



VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN

[Autonomous]

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An ISO 9001 : 2008 Certified Institution

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Recognized under section 2(f) and 12(B) Under UGC Act, 1956

Elayampalayam – 637 205. Tiruchengode, Namakkal Dt., Tamil Nadu

VIVEKANANDHA
EDUCATIONAL INSTITUTIONS

1.1 Curriculum Design and Development

1.1.2 Syllabus Revision

B.Sc., - PHYSICS

(2020-21)

**PG AND RESEARCH DEPARTMENT
OF PHYSICS**

SCHEME OF EXAMINATIONS - UG PHYSICS
(For the candidates admitted during the academic year 2018-19 onwards)

Sem	Subject code	Part	Course	Subjects	Hrs/week	Credits	Int. marks	Ext. marks	Tot. marks
I	18U1LT01	I	Language-I	Tamil-I	6	3	25	75	100
	18U1LH01			Hindi-I					
	18U1LM01			Malayalam-I					
	18U1LE01	II	English-I	English-I	6	3	25	75	100
	18U1MAA01	III	Allied-I	Allied- Mathematics-I	5	3	25	75	100
	18U2MAAP01		Allied	Allied Mathematics Practical	3	-	-	-	-
	18U1PHC01	III	Core-I	Major-I- Properties of Matter & Acoustics	5	5	25	75	100
	18U2PHCP01		Core	Major Practical-I	3	-	-	-	-
	18U1VE01			Value education – (Yoga)	2	2	25	75	100
Total					30	16	125	375	500
II	18U2LT02	I	Language-II	Tamil-II	6	3	25	75	100
	18U2LH02			Hindi-II					
	18U2LM02			Malayalam-II					
	18U2LE02	II	English-II	English-II	6	3	25	75	100
	18U2MAAP01	III	Allied	Allied Mathematics Practical	3	3	40	60	100
	18U2MAA02		Allied-II	Allied- Mathematics-II	5	3	25	75	100
	18U2PHC02	III	Core-II	Major-II- Heat and Thermodynamics	5	5	25	75	100
	18U2PHCP01		Core	Major Practical-I	3	4	40	60	100
	18U2ES01	IV		Environmental studies	2	2	25	75	100
Total					30	23	205	495	700
III	18U3LT03	I	Language-III	Tamil-III	6	3	25	75	100
	18U3LH03			Hindi-III					
	18U3LM03			Malayalam-III					
	18U3LE03	II	English-III	English-III	6	3	25	75	100
	18U3CHA01	III	Allied-III	Allied Chemistry-I	4	3	25	75	100
	18U4CHAP01		Allied	Allied chemistry Practical	2	-	-	-	-
	18U3PHC03	III	Core-III	Major-III- Optics	4	5	25	75	100
	18U4PHCP02		Core	Major Practical-II	3	-	-	-	-
	18U3PHS01	IV	SBEC-I	Laser Technology	3	3	25	75	100
18U3PHN01	IV	NMEC-I	Essentials of Electricity	2	2	25	75	100	
Total					30	19	150	450	600
IV	18U4LT04	I	Language-IV	Tamil-IV	6	3	25	75	100
	18U4LH04			Hindi-IV					
	18U4LM04			Malayalam-IV					
	18U4LE04	II	English-IV	English-IV	6	3	25	75	100
	18U3CHA02	III	Allied-IV	Allied Chemistry-II	4	3	25	75	100
	18U4CHAP01		Allied	Allied chemistry Practical	2	3	40	60	100
	18U4PHC04	III	Core-IV	Major-IV- Mechanics	4	5	25	75	100
	18U4PHCP02	III	Core	Major Practical-II	3	4	40	60	100
	18U4PHS02	IV	SBEC-II	Energy Physics	3	3	25	75	100
18U4PHN02	IV	NMEC-II	Physics in Everyday Life	2	2	25	75	100	
Total					30	26	230	570	800
V	18U5PHC05	III	Core-V	Major-V- Electricity and magnetism	6	5	25	75	100
	18U5PHC06	III	Core-VI	Major-VI- Basic electronics	5	5	25	75	100

	18U5PHC07	III	Core-VII	Major-VII- Quantum mechanics and its relativity	5	5	25	75	100
	18U5PHE01	III	Elective-I	Elective-I- Solid state physics	5	5	25	75	100
	18U5PHS03	IV	SBEC-III	Electrical Appliances	3	3	25	75	100
	18U6PHCP03	III	Core	Core Practical-III	3	-	-	-	-
	18U6PHCP04	III	Core	Core Practical-IV	3	-	-	-	-
				Total	30	23	125	375	500
VI	18U6PHC08	III	Core-VIII	Major-VIII- Atomic Physics	6	5	25	75	100
	18U6PHC09	III	Core-IX	Major-IX- Nuclear Physics	5	5	25	75	100
	18U6PHE02	III	Elective-II	Elective- Electronics and Communication	5	5	25	75	100
	18U6PHE03	III	Elective-III	Elective - Numerical methods	5	5	25	75	100
	18U6PHS04	IV	SBEC-IV	Bio-medical instrumentation	3	3	25	75	100
	18U6PHCP03	III	Core	Core Practical-III	3	4	40	60	100
	18U6PHCP04	III	Core	Core Practical-IV	3	5	40	60	100
	18U6EX01	-	-	Extension activity	-	1	-	-	-
				Total	30	33	205	495	700
			Overall Total	180	140	1040	2760	3800	

ELECTRICITY AND MAGNETISM

Paper Code: 18U5PHC05

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

Goal: To enable the students in order to learn the basic principles theory and concepts of Electricity.

Objective:

- To gain knowledge about the principle and working of electrical circuits.
- Acquire basic knowledge about handling electrical circuits.
- Know about types of electricity.

Unit - I: Electrostatics

12

Introduction - Electric field and Electric intensity – Force between a point charge and linear charge distribution - Electrostatic potential - Potential and intensity at a point due to a dipole - Electric potential at a point due to an electric quadrupole and a charged sphere - Electric potential energy - Energy of a system of charges-Gauss theorem - Applications of gauss theorem - Coulomb's law-Mechanical force experienced by unit area of a charged surface - Energy stored per unit volume in an electric field – Capacitor - Capacitance of a spherical and cylindrical capacitor - energy of a charged capacitor

Unit - II: Magnetic Effect of Electric Current

5%

12

Faraday's law of electromagnetic induction - Lenz law - Fleming's right hand rule - Oersted's experiment-Laplace's law or Ampere's law - Magnetic field at the centre of a circular coil carrying current-Magnetic field at a point due to a straight conductor carrying current - Magnetic field at a point on the axis of a circular coil carrying current - Magnetic field at a point on the axis of a Solenoid - Force experienced by a conductor carrying current placed in a magnetic field of Uniform Intensity - Force between two conductors carrying current - Self induction - Mutual Induction - **Ballistic galvanometer** - Damping correction - uses.

Unit - III: Heating Effectn of Electric Current

5%

12

Introduction – Heat developed in a conductor carrying current – Callendar and Barnes Continues flow method - Temperature of a conductor carrying electric current - Applications of heating effect of electric current - Measurement of Electric power.

Thermoelectricity - Laws of thermo emf-intermediate metals, intermediate tempetarure - S.G. Starling method for Peltier and Thomson effect - Thermodynamics of thermocouple - **Determination of π** and σ - Thermoelectric diagrams and their uses.

Unit - IV: Alternating Current Circuits**12**

AC- measurement of AC - Power factor – RMS, Average value of current and emf - LR, LC and LCR Circuits (Series and Parallel) - Growth and decay - Power factor in LR and CR circuits - AC and DC motors - Types of windings –Series, Parallel and Compound Windings - Transformers - Three phase, delta and star connections – Choke coil – Tesla coil- Skin effect.

Unit - V: Electrical Measurements**5%****12**

Definitions - Practical units - Laws of resistance - Current density - Kirchoff's laws - Wheatstone Bridge - Sensitiveness of a Wheatstone's Bridge - Carey-Foster's Bridge - Determination of temperature coefficient - Kelvin's Double Bridge – Potentiometer - determination of internal resistance of a cell - Comparison of EMF's of Two cells - **Measurement of thermo emf** - Measurement of potential difference and current – Calibration of Voltmeter and Ammeter (High and low range).

Books for Study:

1. Electricity and Magnetism – R.Murugesan, S. Chand, (2008).
2. Electricity and Magnetism - Brijlal and Subramaniam, S.Chand & Co New Delhi, (2003).
3. Electricity and Magnetism, Brijlal and Subramaniam, S. Chand & Co, New Delhi (2016).

