SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(An Autonomous Institution)
Puducherry – 605 107

2nd- Board of Studies Meeting in the Department of Physics

for the Programme
B.Sc. Physics

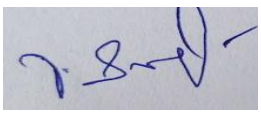
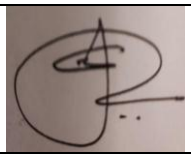
Venue
Physics lab, SAS Block
Sri Manakula Vinayagar Engineering College
Madagadipet, Puducherry – 605 107

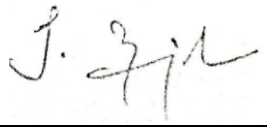
Date & Time
09.04.2021 & 02.00 PM

Minutes of Board of Studies

The Board of Studies - II meeting for Department of Physics was held on **April 9th at 2.00P.M in** the Physics Lab, SAS Block, Sri Manakula Vinayagar Engineering College with the Head of the Department, BoS Chairman, and internal members.

The following members were present for the BoS meeting

Sl.No	Name of the Member with Designation and official Address	Responsibility in the BoS	Signature
1	**Dr. T. Jayavarthanan,** M.Sc., M.Phil., Ph.D. Professor Department of Physics, SMVEC	Chairman	
External Members			
2	**Dr. B. J. Kalaiselvi,** M.Sc., M.Tech., Ph.D Professor, Department of Physics, Pondicherry Engineering College, Puducherry-605014	Pondicherry University Nominee	
3	**Dr. S. Senthilnathan**, M.Sc., M.Phil., Ph.D. Professor, Department of Physics University college of Engineering, Pattukottai	Academic Council Nominee	
4	**Dr. D. Manikandan**, M.Sc., M.Phil., Ph.D. Assistant Professor, Arignar Anna Govt Arts College, Villupuram	Academic Council Nominee	

5	**Mr. J. Bagairathan**, M.Sc., M.Tech Manager, L.G. balakrishnan& brothers Ltd	Industrial Nominee	
Internal Members			
1	Mr. K. Oudayakumar. M.Sc., M.Tech	Member	
2	Dr.T. Sivaranjani M.Sc., M.Phil., Ph.D.	Member	
3	Dr.D.Mohan Radheep M.Sc., M.Phil., Ph.D. PDF	Member	
4	Ms. C. Bavani M.Sc., M.Phil., M.Ed	Member	
5	Ms. S. Geetha M.Sc., M.Phil., B.Ed.	Member	
Co-opted Members			
1	Dr.M.A.Ishrath Jahan M.A., M.Phil., Ph.D	Member	
2	Dr. S. Savithri, M.Sc., M.Phil., Ph.D	Member	
3	Mr.Shanmugam, M.Sc., M.Phil., SET	Member	
4	Mr.K.Ganaesan,M.Sc.,M.Phil	Member	

AGENDA OF THE MEETING

1. Confirmation of minutes of I BoS meeting and the Curriculum Structure of B. Sc. Physics of Regulations 2020 – Modifications if any.
2. UGC curriculum structure of B.Sc. Physics
3. To discuss and approve the proposed B.Sc. Physics Degree Curriculum and Syllabi for III and IV semesters under Autonomous Regulations 2020.
   - ❖ Credit Requirement
   - ❖ Course structures
   - ❖ Discipline Core Courses
   - ❖ Discipline Elective Courses
   - ❖ Open electives offered to other departments
   - ❖ Skill Enhancement Courses
   - ❖ Employability Enhancement Courses
   - ❖ UGC – Mandatory Courses
4. To discuss about the Uniqueness of the Curriculum
   - ❖ Skill Enhancement Courses introduced from III to IV semesters
   - ❖ Value added Courses
   - ❖ Employability Enhancement Courses
   - ❖ NSS, NSO and Yoga are introduced as Extension activity courses
5. To discuss about the Evaluation Systems
   - ❖ Mark weightage for Continuous Assessment and End Semester Examinations
   - ❖ Question paper pattern

- ❖ Marks requirement to pass the course
- ❖ Single Valuation System
- ❖ Grade Point Average (GPA), Cumulative Grade Point Average (CGPA) and Percentage Conversion
- ❖ Classification of Degree

6. To discuss about the Innovative Teaching / Practices Methodology adopted to handle the emerging. / Advanced Technological concept courses
7. To discuss and approve the panel of examiners

Minutes of the Meeting

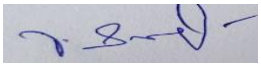
Dr. T. Jayavarthanan, Chairman, BoS opened the meeting by welcoming and introducing the external members, to the internal and co-opted members and thanked them for accepting to become the member of the Board of Studies.
The Chairman proceeded with the presentation to deliberate on agenda items.

