - Polarization, susceptibility and dielectric constant - Local field or internal field - Clausius - Mossoti relation - Sources of polarizability – Electronic polarizability - lonic polarizability - Orientational polarizability - Frequency and temperature effects on polarization - Dielectric breakdown – Properties of different types of insulating materials.

Unit - III Magnetic Properties **[12 Periods]**
Different types of magnetic materials - classical theory of diamagnetism (Langevin theory) - Langevin theory of paramagnetism - Weiss theory of paramagnetism - Heisenberg interpretation on internal field and quantum theory of ferromagnetism - Antiferromagnetism - Hard and soft magnetic materials.

Unit - IV Defects in Solids **[12 Periods]**
X ray diffraction – Bragg's law in one dimension – Experimental methods – Laue Method, powder crystal method and rotating crystal method. Defects in solids – Point defects - Frenkel and schottky defects - Equilibrium concentrations - Line defects – Edge dislocation and screw dislocation - Surface defects - Grain boundary - Effects of Crystal imperfections.

Unit –V Superconductors **[12 Periods]**
Superconductivity - General properties - Type I and II Superconductors – High–Temperature SuperConductor- Meissner effect - BCS theory - London equations- Superconductivity at high frequencies- applications of super conductors (squid, cryotron, magnetic levitation)

Book for study

1. S.O.Pillai "Solid State Physics", New Age International (P) Ltd., 2002.
2. Kittel "Introduction to Solid State Physics", Willey Eastern Ltd. 2003.

Book for Reference

1. A. J.Dekker "Solid State Physics", Macmillan India, 1985.
2. HC Gupta "Solid State Physics", Vikas Publishing House Pvt. Ltd., New Delhi, 2001.
3. M.Arumugam "Materials Science", Anuradha Agencies Publishers, 2002.
4. R L Singhal" Solid State Physics", Kedarnath Ram Nath & Co., Meerut, 2003.

Mapping of Course Outcomes with Program Outcomes:

	Program Outcomes					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	L		H			
CO2	H			L	H	
CO3			H			L
CO4					H	
CO5	H			L	H	

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH5EA	**Electronics**	**4**	**5**	**-**	**-**	**EL1**

Subject Description:

This paper presents the fundamentals of electronics and its applications

Objectives

- To enable the students to acquire the knowledge in electronics and to study the various electronics circuits.
- To motivate the students to apply the concepts of electronics in their day – to – day life.

Course Outcome

CO1	:	To know the basic concept of diodes and transistors
CO2	:	To know the application of transistor as an amplifier
CO3	:	To acquire knowledge about working of diodes as a multivibrator.
CO4	:	To acquire knowledge about working of diodes as a clipper and clamper
CO5	:	To acquire knowledge about SCR, UJT, Triac and diac

Unit I Diodes and Transistors **[12 Periods]**

Classification of solids – types of diodes – characteristics of junction diode and Zener diode – transistors Application: half wave and full wave rectifier, Voltage doubler – PNP and NPN transistors – Characteristics of transistor: CB mode, CE mode, CC mode.

Unit II Amplifiers **[12 Periods]**

Classification of an amplifier – RC coupled voltage amplifier – Power amplifiers – Class A power amplifier – Transformer coupled class A power amplifier – Collector dissipation – push pull class B power amplifier – Feedback amplifier: feedback and related terms – block diagram of a feedback amplifier

Unit III Solid state switching circuits **[12 Periods]**

Introduction - Collector leakage current – Saturation collector current – Switching transistors – Switching action of an transistor – Multivibrator – Types of multivibrator –Astable multivibrator –mono stable multivibrator –Bistable multivibrator.

Unit IV Wave Shaping Circuits **[12 Periods]**

Differentiating circuit – Integrating circuit – Clipping circuit: positive clipper – negative clipper - biased clipper – combination clipper – applications of clipper- Clamping Circuits: Positive clamper – negative clamper.

Unit V Power Electronics **[12 Periods]**

Introduction –SCR – Construction, Working and characteristics – Triac – Construction –Operations – Characteristics – Applications of Triac – Diac – Operations – Applications of Diac: Lamp dimmer, Heat control – Uni-junction transistor – Constructions – Operations – equivalent circuit of UJT – Characteristics of UJT - advantages of UJT – UJT relaxations Oscillator – A/D and D/A conveters

Book for Study

1. D. Chattopadhyay, P C Rakshit, B.Saha, N.N. Purkait, "Foundations of Electronics", New Age International Publishers, New Delhi, 2015.
2. V.K.Mehta, Rohit Mehta, " Principles of Electronics", S.Chand and company, New Delhi,2015.

Books for Reference

1. Jacob Millman, Christos Halkias, Chetan D. Pouikh," Integrated Electronics Analog and Digital Criciuts and Systems", Tata Mc Graw Hill Education Pvt. Ltd., New Delhi, 2016.
2. Dr. R.S. Sedha, "A Textbook of Applied Electronics", S.Chand and Company Pvt. Ltd., New Delhi, 2016.
3. Millman and Halkias "Electronics devises and Circuits", Tata McGraw Hill India, 2007
4. Balbir Kumar and Shail B.Jain " Electronic Devices and Circuits" Kindle Edition

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	L			H	H	
CO2				H	L	
CO3			L	H		
CO4	L		H			
CO5			H			L

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH5EB	**Fibre Optic Communication Systems**	**4**	**5**	**-**	**-**	**EL1**

Subject Description:

This paper presents the fundamentals of Fibre optic and its applications in communications

Objective:

- To facilitate the knowledge about optical and fiber resources and transmission techniques.
- To enrich the idea of optical and fiber networks.
- To explore the trends of optical fiber measurement systems.

