DEPARTMENT OF PHYSICS

SYLLABI FOR M.Sc PHYSICS

CURRICULAM AND SCHEME OF EXAMINATIONS (CBCS)

(APPLICABLE TO STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2017-2018 ONWARDS)

KONGUNADU ARTS AND SCIENCE COLLEGE
(AUTONOMOUS)
COIMBATORE -641029

2017- 2018

PPH1

KONGUNADU ARTS AND SCIENCE COLLEGE

(AUTONOMOUS)

COIMBATORE-641 029

M.Sc., PHYSICS

Curriculum and Scheme of Examination under CBCS

(Applicable to students admitted during the Academic year 2017–2018 and onwards)

Semester	Subject code	Title of the Paper	Instruction hours/cycle	Exam. Marks			Duration of Exam. Hrs.	Credit
				CIA	ESE	Total		
I	15PPH101	**C.P 1**- Classical Mechanics	5	25	75	100	3	5
	15PPH102	**C.P 2**- Mathematical Physics	5	25	75	100	3	5
	17PPH103	**C.P 3**- Modern Optics	5	25	75	100	3	5
	17PPH1N1	**1N1 – Non Major Elective I : Electronics and Microprocessors /** Applied Physics	5	25	75	100	3	5
	15PPH2CL	**C. Pr 1**- General Experiments	5	-	-	-	-	-
	15PPH2CM	**C. Pr 2**- Electronics Experiments	5	-	-	-	-	-
II	15PPH204	**C.P 4**- Quantum Mechanics –I	5	25	75	100	3	4
	16PPH205	**C.P 5**- Thermodynamics and Statistical mechanics	5	25	75	100	3	4
	15PPH206	**C.P 6**- Thin Film Physics, Plasma Physics and Crystal growth	4	25	75	100	3	4
	15PPH207	**C.P 7**- Nuclear and Particle Physics	4	25	75	100	3	4
	17PPH2N2	**2N2 – Non Major Elective II: Energy Physics /** Industrial Physics	4	25	75	100	3	5
	15PPH2CL	**C.Pr 1** - General Experiments	4	40	60	100	4	3
	15PPH2CM	**C.Pr 2** - Electronics Experiments	4	40	60	100	4	3
III	15PPH308	**C.P 8**- Quantum Mechanics-II	5	25	75	100	3	5
	15PPH309	**C.P 9**- Electromagnetic theory and Electrodynamics	5	25	75	100	3	5
	15PPH310	**C.P.10** Solid State Physics	5	25	75	100	3	5
	17PPH3E1	**Major Elective I: Nanotechnology: Principles and Applications /** Atmospheric Science	5	25	75	100	3	5
	15PPH4CN	**C. Pr 3**- Advanced Experiments	5	-	-	-	-	-
	15PPH4CO	**C. Pr 4** - Special Electronics Experiments	5	-	-	-	-	-

PPH2

IV	15PPH411	**C.P. 11** Communication Physics	5	25	75	100	3	4
	15PPH412	**C.P 12** - Atomic & Molecular Spectroscopy	5	25	75	100	3	4
	17PPH4N2	Major Elective II: **Biomedical Instrumentation /** Problems in Physics	5	25	75	100	3	5
	15PPH4CN	**C. Pr 3** - Advanced Experiments	5	40	60	100	6	3
	15PPH4CO	**C. Pr 4** - Special Electronics Experiments	5	40	60	100	6	3
	15PPH4Z1	**Project and Viva Voce**	5	40	160	200	-	4
		Total				2200		90

Major Elective Papers

(2 papers are to be chosen from the following 4 papers)

1. **Nanotechnology: Principles and Applications**
2. Atmospheric Science
3. **Biomedical Instrumentation**
4. Problems in Physics

Non - Major Elective papers

(2 papers are to be chosen from the following 4 papers)

1. **Electronics and Microprocessors**
2. Applied Physics
3. **Energy Physics**
4. Industrial Physics

PPH23

SEMESTER II **17PPH2N2**

NON MAJOR ELECTIVE - II : ENERGY PHYSICS

Total Hours of Teaching: 75 hrs **Total Credits: 5**

Objectives

1. To know about solar radiation & solar pond
2. To know about photovoltaic energy conversion
3. Students to know hydrogen energy, wind energy & OTEC
4. Students to understand the importance of energy auditing and carbon credits.

UNIT I **15 hrs**

Solar thermal energy

Introduction on solar radiation - solar constant - solar radiation at the earth surface - physical principles of the conversion of solar radiation into heat solar energy collectors - flat plate collectors - advantages of flat plate collectors - concentrating collector parabolic through reflectors and mirror - strip reflector - advantages and disadvantages of concentrating collectors over flat plate type collectors - solar energy storage - solar pond - principle of operation and description of non-convective solar pond - **applications of solar ponds***.

UNIT II **15 hrs**

Solar photovoltaic energy

Solar photovoltaic: Introduction - Fundamentals of photovoltaic conversion - semiconductor materials - photon energy - electron - hole concentration and Fermi level –A p-n junction – light absorption in a semi conductor- solar cell materials - efficiency of solar cells - silicon solar cell - polycrystalline & amorphous silion cells - **photovoltaic applications***.

UNIT III **15 hrs**

Wind and Ocean thermal energy

Introduction - Basic principles of wind energy conversion – nature of wind - the power and the wind - forces on the blades and thrust on turbines - wind energy conversions - site selection conservations - basic components of the wind energy conversion system - classification of WEC systems - advantages and disadvantages of WECs - energy storage - applications of wind energy.

Ocean thermal energy

Introduction: Ocean thermal energy conversion (OTEC) – methods of ocean thermal electric power generation - open cycle OTEC system - heat exchangers - bio-fouling – site selection – energy utilization - hybrid Cycle.