Item:1	Review and confirm minutes of 1st BoS meeting held on 27.08.2020 The first BoS Meeting for B.Sc. Physics under regulation 2020 held on 27-08-2020 and confirmed the following points. The member unanimously approved the change in the name of the programme from B.Sc. applied physics to B.Sc. Physics ,henceforth the programme will be B.Sc. Physics and the modifications in all the following documents accordingly has been made. • Course structure of the programme • Curriculum for I to VI Semesters • Syllabi for the semesters I and II • Evaluation system • Innovative teaching methodology adopted • Department Vision, Mission and Course Outcome of the B.Sc. Physics Programme **Minutes are Reviewed and Confirmed**
Item:2	• The panel members approved the curriculum and structure of B.Sc. Physics
Item:3	The BoS members are discussed elaborately and reviewed the Syllabi of semesters III and IV and suggested the following points ➢ Uniformity in course outcome and objective should be maintained. ➢ Equal weightage should be given for all units. ➢ Repeated experiments should be removed **The above suggested points after correction are approved by BOS members and the details are given in Annexure- I.**

	The BoS members reviewed and discussed about syllabi of **Discipline Specific Elective** offered in III and IV semester curriculum and suggested following point, Semester – III • The Elective Named **Physics of devices and instrumentation** to be changed into **Physics for electronic devices**. **Approved the syllabi for Discipline Specific Elective with above mentioned change and recommended to Academic Council. the details are given in Annexure-II**
	The BoS members reviewed syllabi of Open Elective–I offered in the curriculum (R-2020) to other Departments. **Approved the syllabi of Open Elective-I offered to other B.Sc. programme and recommended to Academic Council.**
Item:4	The BoS members reviewed and appreciated the skill development and certification course and recommended to Academic Council
Item:5	**Approved the Evaluation Systems and recommended to Academic Council.**
Item:6	Innovative Teaching/Practices Methodology adopted to handle the emerging. / Advanced Technological concept courses were discussed and recommended to academic council approval.
Item:7	The list of question paper setters and Evaluators was presented and recommended by the BoS members to the academic council.

The Board of Studies resolved to approve the above suggestions for B.Sc. Physics brought forward by the Chairman incorporating the above changes.

The meeting was concluded at **4:00 PM** with vote of thanks by **Dr.T.Jayavarthanan**, Professor, and Department of Physics.



Dr.T.Jayavarthanan
Professor / Physics
Chairman –BOS

Annexure - I
SEMESTER - III

		L	T	P	C	Hrs
A20PHT305	**WAVES OSCILLATIONS AND ACOUSTICS**	**3**	**1**	**0**	**4**	**60**

Course Objectives

- The course presents an introduction to the Oscillations, Waves and Acoustics.
- The aim is to show the importance, types and applications of waves.
- Recognize the production, applications and properties of Ultrasonic waves.

Course Outcomes

After the end of the course, the students will able to

CO 1: Acquire knowledge of Simple Harmonic Motion
CO 2: Understand the character of Transverse waves
CO 3: Understand the character of longitudinal waves and Doppler effect
CO 4: Acquire knowledge of Acoustics.
CO 5: Acquire the knowledge of production, detection and applications of Ultrasonic.

UNIT - I: SIMPLE HARMONIC MOTION (12 Hours)

Simple harmonic motion– Velocity and acceleration in SHM – Energy of a simple harmonic oscillator (LC) –Examples of simple harmonic oscillators in electrical systems – Superposition of two SHMs of Equal time periods and acting at right angles to each other - Lissajous figures –Damped harmonic oscillations.

UNIT - II: TRANSVERSE WAVES (12 Hours)

Introduction to transverse waves – Velocity of transverse waves in stretched string – Standing waves on a string-Determination of AC frequency using Sonometer – Energy of a vibrating string – Standing wave ratio.

UNIT - III: LONGITUDINAL WAVES (12 Hours)

Introduction to longitudinal waves – Sound waves in gases – Energy distribution in sound waves – Intensity of sound waves – Longitudinal waves in a solid – Example: earthquake – Doppler Effect.

UNIT - IV: ACOUSTICS (12 Hours)

Reflection and transmission of sound waves at boundaries – Diffraction of sound waves- Noise and music – Limits of human audibility – The decibel unit- Reverberation time-Sabine's formula for growth and decay – Acoustics of auditoriums and halls– Introduction to acoustic transducers.

UNIT - V: ULTRASONICS (12 Hours)

Ultrasonics – Production of Ultrasonics: Piezo electric effect- Piezo electric crystal generator – Magnetostriction generator –Detection of ultrasonics –Thermal detectors – Piezo electric detectors - Applications of Ultrasonics- Ultrasound scan – NDT.

Textbooks

1. H. J. Pain, The Physics of Vibrations and Waves, John Wiley, (2005), 6th Edition, for Units I, II & III.
2. N. Subrahmanyam, Brijlal, A Text Book of Sound, Second Edition, Vikas Publishing house PVT Ltd, 2016.
3. N.K. Bajaj, The Physics of Waves and Oscillations, Mc Graw Hill Publishers, 2017.