Course Outcome:

CO1	:	To develop knowledge in the basics of fibre optics
CO2	:	To understand the fabrication technique
CO3	:	To acquire knowledge about losses and dispersion in optics
CO4	:	To get idea about LED
CO5	:	To acquire knowledge about the applications of fibre optics in satellite link.

Unit I Fibre Classification **[12 Periods]**

Propagation of light waves in an optical fibre – Acceptance angle and Acceptance cone of a fibre – Numerical Aperture (NA) – NA of a graded Index fibre – Mode of propagation- Fibres – classification – stepped index fibre – stepped index mono mode fibre – Graded index multimode fibre – Comparison of step and graded index fibres.

Unit II Fibre Fabrication and Cables **[12 Periods]**

Classification of Techniques – External chemical vapour deposition – Characteristics – Internal chemical vapour deposition (1^{st} method only) – Characteristics – Phasil system - Fibre cable construction – losses incurred during installation of cable – Testing of cables– cable selection criteria.

Unit III Fibre Losses And Dispersion In Optics **[12 Periods]**

Attenuation in optic fibre– Rayleigh Scattering losses – Absorption losses – Bending losses – Radiation induced losses – Inherent defect losses – Core and Cladding losses-Dispersion in an Optical Fibre – Inter-modal dispersion – Material Chromatic Dispersion– Dispersion Power penalty – Total Dispersion delay.

Unit IV

Light Sources For Optical Fibres **[12 Periods]**

LED – The process involved in LEDS – Structures of LED – Fibre – LED Coupling Modulation bandwidth and Spectral Emission of LEDS.

Unit V Applications **[12 Periods]**

Introduction – Video Link Satellite Link – Computer Link – Nuclear Reaction Link – Community Antenna Television – Switched Star CATV – Networking

Books for study:

1 . Deshpande N.D, Deshpande D.A and Rangole P.K ,"Communication Electronics", Tata McGraw Hill Publishers Ltd (1996).
2. Dr. Subir Kumar Sarkar, " Optical Fibres and Fibre optics Communication System", S.Chand and Company Pvt. Ltd., New Delhi, 2014.
3. A.M.Dhake, "Television and Video Engineering ", Tata Mc Graw Hill Education Pvt. Ltd., New Delhi, 2012.

Book for reference:

1. MGeorge Kennedy ," Electronic Communication Systems", Tata McGraw Hill Publishers Ltd, New Delhi (2008).
2. Sanjeeva Gupta ,"Electronics Communication Systems", Khanna Publications, Salem (1992).
3. Bernard Grob , "Basic Television and Video Systems", McGraw Hill, New York (1997).
4. Govind P. Agrawal, "Fiber-Optic Communication Systems",3rd Edition, Kindle Edition.April 2008.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1			H		L	H
CO2				H	L	
CO3			L	H		
CO4	H	L				
CO5			H	L		

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH5EC	**Principles of Communication systems**	**4**	**5**	**-**	**-**	**EL1**

Subject Description:

This paper presents the fundamentals of electronics and its communication principles.

Objectives

- To enable the students to acquire the knowledge in electronics and to study the various electronic circuits.
- To motivate the students to apply the concepts of electronics and its principles in their day -to - day life.

Course Outcome

CO1	:	To gain basic knowledge about modulation and its different types.
CO2	:	To know about the demodulation of signals and the receivers.
CO3	:	To acquire the basic knowledge about television and its transmission
CO4	:	To study about the different types of antenna and transmission lines
CO5	:	To know about the digital codes and LEDs and its uses in communication.

Unit I Amplitude and Frequency Modulation [12 Periods]

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 [12 Periods]

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 [12 Periods]

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 [12 Periods]

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 [12 Periods]

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.

Books for study

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

Books for References

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 System” Prentice Hall PTR, 1993
6. Haykin Simon S, “Communication Systems”, Wiley , Fifth edition, 2007.
7. K.N. Hari Bhat D. Ganesh Rao “Principles of Communication Systems” ,Cengage India Private Limited,February 2017.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1			L	H		
CO2				H		L
CO3			H			
CO4	H		H	L		
CO5	H					H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH5ED	**Nanoscience**	**4**	**5**	**1**	**-**	**EL2**

Subject Description:

This paper presents the fundamentals of formation of nanomaterials and their properties

Objectives

To acquire knowledge about Nanoscience and Nano materials.

Course Outcome:

CO1	:	To acquire knowledge about the solid material and analyze its strength.
CO2	:	To know the types of synthesis and come to know how to prepare a sample.
CO3	:	To study the various types of synthesis according to the applications.
CO4	:	To characterize the sample in order to find its various behavior
CO5	:	To gain knowledge about the properties of a solid material by analyzing it in different characterizations.

Unit I Systematic Development of materials **[12 Periods]**

Introduction – Solid materials and their strength – perspective of length – Nanoscience and nanotechnology – Nanostructures in nature – Quantum structures – quantum confinement – Surface effects of Nanomaterials – prime materials – carbon nanostructures – oxides: Zinc oxide, Manganese oxide, Lanthanum – manganese based oxide.