Books for Reference:

1. Fundamentals of Magnetism and Electricity - D.N.Vasudeva S.Chand, (2002).
2. Electricity and Magnetism - Nagaratanam and Lakshminarayanan, 3rd revised edition, The National Pub. Co. (1994).
3. Electricity and Magnetism - K.K Tewari, S.Chand, (2009).
4. Electricity and Magnetism – D C Tayal, 2nd revised edition, Himalaya Pub House, (1990).

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)
Elayampalayam, Tiruchengode

Credit: 5
Max. Hours: 60

ELECTRICITY AND MAGNETISM

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Unit - II: Magnetic Effect of Electric Current

5%

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Faraday's law of electromagnetic induction - Lenz law - Fleming's right hand rule - Oersted's experiment-Laplace's law or Ampere's law - Magnetic field at the centre of a circular coil carrying current-Magnetic field at a point due to a straight conductor carrying current - Magnetic field at a point on the axis of a circular coil carrying current - Magnetic field at a point on the axis of a Solenoid - Force experienced by a conductor carrying current placed in a magnetic field of Uniform Intensity - Force between two conductors carrying current - Self induction - Mutual Induction - theory of Ballistic galvanometer - Damping correction - uses.

Unit - III: Heating Effectn of Electric Current

5 %

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Introduction – Heat developed in a conductor carrying current – Callendar and Barnes Continues flow method - seeback effect -Temperature of a conductor carrying electric current - Applications of heating effect of electric current - Measurement of Electric power.

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Starling method for Peltier and Thomson effect - Thermodynamics of thermocouple - - Thermoelectric diagrams and their uses.

Unit - IV: Alternating Current Circuits

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AC- measurement of AC - Power factor – RMS, Average value of current and emf - LR, LC and LCR Circuits (Series and Parallel) - Growth and decay - Power factor in LR and CR circuits - AC and DC motors - Types of windings –Series, Parallel and Compound Windings - **Transformers and uses** - Three phase, delta and star connections – Choke coil – Tesla coil- Skin effect.

Unit - V: Electrical Measurements

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Definitions - Practival units - Laws of resistance - Current density - Kirchaff' laws - Whestone Bridge - Sensitiveness of a Wheatstone's Bridge - Carey-Foster's Bridge - Determination of temperature coefficient - Kelvin's Double Bridge – Potentiometer - determination of internal resistance of a cell - Comparison of EMF's of Two cells - Measurement of thermo emf - Measurement of potential difference and current – Calibration of Voltmeter and Ammeter (High and low range).

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3. Electricity and Magnetism, Brijlal and Subramaniam, S. Chand & Co, New Delhi (2016).

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- 2.Electricity and Magnetism - Nagaratanam and Lakshminarayanan, 3rd revised edition, The National Pub. Co. (1994).
3. Electricity and Magnetism - K.K Tewari, S.Chand, (2009).
4. Electricity and Magnestsim – D C Tayal, 2nd revised edition, Himalaya Pub House, (1990).

Credit: 5

Max. Hours: 60

BASIC ELECTRONICS

Paper Code: 18U5PHC06

Subject Description: This paper presents the fundamentals of electronics and its theory which will be used for studies solving problems during research work.

Goal: To enable the students to acquire the knowledge of electronics and to apply the principles for the situation of different physical problems.

Objectives: To acquire knowledge and apply it to

- Various electronics instruments.
- To apply the development of the electronic instruments.
- To motivate the students to apply the principles of electronics in their day – to – day life.
-

Unit - I: Band Theory of Solids

20%

10

Energy band description of semiconductors - Intrinsic semiconductor - Extrinsic Semiconductor – n-type semiconductor - p-type semiconductor - Charge on n-type and p-type semiconductors - **Majority and minority carriers** – pn junction - **Volt-ampere characteristics of pn junction** - Zener diode - LED Photo diode - **Tunnel diode.**

Unit - II: Transistor

20%

12

Transistor - Basic configurations - **CB, CE and CC mode** - Transistor action - Relation between α , β and γ - DC load line - DC bias and stabilization - AC load line, transistor biasing - Fixed bias - Voltage divider bias – **Transistor as a two part network** - h parameter

Unit - III: Amplifiers and Oscillators

14

Amplifiers:

Amplifiers – Definition of gain, Classification of amplifiers - Single stage and Multi stage RC couples CE amplifier - Class A,B,C - Power amplifiers - Feedback amplifier - General theory of feedback - Principles of negative voltage feedback – Advantages - Emitter follower.

Oscillators:

10%

Oscillators - Criteria for oscillation - **Design and operation of Hartley Oscillator** - Colpitt's Oscillator - Wien's Bridge Oscillator - Phase Shift Oscillator - Piezo-Electric Oscillator.

Unit - IV: Semiconductor Devices

5%

14

Construction, working, characteristics, parameters and applications of FET – MOSFET - Comparison between FET and Transistor **Photodiode - LED** - - Tunnel diode – Photo transistor - UJT - UJT relaxation oscillator – SCR - SCR as a switch.

Unit - V: **Operational Amplifiers and its application**

5%

10

Op amp - Pin configuration - Characteristics of Op amp - Virtual ground - Off-set voltage - Inverting amplifier - Non- inverting amplifier - Differential amplifier - Common mode rejection ratio – Application - op-amp as Adder-Subtractor **gain buffer**- Integrator – Differentiator – Comparator.

Multivibrators:

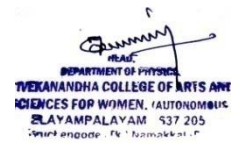
IC 741 Astable, Monostable and Bistable multivibrators.

Books for Study:

1. V K Mehta, Principles of Electronics, S.Chand and Company Ltd., (2012).
2. B.L. Theraja, Basic Electronics (Solid state), S. Chand & Co., (2006).
3. R S Sedha, A text book of Applied Electronics, S.Chand & Company Ltd., (2002).

Books for References:

1. Hand book of Electronics by Gupta Kumar, Published by Pragati Prakashan, (2010).
2. D. Chattopadhyay et al., Foundations of Electronics 2nd edition, WileyEastern Ltd, New Delhi, (1988).
3. Dennis Le Croisette, Transistors, Prentice-Hall of India New Delhi, (1988).
4. Gupta & Kumar, Hand book of Electronics, Pragati Prakhasan, Meerut, (2012).



VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)
Elayampalayam, Tiruchengode

Credit: 5

Max. Hours: 60

BASIC ELECTRONICS

Paper Code: 18U5PHE01

Subject Description: This paper presents the fundamentals of electronics and its theory which will be used for studies solving problems during research work.

Goal: To enable the students to acquire the knowledge of electronics and to apply the principles for the situation of different physical problems.

Objectives: To acquire knowledge and apply it to

- Various electronics instruments.
- To apply the development of the electronic instruments.
- To motivate the students to apply the principles of electronics in their day – to – day life.
-

Unit - I: Band Theory of Solids**20%****10**

Semiconductors -Energy band diagram of semiconductor- Intrinsic semiconductor - Extrinsic Semiconductor – n-type semiconductor - p-type semiconductor - Charge on n-type and p-type semiconductors – pn junction - **I - V characteristics of PN junction** - Zener diode - LED Photo diode - **Schottky diode** .

Unit - II: Transistor**10%****12**

Transistor - Basic configurations - Transistor action - Relation between α , β and γ - DC load line - DC bias and stabilization - **operating point** - AC load line, transistor biasing -Fixed bias - Voltage divider bias - h parameter-**Application of Transistors.**

Unit - III: Amplifiers and Oscillators**14****Amplifiers:****10%**

Amplifiers – Definition of gain, Classification of amplifiers - Single stage and Multi stage RC couples CE amplifier - Class A,B,C - Power amplifiers - Feedback amplifier - General theory of feedback - Principles of negative voltage feedback – Advantages - Emitter follower.

Oscillators:

Oscillators - Criteria for oscillation -Colpitt's Oscillator - Wien's Bridge Oscillator - Phase Shift Oscillator - Piezo-Electric Oscillator.

Unit - IV: Semiconductor Devices**5%****14**

Construction, working, characteristics, parameters and applications of FET – MOSFET - Comparison between FET and Transistor – **solar cell** - Tunnel diode – Photo transistor - UJT - UJT relaxation oscillator – SCR - SCR as a switch.

Unit - V: Operational Amplifiers and its application**5%****10**

Op amp - Pin configuration - Characteristics of Op amp - Virtual ground -Off-set voltage - Inverting amplifier - Non- inverting amplifier - Differential amplifier - Common mode rejection ratio – Application - op-amp as Adder-Subtractor - Integrator – Differentiator – Comparator.

Multivibrators:

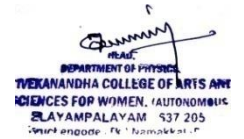
IC 741 Astable, Monostable and Bistable multivibrators.

Books for Study:

- 1.V K Mehta, Principles of Electronics, S.Chand and Company Ltd., (2012).
- 2.B.L. Theraja, Basic Electronics (Solid state), S. Chand & Co., (2006).