Reference Books

1. David Halliday, Robert Resnick and Jearl Walker, Fundamentals of Physics, John Wiley &Sons(2004), 7th Edition.
2. Berkeley Physics Course-Waves: Volume-III, McGraw Hill, (1969).
3. A. P. French, Vibrations and Waves (M.I.T Introductory Physics Series), CRC Press, (1971).

A20PHT306	BASIC ELECTRONICS	L	T	P	C	Hrs
		3	1	0	4	60

Course Objectives:

- To acquire knowledge about basics and physical mechanism behind electronics.
- To know the various semiconductor devices and it's working mechanism.
- To apply the development of the electronic instruments.
- To motivate the students to apply the principles of electronics in their day – to – day life.

Course Outcomes

After the end of the course, the students will able to

CO1: Acquire knowledge about physical mechanism of solids through band theory.
CO 2: Ability to understand the basic semiconductor devices and its connection configuration
CO3: Acquire knowledge about the special semiconductor devices
CO4: Ability to understand the applications of semiconductor on various device applications
CO5: Able to know the principles operational amplifiers

UNIT - I: BAND THEORY OF SOLIDS (12 Hours)

Semiconductors - 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 – Light Emitting (LED) Photo diode - Tunnel diode.

UNIT - II: TRANSISTOR (12 hours)

Transistor - Basic configurations – Common Base (CB), Common Emitter (CE) and Common Collector (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 – hybrid 'h' parameter.

UNIT - III: FIELD EFFECT TRANSISTORS (FET) AND SPECIAL DEVICES (12 hours)

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

UNIT - IV: AMPLIFIERS AND OSCILLATORS (12 hours)

Amplifiers – Definition of gain, Frequency response, decibel and band width - Classification of amplifiers - Single stage and Multi stage RC couples CE amplifier - Class A, B, C - Power amplifiers - Feedback amplifier - Principles of negative voltage feedback – Advantages - Emitter follower. Oscillators - Hartley Oscillator - Colpitt's Oscillator - Phase Shift Oscillator - Piezo-Electric Oscillator.

UNIT - V: OPERATIONAL AMPLIFIERS (OPAMP) (12 hours)

OPAMP - PIN configuration - Characteristics of OPAMP - Virtual ground Off-set voltage - Inverting amplifier - Non- inverting amplifier - Differential amplifier - Common mode rejection ratio – Application - OPAMP as Adder Subtractor – Integrator – Differentiator – Comparotor. IC 741 Astable, Monostable and table multivibrators.

Text books:

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).

References Books

1. Hand book of Electronics by Gupta Kumar, Published by Pragati Prakashan, (2010).
2. D. Chattopadhyay, Foundations of Electronics 2nd edition, Wiley Eastern Ltd, New Delhi, (1988).
3. Dennis Le Croissette, Transistors, Prentice-Hall of India New Delhi, (1988).

A20PHL303	PHYSICS PRACTICAL - III	L	T	P	C	Hrs
		0	0	4	2	30

Choose any 8 experiments from the list given below

Course Objectives

- To provide a practical understanding of some of the concepts learnt in the theory course on Physics.
- To evaluate the process and outcomes of an experiment quantitatively and qualitatively.
- To extend the scope of an investigation whether or not results come out as expected.
- To conduct an experiment collaboratively and ethically.
- To collect data and revise an experimental procedure iteratively and reflectively

Course Outcomes

On successful completion of the course, students will be able to

CO 1 - Ability to know the specific latent heat and Capable of handling compound and torsional pendulum

CO 2 - Acquired basic knowledge about spectrometer and magnetic field due to a current carrying coil.

CO 3 - Ability to determine the focal length of high power microscope and to know basic knowledge about Potentiometer

CO 4 - Ability to prepare formal laboratory reports describing the results of experiments and to interpret the data from the experiments

CO 5 - Ability to know the practical knowledge to describe the experiments and to correlate the theoretical values

LIST OF EXPERIMENTS

1. Compound Pendulum.
2. Rigidity modulus – Torsional pendulum with equal masses
3. Specific latent heat of fusion of ice.
4. Spectrometer-grating-minimum deviation method
5. Spectrometer - i-d curve.
6. M and BH using deflection and vibration magnetometer Tan A and Tan B position.
7. Carry-Foster's bridge - Resistivity of the material of the coil of wire.
8. Potentiometer - Internal resistance of a cell.
9. B.G- Comparison of emf of two cells
10. Determining the focal length of high power microscope objective
11. Study of interference fringes bi-prism arrangements

TEXTBOOKS

1. Practical Physics C.C Ouseph, V.J.Rao andV.Vijayendran
2. Practical Physics M.N.Srinivasan, Sultan sonPubs
3. D P Khandelwal, A Laboratory Manual in Physics for Undergraduate Students (Vani Publication, NewDelhi)

REFERENCE BOOKS

1. Olon, Experiments in Modern Physics.
2. Adrian C. & Melissinos, Experiments in Modern Physics (Academic Press).

SEMESTER -IV

		L	T	P	C	Hrs
A20PHT408	**APPLIED ELECTRONICS**	**3**	**1**	**0**	**4**	**60**

Course Objectives:

- Getting knowledge about Special devices, circuits and its applications.
- To know the various special semiconductor amplifiers and it's working mechanism.
- To motivate the students to learn about memory elements and Boolean mechanism.