Unit II Methods of generation of Nanomaterials : Physical approaches **[12 Periods]**

Introduction – Nanomaterials synthesis – Physical approaches – arc discharge method – Laser ablation – Aerosol synthesis – inert gas condensation – High energy ball milling (mechanical alloying method) – Chemical Vapor deposition – plasma synthesis method – Electro deposition.

Unit III Methods of generation of Nanomaterials : Chemical approaches **[12 Periods]**

Chemical Approaches – Solvothermal synthesis – Hydrothermal synthesis – Reverse micellar emulsion method – Sol - gel synthesis – microwave method – sonochemical process – Co – precipitation.

Unit IV Mechanical and optical properties of Nanomaterial **[12 Periods]**

Introduction – Mechanical behavior – Mechanical properties of Nanomaterials – Optical properties – Optical properties of Nanomaterials – Applications of optical properties of Nanomaterials.

Unit V Electrical and magnetic properties of Nanomaterial **[12 Periods]**

Introduction – Electrical properties – Dielectric materials and properties – Magnetic properties – Magnetic properties of Nanomaterials – Superparamagnetism – Electrochemical properties – Chemical sensing properties

Books for Study:

1. M.A.Shah, Tokeer Ahmad, "Principles of Nanoscience and Nanotechnology", Narosa publishing House Pvt. Ltd., 2015.

Books for reference

1. Nils O. Petersen, "Foundations for Nanoscience and Nanotechnology**"**, CRC Press; 1 edition (19 April 2017).

Mapping of Course Outcomes with Program Outcomes:

	Program Outcomes					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1		H		H	L	
CO2				L	H	
CO3	L			H	L	
CO4				L	H	
CO5		H		H	L	

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH5EE	**Energy Physics**	**4**	**5**	**1**	**-**	**EL2**

Subject Description: This paper presents the fundamentals of electrical, optical , atomic and molecular, thermal and non conventional energies

Objectives

To enable the learner

- To understand the use of energy resources and their application in day – today life

Course Outcome:

CO1	:	To know about the conventional energy uses and its advantages
CO2	:	To learn about the renewable energy sources and its applications in home appliances
CO3	:	To gain knowledge about biomass energy and its fundamentals
CO4	:	To acquire knowledge about biomass and its utilization
CO5	:	To know about all forms of energy and its waves and tides.

Unit I Conventional Energy Sources **[12 Periods]**

World's reserve - commercial energy sources and their availability – various forms of energy – renewable and conventional energy system – comparison – Coal, oil and natural gas – applications – Merits and Demerits

Unit II Solar Energy **[12 Periods]**

Renewable energy sources – solar energy – nature and solar radiation – components – solar heaters – crop dryers – solar cookers – water desalination (block diagram) Photovoltaic generation – merits and demerits

Unit III Biomass energy fundamentals: **[12 Periods]**

Biomass energy – classification – photosynthesis – Biomass conversion process

Unit IV Biomass Utilization **[12 Periods]**

Gobar gas plants – wood gasification – advantages & disadvantages of biomass as energy source

Unit V Other forms of energy sources **[12 Periods]**

Wind energy : power in wind – types of wind energy systems – horizontal axis wind turbine -vertical axis wind turbine – Solar thermal – solar photovoltaic - Geothermal energy – Ocean thermal energy conversion – energy from waves and tides (basic ideas)

Books for Study:

1. D.P. Kothari, K.C. Singal & Rakesh Ranjan, -"Renewable energy sources and emerging Technologies", by Prentice Hall of India pvt. Ltd., New Delhi (2008)

Books for Reference:

1. S.A. Abbasi and Nasema Abbasi , "Renewable Energy sources and their environmental impact" –PHI Learning Pvt. Ltd., New Delhi (2008)
2. Donald H.Perkins, "Introduction to High Energy Physics", Fourth Edition, Addison Welsey Publishing Company, 2013.

Mapping of Course Outcomes with Program Outcomes:

	Program Outcomes					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	H		H			
CO2			L	H		
CO3				H	L	
CO4			H			
CO5	H				L	

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH5EF	**Characterization of Nano Materials and its Applications**	**4**	**5**	**1**	**-**	**EL2**

Subject Description:

This paper presents the fundamental methods of formation of nanomaterials and their analysis studies.

Objectives

To acquire knowledge about Nanoscience and Nano materials.

Course Outcome:

CO1	:	To acquire knowledge about the solid material and analyze its strength.
CO2	:	To know the types of synthesis and come to know how to prepare a sample.
CO3	:	To study the various types of synthesis according to the applications.
CO4	:	To characterize the sample in order to find its various behavior
CO5	:	To gain knowledge about the properties of a solid material by analyzing it in different characterizations.