Books for References:

1. Hand book of Electronics by Gupta Kumar, Published by Pragati Prakashan, (2010).
2. D. Chattopadhyay et al., Foundations of Electronics 2nd edition, Wiley Eastern Ltd, New Delhi, (1988).
3. Gupta & Kumar, Hand book of Electronics, Pragati Prakashan, Meerut, (2012).



VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)
Elayampalayam, Tiruchengode

Credit: 5
Max. Hours: 60

SOLID STATE PHYSICS

Paper Code: 17U5PHC07

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

- To know the formation and structure of different solid materials.
- To motivate the students in order to apply the principles of Solid State Physics in their research studies.

Unit - I: Crystal Structure

14

Crystalline and Amorphous solids - Crystal structure: basis and crystal structure - Primitive lattice cell and unit cell - Bravais lattices in two dimensions and in three dimensions – Lattice planes and Miller indices - interplanar distance - spacing between planes in SC, FCC and BCC - Atomic packing - Atomic radius-lattice constant and density - Crystal structures (SC, HCP, FCC, BCC) - other cubic structures Diamond, Sodium chloride and Cesium chloride.

Unit - II: Crystallography and Crystal Imperfections

12

X-rays: Bragg's law - Laue method - Rotating crystal method - Powder photograph method.

Bonding in Solids: (Qualitative Treatment) Ionic-Covalent - Metallic-Molecular bonds.

Crystal Defects: (Qualitative Study): Frenkel defect - Schottky defect - Edge dislocation - Screw dislocation.

Unit - III: Magnetic Properties

12

Different types of magnetic materials - classical theory of diamagnetism (Langevin's theory) - Langevin's theory of paramagnetism - Weiss theory of paramagnetism - quantum theory of ferromagnetism - anti ferromagnetism - ferrites-general properties of superconductivity - Meissner effect -

BCS theory - entropy and heat capacity - Energy gap - Type I and II superconductors.

Unit - IV: Dielectrics

12

Definition of dielectrics - Different types of electric polarization - Frequency and temperature effects on polarization - Dielectric loss - Clausius - Mosotti relation - Determination of dielectric constant - Dielectric breakdown - Properties of different types of insulating materials.

Unit - V: Advanced Materials

10

Polymers – Ceramics - super strong materials - cermets high temperature materials -thermoelectric materials – electrets - nuclear engineering materials - plastics metallic glasses -optical materials - fiber optic materials & uses.

Books for Study:

1. Solid State Physics by Gupta, Kumar, Nath & Co., (2013).
2. Modern Physics R. Murugesan and Kiruthiga Sivaprasath, S. Chand & Co, New Delhi, (2016).
2. Material Science - M. Arumugam, Anuradha Agencies, (2004).
4. Solid State Physics, S. O. Pillai, New Age International (P) Limited, (2006).

Books for Reference:

1. Introduction to Solid State Physics, Charles Kittel, John Wiley & Sons, 8th Edition, (2004).
2. Materials Science and Engineering, V. Raghavan, Prentice Hall (India) Ltd., (2004).
3. Introduction to Solids - Leonid V. Azaroff, Tata Mc-Graw Hill, (2004).
4. Solid State Physics - A.J. Deckker, Macmillan India, (2004).

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Elayampalayam, Tiruchengode

Credit: 5
Max. Hours: 60

SOLID STATE PHYSICS

Paper Code: 18U5PHC07

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

- To know the formation and structure of different solid materials.
- To motivate the students in order to apply the principles of Solid State Physics in their research studies.

Unit - I: Crystal Structure

14

Crystalline and Amorphous solids - Crystal structure: basis and crystal structure - Primitive lattice cell and unit cell - Bravais lattices in two dimensions and in three dimensions – Lattice planes and Miller indices - interplanar distance - spacing between planes in SC, FCC and BCC - Atomic packing - Atomic radius-lattice constant and density - Crystal structures (SC, HCP, FCC, BCC) - other cubic structures Diamond, Sodium chloride and Cesium chloride.

Unit - II: Crystallography and Crystal Imperfections

10%

12

X-rays: Bragg's law - Laue method - Rotating crystal method - Powder photograph method.

Bonding in Solids: (Qualitative Treatment) Ionic-Covalent - Metallic-Molecular bonds.

Crystal Defects: (Qualitative Study): surface defects - Volume defects- Frenkel defect - Schottky defect - Edge dislocation - Screw dislocation.

Unit - III: Magnetic Properties

15%

12

Different types of magnetic materials - classical theory of diamagnetism (Langevin's theory) - Langevin's theory of paramagnetism - Weiss theory of paramagnetism - quantum theory of ferromagnetism - anti ferromagnetism - ferrites-general properties of superconductivity - Meissner effect - BCS theory – Thermal properties -entropy and heat capacity - Energy gap - Type I and II superconductors.

Unit - IV: Dielectrics

12

Definition of dielectrics - Different types of electric polarization - Frequency and temperature effects on polarization - Dielectric loss - Clausius - Mosotti relation - Determination of dielectric constant - Dielectric breakdown - Properties of different types of insulating materials.

Unit - V: Advanced Materials

5%

10

Basic definition nanomaterials – carbon nano tube - Polymers – Ceramics - super strong materials - cermets high temperature materials -thermoelectric materials – electrets - nuclear engineering materials - plastics metallic glasses -optical materials - fiber optic materials & uses.

Books for Study:

- 1 Solid State Physics by Gupta, Kumar, Nath & Co., (2013).
- 2 Modern Physics R. Murugesan and Kiruthiga Sivaprasath, S. Chand & Co, New Delhi, (2016).
3. Material Science - M. Arumugam, Anuradha Agencies, (2004).
4. Solid State Physics, S. O. Pillai, New Age International (P) Limited, (2006).

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2. Materials Science and Engineering, V. Raghavan, Prentice Hall (India) Ltd., (2004).
3. Introduction to Solids - Leonid V. Azaroff, Tata Mc-Graw Hill, (2004).
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Credit: 5

Max. Hours: 60

QUANTUM MECHANICS AND RELATIVITY

Paper code: 18U5PHE01

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

Goal: To enable the students to acquire the problem solving ability and to apply the Schrödinger's wave equation for the situation of different physical problems.

Objectives: To acquire knowledge and apply it to

- Various physical problems.
- To develop the problem solving ability.
- To motivate the students to apply Schrödinger's equation or solving problems in wave mechanics, nuclear physics etc.,

Unit - I: Wave Nature of Matter

15%

10

Mechanics – Inaduanacy of classical mechanics- foundation of wave -Comparison of Classical and

Quantum ideas - Dual Nature of Matter - Expression for de-

davision and germer experiments- Relation between wave velocity and

group velocity - Wave packet.

Unit - II: Wave Mechanics – I

12

Heisenberg's Uncertainty Principle - physical significance of Heisenberg's Uncertainty relation - Illustration of Uncertainty principle - Heisenberg's gamma ray microscope - Diffraction of a beam of electrons by a slit - Operators in quantum mechanics - Operators for Momentum, K.E, Total energy - Linear operator - Adjoint operators – Commutators - Commutation relation between position and momentum - Commutation relation between Spin and Angular momentum - Ladder operators L_+ , L_- .

Unit - III: Wave Mechanics – II

14

Wave function for a free particle - physical interpretation of the wave function - equation of motion of matter wave - Schroedinger'equation (time independent, time dependent and for free particle) -

orthogonal, normalized and orthonormal wave function - expectation values of dynamical quantities - probability current density - Ehrenfest's theorem - Helium atom - Eigen value and Eigen function equation.

Unit - IV: Applications of Wave Mechanics

12

Application of Schrodinger's equation to one dimensional problems - free particle - finite square potential well - particle in a rectangular potential step - reflection and transmission co-efficient of rectangular potential barrier - application of a barrier penetration - α decay-linear harmonic oscillator - Rigid rotator - Hydrogen atom.

Unit - V: Relativity

12

Special theory of relativity - Postulates of special theory of relativity - length contraction - time dilation - reference systems - inertial and non-inertial frames - Galilean transformation equations - Lorentz transformation equations - the Ether hypothesis - the Michelson - Morley experiment— variation of mass with velocity - Mass-Energy relation- Elementary ideas of general theory of relativity.

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1. Modern Physics, R. Murugesan, S.Chand & Co., New Delhi, (2005).
2. Modern Physics, R. Murugesan and Kiruthiga Sivaprasath, S. Chand & Co, New Delhi, (2016).
3. V.K. Thangappan, Quantum mechanics, New Age International, (1993).
4. G. Aruldass, Quantum Mechanics, Prentice–Hall of India Pvt. Limited, (2002).
5. Relativity and Quantum Mechanics, P.K. Palanisamy, Scitech Publications (India) Pvt Ltd, Kumbakonam, (2007).