Course Outcomes

After the end of the course, the students will able to

CO1: Acquire knowledge about physical mechanism of special semiconductor devices.
CO 2: Understand the special semiconductor devices and its circuit configurations
CO3: Acquire knowledge about the operational amplifier and various oscillator circuits.
CO4: Understand the Boolean mechanism and various memory elements
CO5: know the principles of convertors such as analog to digital and vice versa.

UNIT - I: SPECIAL DEVICES AND APPLICATIONS (12 hours)

Field Effect Transistors (FET) - Characteristics – parameter FET as amplifier – FET as Voltage variable resistor (VVR) – Metal Oxide Semiconductor (MOSFET) – Depletion and enhancement – UniJunction Transistor (UJT) characteristics – UJT as relaxation oscillator – Silicon controlled Rectifier (SCR) characteristics.

UNIT - II: LINEAR OPERATIONAL AMPLIFIER CIRCUITS (12 hours)

OPAMP – Parameters – inverting and Non-inverting amplifier – gain – Miller effect – Virtual ground – offset voltage – offset current – Power Supply Ripple Ratio (PSRR) – Common Mode Rejection Ratio (CMRR) - OPAMP – Sign and scale changer – adder, subtractor and averager – integrator and differentiator – voltage follower – solving simultaneous linear equation.

UNIT – III: APPLICATIONS OF OPERATIONAL AMPLIFIER (12 Hours)

OP AMP logarithmic amplifier – antilogarthmic amplifier – Logarithmic multiplier – Logarithmic divider - Comparator – Schmitt trigger – Astable multivibrator – Monostable multivibrator – Bistable multivibrator – Wein Bridge oscillator – phase shift oscillator.

UNIT - IV: BOOLEAN AND MEMORY ELEMENTS (12 Hours)

Fundamental concepts of Boolean algebra – Basic gates and universal gates – De margon's theorem: Simplification of expressions – Memory cell – Random Access Memory (RAM) – types – Read Only Memory (ROM) – Programmable (PROM), Erasable Programmable (EPROM), Electrically Erasable Programmable EEPROM – Magnetic Disk Memories – Magnetic tapes – Compact disc.

UNIT - V: D / A AND A / D CONVERTER (12 Hours)

555 Timer block diagram - Monostable operation – A stable operation – Schmitt trigger. Phase – Locked Loops (PLL): Basic principles – phase Detector- Analog phase detector – Digital phase detector – voltage controlled oscillator (VCO). Weighted resistor D/A converter – 4bit R-2R ladder DAC – Analog to Digital converter – Stair case ADC– Successive approximation ADC.

Text Books

1. Vijayendran*, Introduction to Integrated Electronics*, S.Viswanathan Pvt. Ltd., 2009.
2. R.S. Sedha, *A text Book of Applied Electronics,* S. Chand & Company Ltd., 2nd New Edition, 2000.
3. M. Arul Thalapathi, *Basic and Applied Electronics,* Cometak Publisher Chennai, 2005.
4. V.K. Mehta, Principles of Electronics, S. Chand & Company Ltd, Chennai, 2005

Reference Books

1. Albert Paul Malvino, *Digital Computer Electronics,* TMH Edition, 1992.
2. I. J. Jagrath, *Electronics – Analog and Digital,* Prentice – Hall of India, New Delhi, 1999.
3. Malvino Leach, *Digital Principles and Applications,* 4thEdn., Tata McGraw Hill, 1992.

A20PHT409	LASER AND FIBER OPTICS COMMUNICATION	L	T	P	C	Hrs
		3	1	0	4	60

Course Objectives:

- Getting knowledge about LASER and its applications.
- To know the various special LASER devices and its physical mechanism.
- To know the basic knowledge about Fiber Optic communications and its importance.

Course Outcomes

After the end of the course, the students will able to

CO 1: Understand the basics principles of laser
CO 2: Study the information about the types of lasers and its characteristics
CO 3: Obtain the knowledge about applications of laser
CO 4: Understand the basics of optic fibers
CO 5: Obtain the knowledge about the Communication processes

UNIT I: LASER PHYSICS **(12 Hours)**

Basic Principle of Laser – Einstein Coefficients – condition for light amplification – Population Inversion – Threshold Condition – Line shape function – Optical Resonators – Three level and four level systems.

UNIT II: TYPES OF LASERS AND OUTPUT MODULATION METHODS **(12 Hours)**

Solid State lasers – Small diode-pumped Nd:YAG (YAG lasers) - Nd:YVO_4 lasers (vanadate lasers) Gas lasers – Helium Neon (He-Ne) and Carbon dioxide (CO_2) lasers – semiconductor lasers – Heterojunction lasers - Argon ion and Eximer Laser– Q switching and mode locking.