Unit I Methods of sample preparation **[12 Periods]**

Introduction – Chemical fixation technique – Cyro Fixation Technique – Dehydration – Embedding Biological samples Sectioning – Staining – Mechanical milling – Chemical etching – Ion etching – Conductive coating

Unit II Structure of Nanomaterials **[12 Periods]**

Introduction – Structure of Nanomaterials – X - ray diffraction (XRD) – The Laue method – The rotating crystal method – The powder method – Determination of grain size/ crystallite size using X - ray line broadening studies (Scherrer's formula) – Determination of crystallite size distribution using X - ray line Shape analysis – X- ray diffraction pattern and analysis of some commercially important oxides – Small angle X- ray scattering

Unit III Electron microscopy **[12 Periods]**

Introduction – Principles of electron microscopy – Scanning electron microscope (SEM) – Strength and limitations of Scanning electron microscopy – Energy dispersion X-ray Analysis (EDX) – Transmission Electron microscope (TEM) – Scanning Tunneling Microscope – Atomic Force microscope (AFM)

Unit IV Spectroscopy Techniques **[12 Periods]**

Introduction – The regions of spectrum – Characterization of electromagnetic radiations – The quantization of energy – Absorption spectroscopy – Photoluminescence – Fourier transform infrared spectroscopy – Raman spectroscopy

Unit V Applications of Nanomaterials **[12 Periods]**

Introduction – Nanomaterials in medicine – Longer - lasting medical implants – Nanomaterials in energy sector – Kinetic energy (KE) penetrators with enhanced lethality – High energy density batteries- Nanomaterials in catalysis – High - sensitivity sensors – Nanomaterials for water purification – Nanomaterials in food –Nanomaterials for the environment – Elimination of pollutants

Book for study:

1. M.A.Shah, Tokeer Ahmad, " Principles of Nanoscience and Nanotechnology", Narosa publishing House Pvt. Ltd., 2015.

Books for reference

1. Nils O. Petersen, "Foundations for Nanoscience and Nanotechnology**"**, CRC Press; 1 edition (19 April 2017).

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	H				H	
CO2			L		H	
CO3		L			H	
CO4				H	L	
CO5		L			H	

SEMESTER-V

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH53P	**Core practical-V Major Practical V - Electronics**	**4**	**-**	**-**	**3**	**CP5**

Course Outcome:

CO1	:	To acquire knowledge about RC regulated power supply, voltage doubler
CO2	:	To acquire knowledge about application of transistor as CB and CE mode.
CO3	:	To get practical knowledge about mutivibrator
CO4	:	To get practical knowledge about various types of amplifiers and oscillator
CO5	:	To gain knowledge about characteristics of FET and UJT

List of experiments (any 8 experiments)

2. Construction and study of IC Regulated Power Supply
3. Voltage doubler
4. Characteristics of transistor- common base mode
5. Characteristics of transistor- common emitter mode
6. RC-Coupled Amplifier –Single Stage
7. Feedback Amplifier
8. Emitter Follower
9. Hartley Oscillator
10. Astable multivibrator using Transistor
11. Monostable multivibrator using Transistor
12. FET characteristics
13. UJT Characteristics

Mapping of Course Outcomes with Program Outcomes:

	Program Outcomes					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	L				H	L
CO2			H		H	
CO3		L	H		H	
CO4				H	H	
CO5			H	H	H	

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH5ZC	**Skill Enhancement courses – III : Concepts of Physics**	**4**	**5**	**-**	**-**	**S3**

Subject Description:

This paper presents the basic knowledge about scientific fact in physics

Objective

- To gain knowledge about applications of the principles of physics.
- To enable the students in order to how basics of physics applied in day to day life.

Course Outcome:

CO1	:	To acquire basic knowledge on renewable energy sources
CO2	:	To get the idea about astrophysics and and the energy resources
CO3	:	To implement the environmental impacts on the concepts of physics
CO4	:	To effectively use energy sources based on the required applications
CO5	:	To develop the principles of physics into application

Unit I Atmosphere **[12 Periods]**

Cosmic Rays - Ozone Layer - CFCs role in depletion - Solar Wind and Earth – Lightning (conducting medium to Earth) - Fragmentary Rainbows - Measurement of Rain - Rain colour of clouds-Reason for continous stream-Cloud bursts-Artificial Rain - Rainbows (Size, doubleness)

Unit II Introduction to Energy Sources **[12 Periods]**

Conventional energy sources: Coal – Gas – Water – Agriculture and organic waste – Non conventional sources: Solar energy – Renewable energy resources**.**

Unit III Applications of Solar Energy **[12 Periods]**

Introduction - Solar water heating- Space heating: Passive heating systems - Thermal storage wall – Roof storage - Solar cell principle – Solar cell modules - Applications of solar photovoltaic system.

Unit IV Space **[12 Periods]**

Saturn rings - Measurement of temperature of planets and stars -Asteroids - Rotation of Earth - Shooting stars and comet s-Atmosphere of stellar bodies - Flat plane orbits of Planets**.**

Unit –V Home Appliances **[12 Periods]**

Microwave ovens - Pressure cooker - Richter scale - Humming sound in Tension wires - Curved Fan wings - Sodium vapour lamp in streets - Tube Lights: Role of chokes of Starter, Reason for no sharp shadows – Photocopier – Thermostat.

Books for study

R.Murugeshan. Er. Kiruthiga Siva Prasath, "Modern Physics", S.Chand and Company Pvt. Ltd., New Delhi, 2016.

Book for Reference :

1. The Hindu speaks on scientific facts, Kasturi & Sons Ltd (2002).
2. The Hindu speaks on scientific facts Volume II, Kasturi & Sons Ltd (2004).