Books for Reference:

1. A text book of quantum mechanics, P.M Matheews & K.Venkatesan, Published by Tata McGraw Hill, New Delhi, (1989).
2. Quantum Mechanics, Satya Prakash, Swati Saluja, Published by Kedar Nath Ram Nath, (2019).
3. Quantum Mechanics, V. Devanathan, Narosa Pub. House, Chennai, (2005).
4. Quantum Mechanics, S. P. Singh, M. K. Bagde, S. Chand & Co, New Delhi,(2002).
5. Ajoy Ghatak & S. Loganathan, Quantum Mechanics, Springer, (2004).

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)
Elayampalayam, Tiruchengode

Credit: 5

Max. Hours: 60

QUANTUM MECHANICS AND RELATIVITY

Paper code: 18U5PHC06

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

Goal: To enable the students to acquire the problem solving ability and to apply the Schrödinger's wave equation for the situation of different physical problems.

Objectives: To acquire knowledge and apply it to

- Various physical problems.
- To develop the problem solving ability.
- To motivate the students to apply Schrödinger's equation or solving problems in wave mechanics, nuclear physics etc.,

Unit - I: Wave Nature of Matter **10%** **10**

Mechanics - Inadequacy of classical mechanics and quantum mechanics - Comparison of Classical and Quantum ideas - Dual Nature of Matter - Expression for de-Broglie wavelength – de Broglie concept of stationary orbits - G.P Thomson experiment - Expression for group velocity - Group Velocity for de Broglie waves - Relation between wave velocity and group velocity - Wave packet.

Unit - II: Wave Mechanics – I **15%** **12**

Heisenberg's Uncertainty Principle - physical significance of Heisenberg's Uncertainty relation - Illustration of Uncertainty principle - Heisenberg's gamma ray microscope - Diffraction of a beam of electrons by a slit - Operators in quantum mechanics - Operators for Momentum, K.E, Total energy - Linear operator - Adjoint operators – Commutators - Commutation relation between position and momentum - Commutation relation between Spin and Angular momentum - Ladder operators L_+ , L_- .

Unit - III: Wave Mechanics **10%** **14**

Wave function for a free particle - physical interpretation of the wave function - equation of motion

of matter wave - Schrodinger's equation (time independent, time dependent and for free particle) - orthogonal, normalized and orthonormal wave function – **Properties of wave function** - expectation values of dynamical quantities - probability current density - Ehrenfest's theorem - Helium atom - Eigen value and Eigen function equation.

Unit - IV: Applications of Schrodinger's equation **15%** **12**

Application of Schrodinger's equation to one dimensional problems - free particle - **finite square potential well** - particle in a rectangular potential step - reflection and transmission co-efficient of rectangular potential barrier - application of a barrier penetration - α decay-linear harmonic oscillator - Rigid rotator - Hydrogen atom – **Helium atom.**

Unit - V: Relativity **12**

Special theory of relativity - Postulates of special theory of relativity - length contraction - time dilation - reference systems - inertial and non-inertial frames - Galilean transformation equations - Lorentz transformation equations - the Ether hypothesis - the Michelson - Morley experiment— variation of mass with velocity - Mass-Energy relation- Elementary ideas of general theory of relativity.

Books for Study:

1. Modern Physics, R. Murugesan, S.Chand & Co., New Delhi, (2005).
2. Modern Physics, R. Murugesan and Kiruthiga Sivaprasath, S. Chand & Co, New Delhi, (2016).
3. V.K. Thangappan, Quantum mechanics, New Age International, (1993).
4. G. Aruldass, Quantum Mechanics, Prentice–Hall of India Pvt. Limited, (2002).
5. Relativity and Quantum Mechanics, P.K. Palanisamy, Scitech Publications (India) Pvt Ltd, Kumbakonam, (2007).

Books for Reference:

1. A text book of quantum mechanics, P.M Matheews & K.Venkatesan, Published by Tata McGraw Hill, New Delhi, (1989).
2. Quantum Mechanics, Satya Prakash, Swati Saluja, Published by Kedar Nath Ram Nath, (2019).
3. Quantum Mechanics, V. Devanathan, Narosa Pub. House, Chennai, (2005).
4. Quantum Mechanics, S. P. Singh, M. K. Bagde, S. Chand & Co, New Delhi,(2002).
5. Ajoy Ghatak & S. Loganathan, Quantum Mechanics, Springer, (2004).

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)
Elayampalayam, Tiruchengode

Credit: 2

Max. Hours: 24

DIGITAL ELECTRONICS

Paper code: 18U5PHS03

Subject Description: This paper presents basic principles of digital electronics. This paper gives deep knowledge to the students regarding number system, arithmetic building blocks, memories and data processing circuits.

Goal: To enable the students to learn the basic principles, theory and concepts of number system memories and data processing circuits counters

Objectives

To give description for the students in order to

- Learn the logic circuits
- Acquire basic knowledge of binary addition
- Understand the action and application of counters
- Get a deep knowledge of various memories used in computer circuits

Unit – I: Number System **5**

Binary number system - Conversion - binary to decimal - decimal to binary - octal numbers - hexadecimal numbers, ASCII Code.

Unit – II: Logic Gates **5**

The basic Gates (OR, AND, NOT), Universal logic gates - NAND/NOR- DEMORGAN'S Theorems - XOR and XNOR Gates - Half adder - Full adder - Half subtractor - Full subtractor using logic gates.

Unit – III: Combination of Logic Circuits **5**

Boolean algebra - Solving boolean equations - Karnaugh map method for simplifying expressions - Product of sums (POS) - Sum of products (SOP), NAND - NAND, NOR - NOR Gates.

Unit – IV: Registers **4**

Shift registers - Series and Parallel loading – Counters - 4 bit binary ripple counter - BCD counter - Ring counter.

Unit – V: Timing Circuits and Flip-Flops

5%

5

555 Timer – Astable, Monostable and Bistable - Multivibrators - R-S Flip-Flop, D Flip-Flop, J-K Flip-Flop, **Master-Slave** Flip-Flop.

Books for Study:

1. Digital Principles and Applications, Donald P. Leach and Albert P. Malvino, 5th (1994).
2. Digital Electronics, D. A. Godse and A.P. Godse, Technical Publisher, Pune, (2008).
3. Digital Electronics, Virendra Kumar, New Age International Publishers, (2007).
4. Digital Electronics, Avinashi Kapoor and L. K. Maheswari, Principles and Practice, Macmillan India Limited, (2004).
5. V. Vijayendran, Digital Fundamentals. S. Viswanathan Printers and Publishers Pvt. Ltd., (2009).

Books for References:

1. Integrated circuits, K.R Botkar, Khanna Publications, (1987).
2. Integrated Electronics, Analog and Digital Circuits and Systems, J. Millman and C. C. Halkias, Tata McGraw - Hill Education, New Delhi, (1991).
3. Morris Mano, Digital Logic and Computer Design, Pearson Education (2004).

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)
Elayampalayam, Tiruchengode

Credit: 2

Max. Hours: 24

DIGITAL ELECTRONICS

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Objectives

To give description for the students in order to

- Learn the logic circuits
- Acquire basic knowledge of binary addition
- Understand the action and application of counters
- Get a deep knowledge of various memories used in computer circuits

Unit – I: Number System

10%

5

Binary number system - Conversion - binary to decimal - decimal to binary - octal numbers - hexadecimal numbers - Gray code - Excess – 3 code - ASCII Code.

Unit – II: Logic Gates

5

The basic Gates (OR, AND, NOT), Universal logic gates - NAND/NOR- DEMORGAN'S Theorems - XOR and XNOR Gates - Half adder - Full adder - Half subtractor - Full subtractor using logic gates.

Unit – III: Combination of Logic Circuits

10%

5

Law of Boolean algebra - Solving boolean equations - Karnaugh map method for simplifying expressions - Product of sums (POS) - Sum of products (SOP), NAND - NAND, NOR - NOR Gates.

Unit – IV: Registers

4

Shift registers - Series and Parallel loading – Counters - 4 bit binary ripple counter - BCD counter - Ring counter.

Unit – V: Timing Circuits and Flip-Flops

5

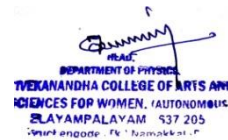
555 Timer – Astable, Monostable and Bistable - Multivibrators - R-S Flip-Flop, D Flip-Flop, J-K Flip-Flop, Master-Slave Flip-Flop.

Books for Study:

1. Digital Principles and Applications, Donald P. Leach and Albert P. Malvino, 5th (1994).
2. Digital Electronics, D. A. Godse and A.P. Godse, Technical Publisher, Pune, (2008).
3. Digital Electronics, Virendra Kumar, New Age International Publishers, (2007).
4. Digital Electronics, Avinashi Kapoor and L. K. Maheswari, Principles and Practice, Macmillan India Limited, (2004).
5. V. Vijayendran, Digital Fundamentals. S. Viswanathan Printers and Publishers Pvt. Ltd., (2009).