UNIT III: APPLICATIONS OF LASER **(12 Hours)**

Application of laser in industry – cutting and welding – Drilling – surface Hardening – Medical applications - laser as diagnostic and therapeutic tool – Holography – Theory of recording and reconstruction – application of Holography.

UNIT IV: OPTIC FIBERS **(12 Hours)**

Fiber optic revolution – basic characteristics of optical fiber – acceptance angle – numerical aperture – propagation of light through optical fiber – theory of mode formation – classification of fibers – step index and graded index fibers – single mode and multi mode fibers – losses in fibers – fabrication techniques of fibers.

UNIT V: FIBER OPTIC COMMUNICATION **(12 Hours)**

Source and detectors for fiber optic communication – Laser and LED – Analog and digital modulation methods – principle of optical detection – pin and APD photo detectors – Noise – Design consideration of a fiber optic communication system.

Text Books

1. R. Murugeshan, *Modern Physics*, S. Chand & Co., 2009.
2. Senthil Kumar, *Engineering Physics*, VRB Publishers Pvt. Ltd., 2013.
3. K. Thyagarajan and Ajoy Ghatak, *Laser Theory and Applications*, Cambridge University Press, 1999.

Reference Books

1. John M. Senior, *Optical Fiber Communications,* Cambridge University Press, 1996.
2. Govind P. Agrawal, *Fiber – Optic Communication Systems*, John- Willey & Sons, 2007.
3. P. K. Palanisamy, *Physics for Engineering*, Scitech publishing Pvt. Ltd., Chennai, 2009.

A20PHL404	PHYSICS PRACTICAL - IV	L	T	P	C	Hrs
		0	0	4	2	30

Choose any 8 experiments from the list given below

Course Objectives

- To provide a practical understanding of some of the concepts learnt in the theory course on Physics.
- To evaluate the process and outcomes of an experiment quantitatively and qualitatively.
- To extend the scope of an investigation whether or not results come out as expected.
- To conduct an experiment collaboratively and ethically.
- To collect data and revise an experimental procedure iteratively and reflectively

Course Outcomes

On successful completion of the course, students will be able to

CO 1 - Ability to know the Youngs modulus experiment and to handle sonometer

CO 2 - Acquired basic knowledge about Potentiometer and magnetic field due to a current carrying coil.

CO 3 - Ability to prepare formal laboratory reports describing the results of experiments and to interpret the data from the experiments.

CO 4 - Ability to calculate the values for figure of merit and to study optical rotation of solutions.

CO 5 – Ability to know the practical knowledge about computer simulation and to handle half and full wave rectifier.

LIST OF EXPERIMENTS

1. Young's modulus – Koenig's method (Non uniform bending)
2. Rigidity Modulus – Statistic Torsion
3. Sonometer ac frequency using steel wire
4. Spectrometer-grating-normal incidence method
5. Field along the axis of the circular coil carrying current and determination of B
6. Carry-Foster's bridge - Temperature co-efficient of the material of a wire.
7. Potentiometer -Calibration of high range voltmeter
8. Figure of merit of a periodic moving coil galvanometer.
9. B.G. - Comparison of capacities.
10. Melde's string-Specific gravity of a solid and liquid.
11. Study of optical rotation by solutions.
12. Study of the rise and decay of current in a RL circuits
13. Junction and Zenor diode characteristics
14. Study of Half and full wave rectifier
15. Computer simulation of effect of magnetic field on charged particles
16. Computer simulation of propagation of electromagnetic waves.

Textbooks

1. Practical Physics C.C Ouseph, V.J.Rao and V.Vijayendran
2. Practical Physics M.N.Srinivasan, Sultan son Pubs
3. D P Khandelwal, A Laboratory Manual in Physics for Undergraduate Students (Vani Publication, NewDelhi)

Reference Books

1. Olon, Experiments in Modern Physics.
2. Adrian C. & Melissinos, Experiments in Modern Physics (Academic Press).

Annexure - II

Semester -III

A20PHE301	MATERIAL SCIENCE	L	T	P	C	Hrs
		4	0	0	4	60

Course Objectives

- To understand the importance of Material Science as a subject that revolutionized modern day technologies
- To understand the significance of material science in the development of new materials and devices for all branches of Engineering
- To impart knowledge to the Engineering students about some of the important areas of Materials Science so as to enable them perceive the significant contributions of the subject in Engineering and Technology

Course Outcomes

After the end of the course, the students will able to

CO1 – Identify crystal lattices and their structures and Lattice defects.

CO2 – Identify the nature of polarization in a dielectric material and to explain the various dielectric materials.

.**CO3** – Understand the source of a materials magnetic behaviour and be able to distinguish types of magnetism.

CO4 – Student is able to define basic properties of Semiconductors & superconducting materials.

CO5 – Have a broad understanding of the techniques used to synthesize the advanced materials.

UNIT -I CRYSTAL STRUCTURE AND LATTICE DEFECTS (12 Hours)

Crystal structure - Bravais Lattices, Crystal Systems — Coordination Number, Atomic Radius, Packing Factor for FCC & HCP structures – Miller Indices- Powder X Ray Diffraction Method. Lattice defects – Qualitative ideas of point, line, surface and volume defects.