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1			H	L		
CO2	L		H			
CO3		L		H		H
CO4				H		H
CO5		H	L		H	

Semester V

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH5VA	**Basics of Electrical wiring**	**2**	**-**	**-**	**-**	**VAC**

Subject Description: This paper provides the knowledge about basics of electrical wiring

Goal: To enable students to acquire basic knowledge wiring in house hold appliances.

Objective: On successful completion of this paper the students gain the knowledge about wiring

Unit I

Electricity conductor, insulator, and resistance - Concept of basic Electricity - Single phase & three phase circuits - Measurement of Electrical quantities like Voltage,- Currents – Resistance - Impedance, power factor and energy

Unit II

Fires in electrical Circuits - Precautions - General Safety of Tools - equipment - Tools required for marking - punching – cutting – drilling - filing - stripping – crimping - socketing - fixing glands - screws - Measuring tools, wire gauges etc. Classification

Unit III

Definition and testing procedure of voltage current power MCB and bus bars - Earthling Connection – Different earthling systems

Unit IV

Serial and parallel connection – diagram Series - Direct Board-different types

Unit V

Two way switch-wiring - Theatre wiring/master switch wiring - Hospital wiring/ room wiring - 3 phase wiring-Fans ,Tube light.

Book for study

1. V.N.Mittle, Arvind Mittel, “basics Electrical engineering”, Mcgraw Hill publisher,2015

SEMESTER- VI

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH63A	**Core paper VII Quantum Mechanics and Relativity**	**5**	**5**	**1**	**-**	**C7**

Subject Description: This paper presents the fundamentals of wave mechanics, Schrödinger's wave equation and its applications.

Objectives

- To acquire knowledge and apply it to various physical problems
- To enhance the problem solving ability.
- To motivate the students to apply Schrödinger's equation or solving problems in wave
- mechanics, nuclear physics etc.,

Course Outcome:

CO1	:	To acquire basic knowledge about wave properties of matter
CO2	:	To get the idea about uncertainity principles and its applications
CO3	:	To acquire knowledge about Schordinger equations and postulates of quantum mechanics
CO4	:	To effectively apply Schordinger equations
CO5	:	To acquire knowledge about Relativity

Unit I Wave Properties of Matter **[15 Periods]**

Introduction – Phase velocity and Group velocity – Analytical expression for a group of waves – Nature of De'Broglie relation – Derivation of the De'Broglie relation – Phase velocity of De'Broglie waves – Relation between the Phase velocity and the wavelength of De'Broglie wave– De'Broglie wavelength associated with a particle of mass M and kinetic energy – Verification of De'Broglie relation – Davission and Germer's experiments – G P Thomson's experiments.

Unit II Uncertainty Principle **[15 Periods]**

Introduction – Heisenberg's Uncertainty Principle – Elementary proof between displacement and momentum – Energy and Time – Physical Significance – Illustration – Diffraction of electrons – Gamma ray microscope – Application – Non-existence of free electrons in the nucleus – Size and Energy in the ground state of Hydrogen atom

Unit III Schrödinger's Wave Equation **[15 Periods]**

Introduction – Wave function for a free particle – Schrödinger's One dimensional wave equation – Time-dependent and Time independent – Physical interpretation – Eigen function – Eigen Value – Eigen equation – Operator for Momentum, Kinetic Energy and Total Energy – Postulates of Quantum Mechanics –Proof

Unit IV Applications of Quantum mechanics **[15 Periods]**

Particle in a box – Particle in a rectangular three dimensional box – Simple Harmonic oscillator – Reflection at a step potential – transmission across a potential barrier: the Tunneling effect

Unit V – Relativity **[15 Periods]**

Introduction – Galilean Transformation equations – Ether Hypothesis – Michelson - Morley experiment – Explanation of the Negative results – Special theory of Relativity – Lorentz transformation equations – Length contraction – Time dilation – Addition of Velocities – Variation of Mass with velocity – Mass energy equivalence.

Books for Study:

1. Kamal Singh, S.P.Singh, "Elements of Quantum Mechanics", S. Chand and Company Pvt. Ltd., New Delhi, 2016.
2. R.Murugeshan. Er. Kiruthiga Siva Prasath, "Modern Physics", S.Chand and Company Pvt. Ltd., New Delhi, 2016

Books for Reference:

1. Leonard, Schiff, Jayendra Bandhyopadhyay, "Quantum Mechanics", Mc Graw Hill Education (India) Pvt. Ltd., New Delhi, 2016.
2. Gupta, Kumar and Sharma, "Quantum Mechanics", Jai PRakash Nath publications, Meerut, 2017.
3. J P Singh, "Relativistic Quantum Mechanics", I.K International Publishing House Pvt. Ltd, 2013.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1			H	L	H	
CO2		L			H	
CO3		H		H		
CO4		H		L		H
CO5			L	H		

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH63B	**Core-VIII: Atomic And Nuclear Physics**	**4**	**5**	**-**	**-**	**C8**

Subject Description:

To analyze the positive rays, atom models in various aspects, spectral lines which is subjected magnetic and electric fields and presents the fundamentals of nucleus and its composition.

Objective:

- To provide the detailed study of positive ray and atomic models.
- To learn the impact of magnetic fields on spectra and behavior of atom in various states.
- To study the structure of nucleus and its formation, binding energy.