Books for References:

1. Integrated circuits, K.R Botkar, Khanna Publications, (1987).
2. Integrated Electronics, Analog and Digital Circuits and Systems, J. Millman and C. C. Halkias, Tata McGraw - Hill Education, New Delhi, (1991).
3. Morris Mano, Digital Logic and Computer Design, Pearson Education (2004).



**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)
Elayampalayam, Tiruchengode**

Credit: 2

Max. Hours: 24

BIO - MEDICAL INSTRUMENTATION

Paper code: 18U5PHS04

Unit – I: Biopotential Electrodes

5

Design of medical instruments - Components of the bio-medical instrument System – Electrodes – Theory -
Micro electrodes – depth and needle electrodes –

Unit – II: Biopotential Recorders

5

Electrocardiography (ECG) - Electromyography (EMG) - Electroretinography (ERG)
- Electrooculography (EOG).

Unit – III: Physiological Aid Devices

5%

4

Pacemakers – **External and Internal Pacemakers** - Different modes of operation
- Artificial heart valves - Anesthesia machine – Measurement of Blood Pressure

Unit - IV: Specialized Medical Equipment

5%

4

Blood cell counter - Electron microscope - X-Ray machine – Image **intensifiers** – Angiography.

Unit – V: Safety Instrumentation

6

Radio Monitoring instruments - Microshock and Macroshock – Endoscopes - Computer Tomography
- Ultrasonic image instrumentation - MRI instrumentation.

Books for Study:

1. Bio-Medical Instrumentation, Dr. M. Arumugam, Anuradha Agencies, (2002).
2. Bio Instrumentation, John G. Webster, editor John Wiley & Sons, Inc, (2004).
3. Biological Instrumentation and methodology, P.K. Bajpai, S Chand & Co, (2010).

Books for Reference:

1. Bio-medical instrumentation, Dr. M. Arumugam, Anuradha Agencies, (2009).
2. Handbook of Biomedical Instrumentation, Dr R.S. Khandpur: Blood Cell Counters, Chapter (McGraw-Hill Professional, Third Edition, (2014).
3. Handbook of Biomedical Instrumentation, Dr R.S. Khandpur, McGraw Hill.

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)
Tiruchengode

Credit: 2

Max. Hours: 24

BIO - MEDICAL INSTRUMENTATION

Paper code: 18U5PHS04

Unit – I: Biopotential Electrodes

10%

5

Design of medical instruments - Components of the bio-medical instrument System – Electrodes – Theory -
Micro electrodes – depth and needle electrodes – Body surface electrodes – pH Electrodes .

Unit – II: Biopotential Recorders

5%

5

Electrocardiography (ECG) – Electroencephalogram (EEG) - - Electroretinography (ERG)
- Electrooculography (EOG).

Unit – III: Physiological Aid Devices

15%

4

Pacemakers - Types of pacemakers - Different modes of operation - blood pressure measurement
- Artificial heart valves - Anesthesia machine – Measurement of Blood Pressure and Blood flow.

Unit - IV: Specialised Medical Equipment

4

Blood cell counter - Electron microscope - X-Ray machine – Image intensifiers – Angiography.

Unit – V: Safety Instrumentation

6

Radio Monitoring instruments - Microshock and Macroshock – Endoscopes - Computer Tomography
- Ultrasonic image instrumentation - MRI instrumentation.

Books for Study:

1. Bio-Medical Instrumentation, Dr. M. Arumugam, Anuradha Agencies, (2002).
2. Bio Instrumentation, John G. Webster, editor John Wiley & Sons, Inc, (2004).
3. Biological Instrumentation and methodology, P.K. Bajpai, S Chand & Co, (2010).

Books for Reference:

1. Bio-medical instrumentation, Dr. M. Arumugam, Anuradha Agencies, (2009).
2. Handbook of Biomedical Instrumentation, Dr R.S. Khandpur: Blood Cell Counters, Chapter (McGraw-Hill Professional, Third Edition, (2014).
3. Handbook of Biomedical Instrumentation, Dr R.S. Khandpur, McGraw Hil

Credit: 5

Max. Hours: 60

ATOMIC PHYSICS

Paper code: 18U6PHC08

Subject Description

Analysis of positive rays, Isotopes, atomic structures, models in various aspects, spectral lines subjected to magnetic fields, light inducing electron emission, X –rays and their diffraction.

Goals and Objectives

- To provide a detailed study of atom, nucleus and their properties.
- To learn the matter-matter and light-matter interactions and therefore understanding the working of atomic power stations.
- To learn the behaviour of atom in various states.

Unit - I: Positive Ray Analysis

10%

10

Discovery-Properties of positive rays– e/m of positive rays – **Positive ray analysis** Thomson's Parabola method **Aston's mass spectrograph** – uses of mass spectrographs -Critical potential – Ionization potential – Excitation potential-Methods of excitation - Determination of Critical Potential – Franck and Hertz's experiment.

Unit - I: Photo Electricity

5%

12

Photoelectric emission – Laws – Lenard's experiment – Richardson & Compton experiment - Einstein's photoelectric equation – Experimental verification of Einstein's Photoelectric equation by Millikan's experiment – Photo electric cells – Photo emission cell – Photo Voltaic cell – Photo conductive cell – Applications of Photo electric cell-**Photo electric cells and its application.**

Unit - III: Vector Atom Model

5%

10

Introduction-Sommerfield atom model-Rutherford atom model-Bohr atom model-Variou quantum numbers, Coupling schemes **(LS, JJ coupling)- LS and JJ coupling** – Pauli's exclusion principle – Electronic configuration of elements and periodic classification – Magnetic dipole moment of electron due to orbital and spin motion – Bohr magnetron – Stern and Gerlach experiment.

Unit - IV: Fine Structure of Spectral

5%

15

Spectral terms and notations – Selection rules – intensity rule and interval rule – Fine Structure of

sodium D lines – **Alkali spectra** -Fine structure in Alkali spectra – Spectrum of Helium – Zeeman effect – Larmour'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 – Paschen back effect and Stark effect.

Unit - V: X- Rays 10%

Introduction **Electromagnetic spectrum**-Production of X-Rays -Absorption of X-Rays - Bragg's Law – Bragg's X-ray spectrometer - Origin and analysis of continuous X-ray spectrum and characteristic X-ray spectrum – **Mosley's law** (Statement, Explanation and Importance) – Compton effect – Derivation of expression for change in wavelength - its experimental verification.

Books for Study:

1. Modern Physics, R. Murugesan, Published by S. Chand & Co., New Delhi, (2005).
2. Modern Physics, R. Murugesan and Kiruthiga Sivaprasath, Published by S. Chand &Co, New Delhi, (2016).
3. Modern Physics, J.B. Rajam, Published by S. Chand & Co, (2004).
4. Atomic and Nuclear Physics – N. Subramaniam and Brijlal, Published by S. Chand & Company Pvt Ltd., (2004).

Books for References:

1. Concept of Modern Physics: Arthus Beiser, McGraw Hill Ed. V, (1999).
2. Atomic and Nuclear Physics by H. Semat and J.R. Albright, Chapman and Hall, (2003).
3. Atomic and Nuclear Physics by S.N. Ghoshal, Published by S. Chand & Co, (2004).

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)
Elayampalayam, Tiruchengode

Credit: 5

Max. Hours: 60

ATOMIC PHYSICS

Paper code: 18U6PHC08

Subject Description

Analysis of positive rays, Isotopes, atomic structures, models in various aspects, spectral lines subjected to magnetic fields, light inducing electron emission, X –rays and their diffraction.

Goals and Objectives

- To provide a detailed study of atom, nucleus and their properties.
- To learn the matter-matter and light-matter interactions and therefore understanding the working of atomic power stations.
- To learn the behaviour of atom in various states.

Unit - I: Positive Ray Analysis

5%

10

Discovery-Properties of positive rays– e/m of positive rays - Thomson’s Parabola method – Aston’s mass spectrograph - Bain’s bridge’s mass spectrograph – uses of mass spectrographs -Critical potential – Ionization potential – Excitation potential-Methods of excitation - Determination of Critical Potential – Franck and Hertz’s experiment.

Unit - II: Photo Electricity

25%

12

Photoelectric emission – Laws – Lenard’s experiment – Richardson & Compton experiment - Einstein’s photoelectric equation – Experimental verification of Einstein’s Photoelectric equation by Millikan’s experiment – Photo electric cells – Photo emission cell – Photo Voltaic cell – Photo conductive cell – Applications of Photo electric cell-Photo electric cells and its application.