UNIT II – DIELECTRIC PROPERTIES (12 Hours)

Dielectric Polarization and Mechanism –Temperature dependence of polarization, Internal or local Field - Clausius-Mossotti relation. Basic ideas of Dielectric loss - frequency dependence of dielectric constant – Measurement of Dielectric constant and loss using Schering bridge – Elementary ideas of Piezoelectric, Ferroelectrics and Pyro electric materials and Applications.

UNIT III – MAGNETIC PROPERTIES (12 Hours)

Origin of atomic magnetic moment – Bohr magneton-Elementary Ideas of classification of magnetic materials (Dia, Para, Ferro, antiferro & Ferri). – Quantum theory of Para & Ferro Magnetism – Domain Theory of Hysteresis –Structure and Properties of Ferrites – Properties of Soft & Hard Magnetic Materials – Applications. Magnetic data storage – Magnetic tapes, Hard disks, Magneto optical recording.

UNIT IV – SEMICONDUCTORS AND SUPERCONDUCTORS (12 Hours)

Semiconductors -Derivation of Carrier concentration in intrinsic Semiconductors –temperature dependence of carrier concentration and electrical conductivity in semiconductors (qualitative ideas), Hall effect in Semiconductors -- Application of Hall Effect, Superconductivity - Basic concepts – transition temperature – Meissner effect – Type I and II superconductors – high temperature superconductors– Applications of superconductors.

UNIT V – ADVANCED MATERIALS (12 Hours)

Liquid Crystals – Types – Application as Display Devices. Metallic Glasses – preparation by melt spinning. Twin roller system, properties and applications. Shape Memory alloys (SMA), Shape memory effect, Properties and applications of SMA Nanomaterial's- Nano materials (one, two & three Dimensional) –Methods of synthesis (PVD, CVD, Laser Ablation, Sol gel, and Ball-milling Techniques), Properties and applications of nanomaterial.

Text books

1. V Rajendran, Engineering Physics, 2 nd Edition, TMH, New Delhi 2011.
2. V Raghavan , Materials Science and Engineering- A First Course, 5th Edition, Prentice Hall of India, 2008.
3. S.O Pillai , Solid State Physics– New Age International,2005.

Reference Books

1. Ali Omar M, Elementary Solid State Physics, Addison Wesley Publishing Co., 2009.
2. William D Callister Jr., Material Science and Engineering, 6th Edition, John Wiley and sons, 2009.
3. Srivatsava J P, Elements of Solid State Physics, Prentice Hall of India, 2004.

A20PHE303	EMBEDDED SYSTEM: INTRODUCTION TO MICROCONTROLLERS	L	T	P	C	Hrs
		3	1	0	4	60

Course Objectives

- The course presents an introduction to the embedded system and Microcontrollers.
- The aim is to show how to program 8051 microcontroller and its physical mechanism.
- Recognize the applications and properties of embedded system design and development.

Course Outcomes

After the end of the course, the students will able to

CO1 – Introduction to embedded system, design issues and challenges.
CO2 – The roles played by 8085 programming, subroutines, hardware and software interrupts.
CO3 – Internal and schematic structure of 8051 microcontroller.
CO4 – I/O programming of 8051 microcontroller, addressing the system and operations.
CO5 – 8051 compilation, debugging and industrial applications.

UNIT 1 EMBEDDED SYSTEM INTRODUCTION (12 Hours)

Introduction to embedded systems and general purpose computer systems, architecture of embedded system, classifications, applications and purpose of embedded systems, challenges and design issues in embedded systems, operational and non-operational quality attributes of embedded systems, elemental description of embedded processors and microcontrollers.

UNIT II REVIEW OF MICROPROCESSORS (12 Hours)

Organization of Microprocessor based system, 8085 pin diagram and architecture, concept of data bus and address bus, 8085 programming model, instruction classification, subroutines, stacks and its implementation, delay subroutines, hardware and software interrupts.

UNIT III 8051 MICROCONTROLLER (12 Hours)

Introduction and block diagram of 8051 microcontroller, architecture of 8051, overview of 8051 family, 8051 assembly language programming, Program Counter and ROM memory map, Data types and directives, Flag bits and Program Status Word (PSW) register, Jump, loop and call instructions.

UNIT IV PROGRAMMING OF 8051 (12 Hours)

Introduction of I/O port programming, pin out diagram of 8051 microcontroller, I/O port pins description and their functions, I/O port programming in 8051, (Using Assembly Language), I/O programming: Bit manipulation. 8051 addressing modes and accessing memory using various addressing modes, assembly language instructions using each addressing mode, arithmetic & logic instructions, 8051 programming in C:- for time delay and I/O operations and manipulation, for arithmetic & logic operations, for ASCII and BCD conversions.