Course outcome:

CO1	:	To learn about the cathode ray, its discovery and properties
CO2	:	To know about vector atom model and some basic concepts about the function of electrons under magnetic and electric fields
CO3	:	To learn and analyze the spectral lines of different atoms and its fine structures
CO4	:	To learn about the basic concept of nucleus and its properties
CO5	:	To understand and analyze the application of nuclear fission fusion

Unit I Cathode Rays **[12 Periods]**

Cathode rays – properties – e/m of cathode rays – Milliken's oil drop method – Positive rays –Properties – e/m of Positive rays: Thomson's parabola method – Aston's Bain's bridge - Determination of critical Potential – Franck and Hertz's experiment - Davi'srs and Goucher method.

Unit II Vector Atom model **[12 Periods]**

Various quantum numbers, L-S and j-j Couplings – Pauli's exclusion principle – electronic configuration of elements and periodic classification – magnetic dipole moment of electron due to orbital and spin motion – Bohr magnet ion stern and Gerlach experiment.

Unit III Fine structure of special lines **[12 Periods]**

Special terms and notations – selection rules- intensity rule and internal rule – Fine structure of sodium D lines – Alkali spectra – Fine structure in Alkali spectra – spectrum of Helium – Zeeman effect - Larmor's theorem – Debye's quantum mechanical explanation of the normal Zeeman effect – Anamolous Zeeman effect – theoretical explanation, Lande's 'g' factor and explanation of splitting of D1 and D2 lines of sodium.

Unit IV Nucleus I **[12 Periods]**

Review of basic properties of nuclei – mass, radius, binding energy, nuclear moments – isotopes – isobars – radioactivity cyclotron – Betatron – Geiger Muller counter – cloud chamber – Q value of nuclear reaction – discovery of neutron, positron.

Unit V Nucleus II **[12 Periods]**

Liquid Drop Model – application to fission, fission fragments, neutrons in fission process – nuclear energy – thermo nuclear reactions – atom bomb. Shell Model – magic numbers – spin orbit coupling – Basic ideas of a nuclear reactor. Bethe's Theory of fusion – Solar energy – hydrogen bomb. Basic classification of subatomic particles – photons, leptons – meson – baryons.

Book for Study:

1. R.Murugeshan. Er. Kiruthiga Siva Prasath, "Modern Physics", S.Chand and Company Pvt. Ltd., New Delhi, 2016.

Books for Reference

1. N.K. Sehgal , K.L. Chopra , D.L. Sehgal, " Modern physics", Sultan Chand And Sons, 2014.
2. Colin N Banwell and Elaine M. McCash, " Fundamentals of Molecular Spectroscopy", Mc Graw Hill Education Pvt. Ltd., New Delhi, 2016.
3. Arthus Beiser, Concept of Modern Physics: Mc Graw Hill Ed. V (1999).
4. Semat**,** Henry, "Introduction to Atomic and Nuclear Physics", Springer US, 1972.

Mapping of Course Outcomes with Program Outcomes:

	Program Outcomes					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	H			H		
CO2		L			L	
CO3			H			
CO4			L			
CO5		H		H	H	

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH6EA	**Biophysics**	**4**	**5**	**-**	**-**	**EL3**

Subject Description:

This paper presents the fundamentals of biomolecules and its studies.

Objectives:

- To Facilitate the knowledge about biomolecules
- To Explore the trends of optical techniques.

Course Outcome:

CO1	:	To study the basic concepts of bio molecules and its various structures
CO2	:	To know about the kinetics of molecules and its process
CO3	:	To study the significance of molecules and its characteristics.
CO4	:	To know the characterization techniques of biological samples.
CO5	:	To study about the bioelectricity and radioactivity.

Unit I Structure of Biomolecules **[12 Periods]**

Introduction - Atomic structure - Hydrogen atom - Bonds between atoms and molecules - secondary or weak bonds - Bond energy - Disulphate bonds – Peptide bond - Structure of Proteins - Molecular weight determination - Kinetic methods - Static methods - Structure of nucleic acids - DNA - RNA.

Unit II Kinetics of Molecules I **[12 Periods]**

Diffusion Factors affecting diffusion·- Simple diffusion – Fick's law of diffusion - Diffusion of electrolytes - Biological significance of diffusion

Osmosis: Osmosis - Osmotic pressure - Laws of osmosis - osmometry - osmotic pressure of electrolytes.

Filtration: Filtration - Passage of fluid though blood vessels - Formation of Urine- Dialysis Principle of dialysis in artificial kidney - kinds of dialysis.

Unit III Kinetics of Molecules II **[12 Periods]**

Adsorption: Adsorption - Factors affecting adsorption - Adsorption of ions by Solids and Liquids - adsorption of Gases by solids - Biological significance of adsorption.

Hydrotropy : Hydrotropy - Biological importance of hydrotropy.

Precipitation: Precipitation - Biological significance.

Colloids: Types of colloids - characteristics of colloids - stability of colloids - Gel - Emulsions - Techniques for the separation of colloids - Biological importance of colloids – Gibb's Donnan Equilibrium.

Unit IV Optical Techniques in Biological Studies **[12 Periods]**

Characteristics of light- compound· microscope - Ultraviolet microscope - Electron microscope - Transmission electron microscope - Scanning Electron microscope - Monochromator - Light sensitive detectors- Spectrophotometer - Atomic absorption flame photometer - Electromagnetic radiation Spectroscopy - Ultraviolet, visible, infrared and fluorescent spectroscopy - Atomic absorption and emission spectroscopy - mass spectroscopy - Raman spectroscopy – x ray diffraction crystallography.