Unit - III: Vector Atom Model

10%

10

Introduction-Sommerfield atom model-Rutherford atom model-Bohr atom model-Various quantum numbers, Coupling schemes (LS, JJ coupling)- LS and JJ coupling – Pauli’s exclusion principle – Electronic configuration of elements and periodic classification – Magnetic dipole moment of electron due to orbital and spin motion – Bohr magnetron – Stern and Gerlach experiment.

Unit - IV: Fine Structure of Spectral Lines

15

Spectral terms and notations – Selection rules – intensity rule and interval rule – Fine Structure of sodium D lines – Fine structure in Alkali spectra – Spectrum of Helium – Zeeman effect – Larmour'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 – Paschen back effect and Stark effect.

Unit - V: X- Rays 15%

13

Electromagnetic spectrum - Production of X-Rays - Absorption of X-Rays - Bragg's Law – Bragg's X-ray spectrometer - **Powder crystal method** – Origin and analysis of continuous X-ray spectrum and characteristic X-ray spectrum - – Mosley's law (**Statement, Explanation and Importance**) – Compton effect – Derivation of expression for change in wavelength - its experimental verification.

Books for Study:

1. Modern Physics, R. Murugesan, Published by S. Chand & Co., New Delhi, (2005).
2. Modern Physics, R. Murugesan and Kiruthiga Sivaprasath, Published by S. Chand & Co, New Delhi, (2016).
3. Modern Physics, J.B. Rajam, Published by S. Chand & Co, (2004).
4. Atomic and Nuclear Physics – N. Subramaniam and Brijlal, Published by S. Chand & Company Pvt Ltd., (2004).

Books for References:

1. Concept of Modern Physics: Arthus Beiser, McGraw Hill Ed. V, (1999).
2. Atomic and Nuclear Physics by H. Semat and J.R. Albright, Chapman and Hall, (2003).
3. Atomic and Nuclear Physics by S.N. Ghoshal, Published by S. Chand & Co, (2004).

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)
Elayampalayam, Tiruchengode

Credit: 5

Max. Hours: 60

NUCLEAR PHYSICS

Paper Code: 18U6PHC09

Subject Description: This paper presents the fundamentals of formation of nucleus, composition of nucleus with their energy.

Goal: To enable the students to acquire knowledge of the nuclear energy, fission and fusion with particle accelerator.

Objectives: To acquire knowledge and apply it to

- Study the structure of nucleus.
- Know the formation of nucleus and their binding energy.
- To motivate the students to analyze the energy released by the nucleus during the fission and fusion process and therefore understanding the working of Nuclear power stations.

Unit –I: Nuclear Properties

10

Classification and Properties of nuclei-Binding energy-Nuclear stability - Mass parabola-Nuclear isomerism-Nuclear forces-Magnetic dipole moment of nuclei-

Nuclear models: Liquid drop model-Shell model

Unit–II: Nuclear Radiations

5%

13

Detectors: Basic principles of particle detectors-Ionization chamber-G.M counter-Characteristics-Proportional counter-Wilson cloud chamber-Bubble chamber - Scintillation counters – **Photomultipliers.**

Accelerators: Synchrocyclotron–Synchrotron–Electron and proton synchrotron

Unit – III: Natural Radioactivity

5%

10

Alpha decay-Geiger-Nuttal law-Gamow’s theory-Neutrino theory of beta decay Half life period–Mean life–Decay constant–**Relation between them**-Fajan’s Soddy displacement law - Magnetic Spectrograph-Gamma emission– Selection rules-Interaction of charged particles with matter-Internal conversion-Law of radioactive disintegration- Law of successive disintegration–Carbon dating.

Unit – IV: Nuclear Reactions

15

Nuclear reactions–Types-Nuclear energy equations-Calculation of Q–value- Nuclear artificial

transmutations -Transuranic elements.

Nuclear Fission and Fusion

Bohr-Wheeler's theory–Fission Process-Chain reactions-Nuclear Reactor-Principle-Pressurized water reactor-Boiling water reactor-Fusion Reactor-Atom b o m b - F u s i o n p r o c e s s–Hydrogen bomb-Carbon-nitrogen cycle, proton-proton cycle -Thermo nuclear reactions -Stellar energy.

Unit – V: Elementary Particles

12

Fundamental interactions - Quantum Numbers – Baryon – Lepton – Strangeness – Hypercharge – Isospin - Quark Model - Conservation law – Parity – Charge - CPT Theorem.

Books for Study:

1. V. Devanathan, Nuclear Physics, Narosa Publishing House, (2006).
2. Nuclear physics by D. C. Tayal, Himalaya Publishing house, 5th edition, (2018).
3. Nuclear Physics: An Introduction, S. B. Patel, Wiley-Eastern, New Delhi, (1991).

Books for Reference:

1. Modern Physics by R. Murugasen, S. Chand & Co, 8th Edition (2001).
2. Concepts of Nuclear Physics, B. L. Cohen, Tata McGraw Hill, New Delhi,(1988).
3. Nuclear Physics: Experimental and Theoretical H. S. Hans, New Age International Publishers, New Delhi, (2001).
4. Elementary Particle Physics: An Introduction, D.C. Cheng and G.K. O'Neill, Addison-Wesley, (1979).
5. Basic Nuclear Physics and Cosmic rays, B.N. Srivatsava, Pragati Prakashan, (2016).

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)
Elayampalayam, Tiruchengode

Credit: 5
Max. Hours: 60

NUCLEAR PHYSICS

Paper Code: 18U6PHC09

Subject Description: This paper presents the fundamentals of formation of nucleus, composition of nucleus with their energy.

Goal: To enable the students to acquire knowledge of the nuclear energy, fission and fusion with particle accelerator.

Objectives: To acquire knowledge and apply it to

- Study the structure of nucleus.
- Know the formation of nucleus and their binding energy.
- To motivate the students to analyze the energy released by the nucleus during the fission and fusion process and therefore understanding the working of Nuclear power stations.

Unit –I: Nuclear Properties **30%** **10**

Constituents of nuclei-Classification and Properties of nuclei-**Nuclear mass**-
Binding energy-Nuclear stability - Mass parabola-**Nuclear Size-Nuclear spin**-Nuclear isomerism-
Nuclear forces-Magnetic dipole moment of nuclei-**Parity of nuclei.**

Nuclear models: Liquid drop model-**Semi empirical mass formula**-
Shell model-**Salient features of shell model.**

Unit–II: Nuclear Radiations **5%** **13**

Detectors: Basic principles of particle detectors-Ionization chamber-G.M counter-
Characteristics-Proportional counter-Wilson cloud chamber-Bubble chamber - Scintillation counters

Accelerators: Synchrocyclotron-Synchrotron-Electron and proton synchrotron – **Betatron.**

Unit – III: Natural Radioactivity **5%** **10**

Alpha decay-Geiger-Nuttal law-Gamow's theory **of alpha decay**-Neutrino theory of beta decay
Half life period-Mean life-Decay constant--Fajan's Soddy displacement law - Magnetic
Spectrograph-Gamma emission- Selection rules-Interaction of charged particles with matter-Internal
conversion-Law of radioactive disintegration- Law of successive disintegration-Carbon dating.

Unit – IV: Nuclear Reactions **15**

Nuclear reactions-Types-Nuclear energy equations-Calculation of Q-value- Nuclear artificial
transmutations -Transuranic elements.

Nuclear Fission and Fusion

Bohr-Wheeler's theory–Fission Process-Chain reactions-Nuclear Reactor-Principle-Pressurized water reactor-Boiling water reactor-Fusion Reactor-Atom bomb - Fusion process–Hydrogen bomb-Carbon-nitrogen cycle, proton-proton cycle -Thermo nuclear reactions -Stellar energy.

Unit – V: Elementary Particles

10%

12

Introduction - Classifications of elementary particles - Fundamental interactions - Quantum Numbers – Baryon – Lepton – Strangeness – Hypercharge – Isospin - Quark Model - Conservation law – Parity – Charge - CPT Theorem.

Books for Study:

1. Modern Physics by R. Murugasen, S. Chand & Co, 8th Edition (2001).
2. V. Devanathan, Nuclear Physics, Narosa Publishing House, (2006).
3. Nuclear physics by D. C. Tayal, Himalaya Publishing house, 5th edition, (2018).
4. Nuclear Physics: An Introduction, S. B. Patel, Wiley-Eastern, New Delhi, (1991).
5. Concepts of Nuclear Physics, Bernald. L, Cohen, TMH, (1971).

Books for Reference:

1. Concepts of Nuclear Physics, B. L. Cohen, Tata McGraw Hill, New Delhi,(1988).
2. Nuclear Physics: Experimental and Theoretical H. S. Hans, New Age International Publishers, New Delhi, (2001).
3. Elementary Particle Physics: An Introduction, D.C. Cheng and G.K. O'Neill, Addison-Wesley, (1979).
4. Introduction to Elementary Particles, D. Griffiths, Wiley International, New York, (1987).
5. Basic Nuclear Physics and Cosmic rays, B.N. Srivatsava, Pragati Prakashan, (2016).