UNIT V EMBEDDED SYSTEM DESIGN AND DEVELOPMENT (12 Hours)

Embedded system development environment, file types generated after cross compilation, disassembler/ decompiler, simulator, emulator and debugging, embedded product development life-cycle, trends in embedded industry.

Text Books

1. Embedded Systems: Architecture, Programming & Design, R. Kamal, 2008, Tata McGraw Hill
2. The 8051 Microcontroller and Embedded Systems Using Assembly and C, M.A.Mazidi, J.G. Mazidi, and R.D. McKinlay, 2 Edition., 2007, Pearson Education India.
3. Embedded Microcomputer System: Real Time Interfacing, J.W. Valvano, 2000, Brooks/Cole.

Reference Books

1. Microcontrollers in practice, I. Susnea and M. Mitescu, 2005, Springer.
2. Embedded Systems: Design & applications, 1/e S.F. Barrett, 2008, Pearson Education India
3. Embedded Microcomputer systems: Real time interfacing, J.W. Valvano 2011, Cengage Learning.
4. Introduction to embedded systems:using microcontrollers and the MSP430, Manuel Jiménez , Rogelio Palomera, Isidoro Couvertier,Springer.
5. Microcontrollers and Embedded system design, Nilesh Bhaskarrao Bahadure,Saurabh Chandrakar, I.K. International Publishing House Pvt. Ltd.

A20PHE302 PHYSICS FOR ELECTRONIC DEVICES L T P C Hrs
3 1 0 4 60

Course Objectives

- To understand the importance of Physics of Devices & Instrumentation as a subject that revolutionized modern day technologies.
- Recognize the applications and properties of Optoelectronic device design and development.
- To understand the significance of Device and Instrumentation in the development of new materials and devices for all branches of Engineering

Course Outcomes

After the end of the course, the students will able to

CO1 – Introduction to Energy band, Charge Carrier in semiconductor etc.
CO2 – The roles played by Excess Carriers in Semiconductors.
CO3 – Internal and schematic structure of p-n junction diodes.
CO4 – Introduction to various Optoelectronic Devices, design and challenges.
CO5 – Introduction to Photodector and their characteristics.

UNIT- I: ENERGY BAND AND CHARGE CARRIER IN SEMICONDUCTORS (12Hours)

Energy band in solids: Energy band – Metal, Semiconductor and Insulators – Direct and Indirect Semiconductors. Charge Carriers in Semiconductor: Electron and Holes – Effect Mass in intrinsic semiconductors, dependence of Fermi level on temperature and doping concentration. and mobility – drift – effect of temperature and doping on mobility. (qualitative only)

UNIT-II: EXCESS CARRIERS IN SEMICONDUCTORS (12 Hours)

Luminescence: Photoluminescence – Electroluminescence – Carrier Lifetime and Photoconductivity – direct recombination of electrons and holes – indirect recombination; trapping – photoconductivity devices – Diffusion of Carriers – diffusion processes – diffusion and drift of carriers; built-in field – diffusion and recombination –Diffusion length.

UNIT-III: P-N JUNCTION DIODES (12 Hours)

P-N Junction Diode, Depletion region, Barrier Potential, Working in Forward and Reverse bias condition – Junction capacitance, Diode current equation– Effect of temperature on reverse saturation current – construction, working, V-I characteristics and simple applications of varactor diode, Zener diode and Tunnel diode.

UNIT-IV: OPTOELECTRONIC DEVICES (12 Hours)

Current and Voltage in an illumination junction – Solar Cells – Photo detectors - Light Emitting Diodes: Light – Emitting materials – Semiconductor Lasers: population inversion at a junction – Basic of Semiconductor Laser – materials for semiconductor Lasers.

UNIT-V: PHOTODIODES (12 Hours)

Types of FET-Characteristics and Principles of operation of JFET -JFET as an amplifier- CS, CD, CG configuration-Operation of MOSFET as a switch – as a variable resistor – UJT-SCR and it's Characteristics

Text Books:

1. Ben G Streetman and Sanjay Kumar Banerjee, "Solid State Electronics" 6thEdn PHI
   Unit I – Chapter 3 (relevant sections) Unit II – Chapter 4 (relevant sections)
   Unit IV – Chapter 8 (relevant sections) 2. Electronic Devices and Circuit Theory --- Robert L. Boylestad& Louis Nashelsky. 2.
3. Electronic Devices and Circuits I – T.L.Floyd- PHI Fifth Edition

Reference Books

1. S.Salivahanan, N. Suresh Kumar and A. Vallavaraj "Electronic divces and circuits" TMH(1998)
2. Millman and Halkias, "Electronics Devices and Circuicts"- McGraw Hill, V reprint 1993,
3. Boylestsd. L.Robert and Nashalsky Louis, "Electronic devices and Circuit theory", PHI 1997.

A20PHE404 **MEDICAL PHYSICS**

L	T	P	C	Hrs
4	0	0	4	60

Course Objectives

- To explain the physical principles underlying the five areas of the application of physics to medicine covered in the module.
- To discuss the advantages and drawbacks of each of these therapeutic or investigative techniques
- Understanding of the current research into ways in which they might be improved.