Unit V Bioelectricity and Radiation Biology **[12 Periods]**

Membrane potential - Resting membrane potential - Action potential and nerve impulse conduction Rate of nerve impulse conduction- Recording of nerve impulses by C.R.O - Resting membrane potential -.J Injury potential- Monophasic and diphasic action potentials - Radioactivity - Natural radioactivity Artificial or induced radioactivity - Radioactive disintegration - units of Radioactivity.

Books for Study

1. M.A. Subramanian, "Biophysics Principles and Techniques ", MJP Publishers – Chennai

Books for reference

1. Dr.S.Palanichamy & Dr.M.Shanmugavelu, "Principles Of Biophysics", Palani Paramount Publications – Palani.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	H				L	
CO2			L	H		
CO3			H		L	
CO4				H		
CO5	H					L

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH6EB	**Digital electronics and Microprocessor**	**4**	**5**	**-**	**-**	**EL3**

Subject Description

This paper presents basic principles of digital electronics. Students can acquire knowledge regarding number systems, arithmetic building blocks, memories and data processing circuits and Microprocessor.

Objective:

To give description for the student in order to

- Learn the logic circuits.
- Acquire basic knowledge of binary addition
- Understand the action and application of counters.

Course Outcome:

CO1	:	To learn the number system and binary arithmetic operations.
CO2	:	To acquire basic knowledge of logic gates and its applications.
CO3	:	To understand the action and application of flip flops and counters
CO4	:	To knows the Arithmetic, Data processing circuits and Shift Register
CO5	:	To get a deep knowledge of Microprocessor

Unit I Number System, Binary Arithmetic and Binary Codes [12 Periods]

Decimal , Binary , Octal , Hexadecimal number system – Conversion from one system to another system-Binary arithmetic operations-Representation of negative number-Binary subtraction using 1's and 2's compliment-weighted codes-non weighted codes-alpha numeric codes: ASCII code – EBCDIC - Parity : even parity and odd parity method of single bit error detection

Unit II Logic gate, Logic circuits, Boolean Algebra and Karnaugh map [12 Periods]

Basic Logic gates (NOT,OR,AND) – Universal building blocks (NAND and NOR gates) – EX-OR and EX-NOR gates- construction of basic gates using discrete components - Law of Boolean algebra- DeMorgan's theorems– Simplifications of Boolean expressions – Karnaugh maps - constructions – Simplification of Boolean expressions using Karnaugh maps.

Unit III Flip- flops and Counters [12 Periods]

R-S flip flop – D flip flop- JK flip flop – Master slave J-K flip flop –Edge triggered flip flops. Asynchronous and synchronous counters - Ring counters- Modulus counters - Mod 3, Mod 5 and Decade counters.

Unit IV Arithmetic, Data processing circuits and Shift Register [12 Periods]

Half and full adder – half and full subtractor – parallel binary adder and subtractor –Multiplexer-
De- multiplexer-Encoder-Decoder-Serial in serial out shift register-Parallel in parallel out shift registers.

Unit V Microprocessor [12 Periods]

Basic concept – Organization of Microprocessor – Organization of 8085 – Data and Address bus addressing – The I/O devices – Registers in 8085 – Instruction types – Classification of Instruction – Addressing modes – Programming 8085 – The programming process – machine language programming – Assembly language Programming – The instruction format, Assembler directives, Constant in assembly programming – Language for writing algorithms – The Stack – Subroutines.

Books for study:

1. Digital principles and applications, Albert Paul Malvino & Donald P Leach, Tata McGraw Hill, New Delhi I(1999).
2. Digital fundamentals Floyd , Tata McGraw Hill, New Delhi(1995).
3. Digital logic and computer design M.Morris Mano,Prentice-Hall of India Pvt.Ltd, NewDelhi (2006).
4. Introduction to Microprocessors by Aditya P Mathur (3rd Edition TMH)

Books for reference:

1. Introduction to Integrated electronics digital and analog, V.Vijayendaran, S.Vishwanathan Printers and Publishers Pvt.Ltd (reprint 2011).
2. A K Singh, "Digital Principles Foundation of Circuit Design and Application", New Age International Publishers,2014.

Mapping of Course Outcomes with Program Outcomes:

	Program Outcomes					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	H				H	
CO2			L	H	L	
CO3	L	H			H	
CO4	H				L	
CO5			L		H	

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH6EC	**Geo physics**	**4**	**5**	**-**	**-**	**EL3**

Subject Description:

This paper presents the fundamentals of geographic state of earth through physics.

Objectives

- To acquire knowledge about Seismology.
- To acquire knowledge about earth quakes.

Course Outcome:

CO1	:	To know about Seismology and its various factors.
CO2	:	To learn about surface waves and Seismometry.
CO3	:	To learn about the earthquakes and and gravity.
CO4	:	To acquire knowledge about Geomagnetism and Internal structure of the Earth
CO5	:	To study about the Geochronology and Geothermal Physics

Unit I Introduction and Seismology: **[12 Periods]**

Introduction - Seismology: P waves, S waves, their velocities - Time distance curves and the location of epicenters - Effect of boundaries - Major discontinuities and resulting phase of seismic waves - Derivation of properties from the velocities.