**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)
Elayampalayam, Tiruchengode**

Credit: 5

Max. Hours: 60

ELECTRONICS AND COMMUNICATION

Paper code: 18U6PHE02

- Unit – I: Modulation and Demodulation** **20%** **10**
 Modulation–Necessity for modulation–Principles & representation of AM, FM and PM-Modulation factor–Percentage of modulation Assignable Frequency spectrum and detector- Advantage and disadvantage– Demodulation –Essentials of demodulation –AM detector –AGC.
- Unit – II: AM Transmitter and Receiver Fundamentals** **10%** **13**
 Low level modulation–High level modulation–TRF receiver–Super heterodyne principle–Super heterodyne receiver–~~excitor- driver- modulator and direct neutralization~~ - Double conversion receiver– Image frequency rejection–S/N ratio–Sensitivity–Selectivity–RF amplifier–Mixer–Local oscillator–IF amplifier.
- Unit – III: Communication Elements** **11**
 Variable frequency oscillator–Reactance modulator-PLL–Frequency multiplier –Power output amplifier–FM limiter-The discriminator–The ratio detector–AFC- Balanced modulator principle–Phase modulator–Frequency divider.
- Unit – IV: Antennas and Propagation** **12**
 The half wave dipole–Its Characteristics-Impedance and radiation pattern– The folded dipole– Characteristic impedance and radiation pattern–Parabolic reflector antenna-Parasitic array antenna- Features and applications Transmission line–Cable types–Co- axial and wire-pair–Maximum power transfer.
- Unit – V: Communication Types** **12**
 Communication–Components of a communication system–Wireless communication system Satellite communication fundamentals–Up Link–Down Link–RADAR-principle-transmitting systems– Fibre optic communication fundamentals–Advantages and disadvantages.

Books for Study:

1. Electronic Communication, Modulation and Transmissio-Robert J. Schoenbeck, Universal Book Stall, Delhi, (1992).
2. Electronic Communication Systems–George Kennedy, Tata McGraw Hill, 4th Edition, (2006).
3. Hand book of Electronics-Gupta & Kumar, Pragati Prakashan, (2005).

Books for References:

1. Principles of Communication Engineering–Anokh Singh, S. Chand & Co., Delhi (1999).
2. Communication Electronics – N.D. Despande and others–Tat McGraw Hill,(2004).
3. Electronic Communication, Dennis Roddy and John Coolen, Prentice Hall Career and Technology, 4th edition, (1995).

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Elayampalayam, Tiruchengode**

Credit: 5

Max. Hours: 60

ELECTRONICS AND COMMUNICATION

Paper code: 18U6PHE02

Unit – I: Modulation and Demodulation	5%	10
<p>Modulation–Necessity for modulation–Principles & representation of AM, FM and PM-Modulation factor–Percentage of modulation–Advantage and disadvantage– Demodulation –Essentials of demodulation –AM detector –AGC.</p>		
Unit – II: AM Transmitter and Receiver Fundamentals		13
<p>Low level modulation–High level modulation–TRF receiver–Super heterodyne principle–Super heterodyne receiver–Double conversion receiver–Image frequency rejection–S/N ratio–Sensitivity–Selectivity–RF amplifier–Mixer–Local oscillator–IF amplifier.</p>		
Unit – III: Communication Elements		11
<p>Variable frequency oscillator–Reactance modulator-PLL–Frequency multiplier –Power output amplifier–FM limiter-The discriminator–The ratio detector–AFC- Balanced modulator principle–Phase modulator–Frequency divider.</p>		
Unit – IV: Antennas and Propagation		12
<p>The half wave dipole–Its Characteristics-Impedance and radiation pattern– The folded dipole–Characteristic impedance and radiation pattern–Parabolic reflector antenna-Parasitic array antenna-Features and applications Transmission line–Cable types–Co- axial and wire-pair–Maximum power transfer.</p>		
Unit – V: Communication Types		12
<p>Communication–Components of a communication system–Wireless communication system Satellite communication fundamentals–Up Link–Down Link–RADAR-principle-transmitting systems–Fibre optic communication fundamentals–Advantages and disadvantages.</p>		

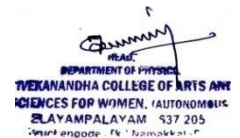
Books for Study:

1. Electronic Communication, Modulation and Transmissio-Robert J. Schoenbeck, Universal Book Stall, Delhi, (1992).

2. Electronic Communication Systems–George Kennedy, Tata McGraw Hill, 4th Edition, (2006).
3. Hand book of Electronics-Gupta & Kumar, Pragati Prakashan, (2005).

Books for References:

1. Principles of Communication Engineering–Anokh Singh, S. Chand & Co., Delhi (1999).
2. Communication Electronics – N.D. Despande and others–Tat McGraw Hill, (2004).
3. Electronic Communication, Dennis Roddy and John Coolen, Prentice Hall Career and Technology, 4th edition, (1995).



VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)
Elayampalayam, Tiruchengode

Credit: 5

Max. Hours: 60

NUMERICAL METHODS

Paper code: 18U6PHE03

Subject Description: This paper presents the mathematical aspects to solve the physical problems.

Goal & Objectives: To acquire knowledge about

- Mathematical equations which can be applied in physical problems.
- To motivate the problem solving ability of students.

Unit – I: Curve Fitting

12

Introduction-Normal equations-Method of averages-Least square fitting- Straight line fit-nonlinear curvefit.

Unit – II: Numerical Solution of Algebraic and Transcendental Equations

12

The iteration method-Newton-Raphson method-Runge kutta method for (Second and third orders).

Unit – III: Simultaneous Linear Equations

12

Solution of simultaneous linear equation-Gauss elimination method- Jordan method-Jacobi method modification- Gauss-Seidel method of iteration-Matrix method of inversion-eigen value and eigen vectors of a matrix.

Unit – IV: Interpolation

12

Linear interpolation-Lagrange interpolation method-Newton forward and backward interpolation formula-Newton's interpolation formula for unequal intervals.

Unit – V: Numerical Integration

12

Newton's forward and backward difference formula to compute derivatives- Numerical integration: The trapezoidal rule-Simpson's 1/3 rule-Simpson's 3/8 rule-Extended Simpson's rule-Gaussian quadrature formula.

Books for Study:

1. Introductory Methods of Numerical analysis – S.S. Sastry, Prentice – Hall of India, New Delhi, 3rd Edition (2003).
2. M.K. Jain, S.R.A.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International, (2003).
3. S.D. Conte, C. Boor, Elementary Numerical Analysis, McGraw –Hill, Singapore, 3rd edition, (1981).

Books for Reference:

1. Numerical Methods A. Singaravelu – Meenakshi Agency, Chennai, (2001).
2. J.H. Mathews, Numerical Methods for Mathematics, Science and Engineering Prentice-Hall of India, New Delhi, (1998).

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)
Elayampalayam, Tiruchengode

Credit: 5

Max. Hours: 60

NUMERICAL METHODS

Paper code: 21U6PHE03

Subject Description: This paper presents the mathematical aspects to solve the physical problems.

Goal & Objectives: To acquire knowledge about

- Mathematical equations which can be applied in physical problems.
- To motivate the problem solving ability of students.

Unit – I: Curve Fitting

5%

12

Introduction-Normal equations-Method of averages-Least square fitting- Straight line fit-nonlinear curve fit- **fitting of parabola**

Unit – II: Numerical Solution of Algebraic and Transcendental Equations

12

The iteration method-Regular Falsi Method-Newton-Raphson method-Euler's Method-Modified Euler's method-Runge kutta method for (Second and third orders).

Unit – III: Simultaneous Linear Equations

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Solution of simultaneous linear equation-Gauss elimination method- Jordan method-Jacobi method modification-Gauss-Seidel method of iteration-Matrix method of inversion-eigen value and eigen vectors of a matrix.

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VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)
Elayampalayam, Tiruchengode

Credit: 2

Max. Hours: 24

MICROPROCESSOR AND ITS APPLICATIONS

Paper code: 18U6PHS05

Subject Description: This subject deals with the functions and principles of Micro Processors.

Goal: To learn about function of micro processors and operate them by learning with different features.

Objectives: On successful completion of this subject the student should have

- The basic knowledge of computers and its processors.
- To operate the processors with basic idea.

Unit – I: Introduction

5%

3

Microprocessor - Evolution of microprocessor - Organization of microcomputer -
 Microprocessor programming **Assembly language programming.**

Unit – II: Architecture

4

Intel 8085 Microprocessor Architecture – ALU - Timing and Control unit -Data and Address bus -
 Pin Configuration - PSW.