Course Outcomes

After the end of the course, the students will able to

CO1 – Introduction to X-ray imaging, X-ray production, Optical Chromatography etc.,.
CO2 – The roles played by Nuclear medicine.
CO3 – Brief ideas about Ultrasound medicine.
CO4 – Introduction to various types of Radiotheraphy.
CO5 – Understand the concept of various imaging techniques like EEG, ECG, MEG and MCG.

UNIT I - X-RAY IMAGING (12 Hours)

Production of X-ray images, attenuation coefficients, choice of suitable energy, contrast, hardware; digital imaging X-ray computed tomography, five generations of scanners, reconstruction methods, CT number, contrast stretching-Optical Chromatography.

UNIT II NUCLEAR MEDICINE (12 Hours)

In vitro and in vivo testing, gamma rays for imaging, radiopharmaceuticals, the gamma camera, SPECT, PET, examples of clinical use.

UNIT III ULTRASOUND IN MEDICINE (12 Hours)

Ultrasound imaging, generation and detection of ultrasound, ultrasound propagation, choice of frequency, A-scan, B-scan, M-mode imaging and echo cardiography. Use of Doppler techniques for blood flow etc. Use of ultrasound in therapy

UNIT IV RADIOTHERAPY (12 Hours)

Effect of radiation on normal and malignant tissue, cell survival Types of radiotherapy unit: low voltage, ortho-voltage, megavoltage, and electron beam, brachytherapy Dosimeter: conformal radiotherapy- Photodynamic Therapy.

UNIT V NEUROELECTRICS AND NEUROMAGNETICS (12 Hours)

Basic electrophysiology, genesis of electric and magnetic signals Techniques for measurement and imaging of Electroencephalogram (EEG), Electrocardiogram (ECG), MEG and MCG.

Text Books:-

1. Webb. S (Ed), The Physics of Medical Imaging, Hilger 1988
2. Dendy. P.P and B Heaton, Physics of Diagnostic Radiology, IOPP 2012
3. Brown. B.H et. al., Medical Physics and Biomedical Engineering IOPP 1999

Reference Books

1. Maisey, Britton and Gilday (Eds), Clinical Nuclear Medicine, Chapman and Hall 1991
2. Hendee. W.R, Radiation Therapy Physics, Mosby 2004
3. HedrickW.R, DL Hykes, and DE Starchmann, Ultrasound Physics and Instrumentation, Mosby 1995

A20PHE405	ENERGY PHYSICS	L	T	P	C	Hrs
		4	0	0	4	60

Course Objectives

- The course presents an introduction to conventional and Non-conventional energy sources.
- The aim is to show various Biomass and Geothermal energy.
- Recognize the Energy storage and impacts of Non-conventional energy.

Course Outcomes

After the end of the course, the students will able to

CO1- Study about the Conventional Energy Sources

CO2- Learn about the Non-Conventional Energy Sources

CO3- Acquire Knowledge of Biomass energy

CO4- Be familiar with the geothermal energy

CO5- Apply the knowledge of Energy storage and impacts of Non-conventional energy

UNIT I - CONVENTIONAL ENERGY SOURCES: (12 hours)

World's reserve of commercial energy sources and their availability-various forms of energy-renewable and conventional energy systems- comparison and natural gas – availability –statistical details-applications- merits and demerits

UNIT II NON-CONVENTIONAL ENERGY SOURCES: (12 hours)

Renewable energy sources- solar energy- nature of solar radiation- components-solar heaters- crop dryers- space cooling-solar ponds-solar cookers-water desalination- photovoltaic generation basics-merits and demerits of solar energy

UNIT III BIOMASS ENERGY (12 hours)

Classification- photosynthesis- biomass conversion process-go-bar gas plants wood gasification-ethanol from wood- advantages and disadvantages of biomass as energy source

UNIT IV GEOTHERMAL ENERGY (12 hours)

Wind energy- ocean thermal energy conversion (OTEC)-energy from waves and tides (basic ideas, nature, applications, merits and demerits)

UNIT V ENERGY STORAGE- IMPACTS OF NON-CONVENTIONAL ENERGY (12 hours)

Conversion of energy- patterns of energy consumption in domestic, industrial, transportation, agricultural sectors- conservation principles in these sectors- energy crisis and possible solutions-energy options for the developing countries- energy storage and hydrogen as a fuel (basics)-impact due to nonconventional energy sources-global warming

TEXT BOOKS

1. Rajamaanar, 2004, Environmental Studies.
2. Katharina Krischer , Konrad Schönleber,Physics of energy conversion.
3. Washington Taylor, Robert L.Jaffe, Physics of energy.

REFERENCE BOOKS

1. Sukhatme, Solar Energy, McGraw-Hill Inc., US, 2nd Revised Edition,1997.
2. Pratima Bajpai, Biomass to energy conversion technologies.
3. Biomass for energy and the environment,P.Chartier,G.L Ferrero,1997