Unit II Surface Waves and Seismometry: **[12 Periods]**

Surface waves: Rayleigh waves and Love waves – and Study of earth by surface waves.

Seismometry: Horizontal seismograph and seismography equation – Strain seismograph.

Unit III Earthquakes and Gravity: **[12 Periods]**

Earthquakes: Focus, magnitude, frequency - Detection and prediction - Gravity: The potential (Laplace's equation and Poisson's equation) - Absolute and relative measurements of gravity - Hammond Faller method - Worden gravimeter.

Unit IV Geomagnetism and Internal structure of the Earth: **[12 Periods]**

Geomagnetism: Fundamental equations - Measurements: method of Gauss, saturation induction magnetometers, proton precession magnetometers, alkali vapour magnetometers - Theories of earth's magnetism - Causes of the main field -Dynamo theories – Internal structure of the earth: The core Variation of mechanical properties with depth - Materials and equation of state of the interior of the earth.

Unit V Geochronology and Geothermal Physics: **[12 Periods]**

Geochronology: Radioactivity of the earth - Radioactive dating of rocks and minerals Geological time scale - The age of the earth - Geothermal physics: Flow of heat to the surface of the earth - Sources of heat within the earth - Process of heat transport internal temperature of the earth.

Books For Study:

1. Garland, G.D., "Introduction to Geophysics", 11 Ed., WB Saunder Company, London, l 979.
2. Cook, A. H., "Physics of the Earth and Planets", I Ed., McMillan Press, London, 1973.

Books For Reference

1. Dr. El-Arabi H. Shendi, "Introduction Of Geophysics", Suez Canal University,2007.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	H		H		H	
CO2	L					
CO3	H			L	H	
CO4			H			
CO5	L			H	L	

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH63P	**Major Practical VI : Digital Electronics and Microprocessor**	**4**	**-**	**-**	**3**	**CP7**

CO1	:	To have a practical knowledge about gates and its applications.
CO2	:	To acquire basic knowledge microprocessor.

Any 6 from each section

Section – A

Digital Electronics

1. Logic gates using IC – Verification of truth tables and DeMorgan's theorem
2. NOR and NAND gates – Universal building blocks
3. Half adder and Full adder
4. Half subtractor and Full subtractor
5. Analog to Digital convertor
6. Digital to Analog convertor.
7. Op-Amp LM741 as adder, subtractor and scalar.
8. Op-Amp LM741 as inverting and non inverting amplifier

Section – B

Microprocessor

1. 8085-ALP for 8 Bit addition, Subtraction
2. 8085-ALP for one's compliment, masking off most significant 4 bits and setting bits.
3. 8085-ALP for 8 Bit Multiplication and Division
4. 8085-ALP for finding the biggest element in the array and sum the element in the array
5. 8085-ALP to sort the array in descending order and ascending order
6. 8085-ALP to count the number of zeros, +ve, -ve number and square of a number
7. ALP- Matrix addition.
8. 8085-ALP for ASCII to decimal conversion, BCD to Hex conversion, Hex to Decimal conversion and Hex to binary form

Mapping of Course Outcomes with Program Outcomes:

	Program Outcomes					
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1		H			L	H
CO2		L				H

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BPH6ZD	**Skill based Subject – Internet of Things and Arduino**	**4**	**5**	**1**	**-**	**S4**

Subject Description:
This paper presents the fundamentals Internet of things, Microcontroller and Arduino.

Objectives

- To acquire knowledge about Internet of things.
- To acquire knowledge about Microcontroller and Arduino.

Course Outcome:

CO1	:	To learn and understand the basic concept of Internet of things
CO2	:	To know the basics of microcontroller and its input and output ports
CO3	:	To acquire new knowledge about interfacing the devices for applications using microcontroller chips.
CO4	:	To know the installation of software and run it by programs
CO5	:	To apply the program in Arduino to make an application product

Unit I Internet of things **[12 Periods]**
Introduction to IOT – Definitions – Enabling technologies – open problems – future challenges – Applications IOT PROTOCOLS, IOT Communication Models, IOT Communication APIs, IOT Enabling Technologies

Unit II Microcontroller **[12 Periods]**
Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

Unit III Interfacing Microcontroller **[12 Periods]**
Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation.

Unit IV Arduino **[12 Periods]**
Introduction – install the software – The integrated development environment (IDE) – operators – statements: IF, ELSE, WHILE, FOR – Arrays – library functions - Circuits and programs

Unit V Programming in Arduino **[12 Periods]**
Programs using IF, ELSE, WHILE, FOR statements – programs using Arrays – Circuit and program: one button and an LED, two buttons and an LED, potentiometer, RGB LEDs, Simple note, music

Books for Study

1. Kenneth J. Ayala, Dhananjay V. Gadre, "The 8051 Microcontroller and Embedded systems using Assembly and C", Cengage Learning Pvt. Ltd., New Delhi. 2010.
2. Alan G. Smith," Introduction to Arduino",2011.

Books for Reference

1. Arshdeep Bahga & Vijay audisetti ,"Internet of Things: A Hand - on Approach", UniversityPress,2010.
2. Marco Schwartz, "Internet of Things", PackT Open Source publishers, 2016.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	L		H	H	H	
CO2		L				
CO3			H		L	
CO4	H					
CO5		H	H		H	