UNIT IV **15 hrs**

Hydrogen energy and Fuel cells

Hydrogen energy

Introduction - hydrogen production - electrolysis or the electrolytic production of hydrogen - solar energy methods - bio-photolysis and photo-electrolysis - hydrogen storage – hydrogen transformation - utilization of hydrogen gas - electric power generation - hydrogen in fuel cells - **Hydrogen as an alternative fuel for motor vehicles *** - safety and management.

Fuel Cells:

Introduction – Principle of operation of a fuel cells - classification of fuel cell -hydrogen fuel cells - Advantages and disadvantages of fuel cells - applications of fuel cells.

Unit V **15 hrs**

Energy Auditing and Carbon Credit

An Economic concept of Energy – Principles of Energy conservation and Energy Audit - types of energy Audits – **Global Climate change - Greenhouse effect*** – Emissions from Combustion of Natural gas.

Emission trading: The definition and concept – carbon credits – carbon currency – carbon credits under Kyoto Protocol.

Trading of Carbon Credits and India's perspectives – Implementing of CDM projects in India – Potential CDM projects in India.

***Selfstudy**

Books for study:

1. Solar energy fundamentals and applications — H.P. Garg and J. Prakash, McGraw Hill, New Delhi, (2002).
2. Solar Cell Device Physics — Stephen J.Fonash, IInd Edition, Elsevier Publishers, USA (2010).
3. Non ConventionalEnergy Sources, — G.D.Rai, Fifth Edition, Khanna Publishers, New Delhi, (12th reprint 2014).
4. Emissions trading and carbon management — A.N. Sarkar, Pentagon Press, New Delhi, First Edition, (2010)

Books for Reference:

1. Fundamentals of solar cells, photovoltaic solar energy — Fahrebruch & Bube Academic Press, (1983)
2. Hydrogen as an energy carrier technology system — Winter & Nitch, Springer, New Delhi (1988)
3. Fundamentals of energy engineering — Albert Thumann, The Fairmont Press INC., USA, (1984).

PPH44

SEMESTER – IV **17PPH4N2**

MAJOR ELECTIVE II: BIOMEDICAL INSTRUMENTATION

Total Hours of Teaching: 75 hrs **Total Credits: 4**

Objectives

i. To impart knowledge on various biomedical instruments
ii. To understand the working of biomedical instruments

UNIT I **15 hrs**

Bioelectric potential and transducers

Origin of bioelectric signals – Electrocardiogram – Electroencephalogram – Electromyogram – Physiological transducers – classifications – characteristics – variable resistance, capacitance, inductance transducers – LVDT – Piezoelectric transducers – pressure transducers – LVDT and strain gauge transducers – electrical resistance thermometer – Photoelectric transducers – Photovoltaic and Photoemissive cells – **Silicon diode detectors and diode arrays***

UNIT II **15 hrs**

Pulmonary function Analyzers

Ventilation, distribution and diffusion –Respiratory volumes and capacities– Basic Spirometer and Ultrasonic Spirometer.

Blood Gas Analyzers

Acid – Base balance, Blood pH measurements – electrodes for blood pH measurements – Effect of blood on electrodes – Buffer solutions. Measurement of blood pCO_2 - blood pO_2 measurements – A complete blood gas analyzer.

Oximeters

Principle of oximetry – invitro-oximetry and invivo-oximetry. Ear oximeter and pulse oximeter.

UNIT III **15 hrs**

Blood Cell Counters and Audiometer

Types of blood cells - Methods of cell counting- Automatic optical method - Electrical conductivity method - Coulter counter – Mechanism of hearing – Measurement of Sound – Basic audiometer – Hearing Aids – conventional and digital hearing aids.

Bio-medical Recorders

Electrocardiograph (ECG) – block diagram description of an ECG – ECG leads (basic concepts) – Microprocessor based ECG machines - Electroencephalograph (EEG) – block diagram description of an EEG – Computerized analysis of EEG.

Telemedicine

Telemedicine applications – Telemedicine concepts – essential parameters for telemedicine – block diagram explanation of a typical telemedicine system – **Concepts of Telemedicine technology***

UNIT IV **15 hrs**

Modern Imaging Systems

X-Rays: Nature of X-rays, properties and units of X-rays- X-ray machine – Visualization of X-rays: - X-ray Image Intensifier System – Basic Principle of X-ray Computed Tomography.

PPH45

Magnetic Resonance Imaging

Principles of NMR imaging systems – Fourier transformation of the FID - Basic NMR components – block diagram explanation – biological effects of NMR imaging - Advantages of NMR imaging System.

Ultrasonic Imaging Systems

Principle of Ultrasonic waves – Generation and detection of Ultrasound – Medical ultrasound – ultrasonic imaging instrumentation.

UNIT V **15 hrs**

Electrical safety of medical instruments

Introduction – radiation safety instrumentation - physiological effects due to 50 Hz current passage – micro shock – macro shock – electrical accidents in hospitals – devices to protect against electrical hazards – hospital architecture.

*** Self study**

Books for study:

1. Hand book of Biomedical instrumentation	R.S Kandpur, Tata McGraw Hill publishing Co, New Delhi 2nd Edition (2014).
2. Biomedical instrumentation	Dr.M.Arumugam, Anuradha Agencies publishers, Kumbhakonam, (2010).

Book for reference:

1. Biomedical instrumentation and measurements	Leslie Crombwell, Fred.J.Weibell & Trich.A.Pfeiffer, Prentice Hall of India, (2011).
2. Electronic Instrumentation	H.S.Kalsi II edition Tata Mc GrawHill Co.(2013)