Unit - III: Instruction Set

5

Intel 8085 Instructions **set** - Opcode and Operands - Instruction word size - Instruction cycle -
 Timing diagram - Addressing modes.

Unit - IV: Memories

5%

5

Counter – Stack – Subroutines - Stack pointer - Internal data bus –Mnemonics - **Communication**
with microprocessor.

Unit – V: Assembly Language Programs of 8085

10%

7

Programs for 8-bit (i) Addition (ii) Subtraction (iii) Multiplication (iv) Division (v) Greatest
 and Smallest number **in an array of 8-bit unsigned numbers** (vi) Arranging numbers in Ascending and
 Descending order (vii) **Sum of N-numbers.**

Books for Study:

1. P. Mathur, Introduction to Microprocessor, TMH, 3rd edition, (2006).
2. M. Gilmore, Microprocessor Principles and Application, TMH, 2nd edition, (1995).
3. B. Ram, Fundamentals of Microprocessor and Microcomputers, Dhanpat Rai Publications, (2005).

Books for Reference:

1. Ramesh Gaonkar, Microprocessor Architecture Programming and application, Prentice Hall PTR, 5th edition, (2002).
2. A.K. Roy and K.M. Bunchandi, Advanced Microprocessor and peripherals, TMH, 2nd edition, (2009).



VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)
Elayampalayam, Tiruchengode

Credit: 2

Max. Hours: 24

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- To operate the processors with basic idea.

Unit – I: Introduction

5%

3

Microprocessor-Evolution of microprocessor-Organization of microcomputer -

Microprocessor programming- Machine -Assembly language programming.

Unit – II: Architecture

4

Intel 8085 Microprocessor Architecture-ALU-Timing and Control unit-Data and Address bus-Pin Configuration-PSW.

Unit - III: Instruction Set

5%

5

Intel 8085 Instructions-Opcode and Operands-Instruction word size – set- -Instruction cycle-Timing diagram-Addressing modes.

Unit - IV: Memories

5%

5

Counter-Stack–Subroutines-Stack pointer-Internal data bus–Mnemonics – System soft ware –

Monitor.

Unit – V: Simple Programs

5%

7

Programs for 8-bit (i) Addition (ii) Subtraction (iii) Multiplication (iv) Division (v) Greatest and Smallest number in an array of 8-bit unsigned numbers (vi) Arranging numbers in Ascending and Descending order (vii) Sum of N-numbers

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**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)
Elayampalayam, Tiruchengode**

Credit: 2

Max. Hours: 24

ELECTRICAL APPLIANCES

Paper code: 18U6PHS06

Subject Description: This paper presents the fundamental principle and working of electrical appliances

Goal & Objectives: To acquire knowledge about

- Handling household appliances.
- Know about the principle behind the working of appliances used in daily life.

Unit – I: Electrical Heating

5%

5

Electrical heating **modes of transfer of heat** methods of electric heating-resistance heating-induction heating-high frequency eddy current heating- dielectric heating.

Unit – II: Welding

5

Resistance welding-Electric arc welding-DC and AC welding equipment-Energy storage welding-Occupational hazards due to chemical reactions- Industrial heating and welding

Unit – III: Welding 20%

Resistance welding-Electric arc welding-DC and AC welding equipment-Energy storage welding-Occupational hazards due to chemical reactions- Industrial heating and welding.

Unit – IV: Domestic Appliances I

5%

5

Theory and principle of operation of fans - Wet grinder - Mixer grinder - Refrigerator - Air conditioner and Air cooler- **difference between them.**

Unit – V: Domestic Appliances II

5%

5

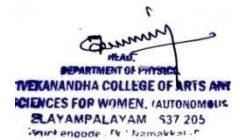
Theory and principle of operation of **DVD player**-Washing machine- Induction stove - Microwave oven -

Books for Study:

1. A text book in Electric power, P.L. Soni, P.V. Gupta & V.S. Bhatnagar, 2nd Edition (1995).
2. Utilisation of Electrical Energy, E.O. Taylor, Orient Longman, Orient Blackswan, (1971).
3. A Course in Electrical Power, J.B. Gupta, M/s. B.D. Jaataris & Sons, S. K. Kataria & Sons, (2009).
4. A text book in Electrical Technology, B.L. Teraja, S. Chand & Co., New Delhi Vol-1, (2010).

Books for Reference:

1. Electricity & Magnetism, R. Murugesan, S. Chand & Co., New Delhi, (2007).
2. Performance and design of A.C. Machines, M.G. Say, ELBS Third edition, (1980).
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VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)
Elayampalayam, Tiruchengode

Credit: 2

Max. Hours: 24

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Paper code: 18U6PHS06

Subject Description: This paper presents the fundamental principle and working of electrical appliances

Goal & Objectives: To acquire knowledge about

- Handling household appliances.
- Know about the principle behind the working of appliances used in daily life.

Unit – I: Heating

5

Electrical heating-modes of transfer of heat-methods of electric heating-resistance heating-induction heating-high frequency eddy current heating- dielectric heating.

Unit – II: Welding

5

Resistance welding-Electric arc welding-DC and AC welding equipment-Energy storage welding-Occupational hazards due to chemical reactions- Industrial heating and welding.

Unit – III: Motor for Electrical appliances

20%

4

Electrification by friction-Two kinds of electricity-Principle and types of Capacitor and resistance.

Unit – IV: Domestic Appliances I

5%

5

Theory and principle of operation of fans - Wet grinder - Mixer grinder - Refrigerator - Air conditioner and Air cooler- Battery and Batter chargers.

Unit – V: Application of Home Appliances

10%

5

Theory and principle of operation of vacuum cleaner, air Purifier - Washing machine- Induction stove-Iron box -Microwave oven.

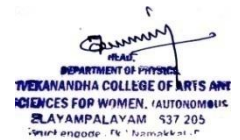
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**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)
Elayampalayam, Tiruchengode**

Max. Hours: 36

PAPER CODE: 18U6PHCP03

CORE PRACTICAL – III

Any 12 Experiments

1. Cantilever –Young’s modulus mirror and telescope.
2. Deflection magnetometer–M and B_H –TAN C position.
3. Comparison of mutual inductance –BG.
4. Spectrometer – i-i’ curve.
5. Spectrometer small angled prism.
6. Potentiometer –calibration of high range voltmeter.
7. Lee’s disc–thermal conductivity of a good conductor.
8. Co-efficient of viscosity-under graduated Burette-Radius by Mercury pellet method.
9. FET - Characteristics.
10. UJT - Characteristics.
11. Hartley oscillator.
12. Colpitt’s oscillator.
13. SCR – Characterisitics.
14. Microprocessor 8085–Addition and Subtraction.
15. Microprocessor 8085–Multiplication and Division.

Book for Refernces:

1. Practical Physics – C. C. Ouseph, U. J. Rao, V. Vjiayendran, 1st Edition, (2015).
2. Advanced Practical Physics, S.P Singh and Pragati Prakashan, 17th Edition, Vol–I, II.
3. P. R. Sasi Kumar, Practical Physics–PHI, (2011).

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)
Elayampalayam, Tiruchengode

Max. Hours: 36

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5. Spectrometer small angled prism.
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VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)
Elayampalayam, Tiruchengode

Credit: 4
Max. Hours: 36

CORE PRACTICAL – IV

PAPER CODE: 18U6PHCP04

Any 12 Experiments

1. Koenig's method–Uniform Bending.
2. Koenig's method–Non-Uniform Bending.
3. Cantilever–dynamic method.
4. Bifilar pendulum–Parallel threads.
5. Newton's rings–Refractive index of liquid.
6. Spectrometer-Dispersive power of a Grating.
7. Spectrometer –Cauchy's constant.
8. Potentiometer EMF of a thermocouple.
9. Field along the axis of coil–Vibration Magnetometer.
10. Carey foster bridge–temperature coefficient of resistance.
11. Astable multivibrator using 555 timer.
12. Monostable multivibrator using 555 timer.
13. Operational amplifier: Intergrator and differentiator.
14. V-I characteristics of LED.
15. RS Flip-Flop using NAND and NOR gates.

Book for Refernces:

1. Practical Physics – C. C. Ouseph, U. J. Rao, V. Vjiayendran, 1st Edition, (2015).
2. Advanced Practical Physics, S.P Singh, and Pragati Prakashan, 17th Edition, Vol–I, II.
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VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)
Elayampalayam, Tiruchengode

Credit: 4
Max. Hours: 36

CORE PRACTICAL – IV

PAPER CODE: 18U6PHP04

Any 12 Experiments

- 1.Koenig's method–Uniform Bending.
- 2.Koenig's method–Non-Uniform Bending.
- 3.Cantilever–dynamic method.
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