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**K.S. Rangasamy College of Arts and Science**  
(Autonomous)  
Tiruchengode - 637 215

**Department of Physics (UG)**

**Details of Elective Course offered by the Department**

**Details of the Elective Courses**

1. Energy Physics
2. Geophysics
3. Nanoscience
4. Biomedical Instrumentation

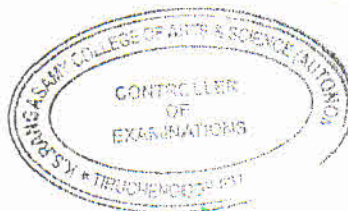
List of Encl.:

- Syllabus copy of the courses



**HoD**

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**CoE**

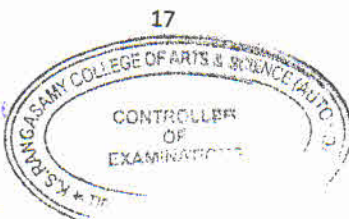
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18UPHEL501	ELECTIVE I: ENERGY PHYSICS	SEMESTER - V	
<b>Course Objectives:</b> The course aims <ul style="list-style-type: none"> <li>To provide fundamental knowledge on Energy Physics.</li> <li>To develop Knowledge on various Energy Generation, Utilization, and conversion methods</li> </ul>			
Credits: 4		Total Hours: 45	
UNIT	CONTENTS	Hrs.	CO
I	<b>Fundamentals:</b> Definitions - Energy sources - Classification - Scientific principles of renewable energy - Technical implications - Principles of energy conservation - Types of energy audit - Energy conservation technologies.	9	CO 1
II	<b>Solar Energy:</b> Physical principles of the conversion of solar radiation into heat - Types of Air Heaters - Applications of Solar Air Heaters - Types of Drier - Direct and Indirect Type Solar Drier - Principle of photovoltaic conversion of solar energy - Application of Solar Energy in Space - solar pond.	9	CO 2
III	<b>Wind Energy:</b> Turbine types and terms - Characteristics of wind - Power extraction by turbine - Electricity generation - Classification of electricity systems using wind power - Mechanical power	9	CO 3
IV	<b>Biomass and Bio-Fuels:</b> Introduction - Bio fuel classification - Biomass production for energy forming - Classification - Biomass conversion technologies - Pyrolysis - Alcoholic fermentation - Wastes and residues - Social and environment aspects.	9	CO 4
V	<b>Energy Storage Systems:</b> Importance - Chemical storage - Heat storage - Electrical storage - Lead acid battery - Advantages of batteries - Hydrogen storage - Fuel cells - Mechanical storage - national energy policy - Super capacitors.	9	CO 5
<b>Text Book</b>			
1. John Twidell and Tony Weir. 2013. <b>Renewal Energy Resources</b> , [Second Edition], Taylor & Francis, New York.			
<b>Reference Books</b>			
1. Sultana, S.P. 1997. <b>Solar Energy</b> . [Second Edition]. TMH, New Delhi.			
2. Boyle. 2004. <b>Renewable Energy</b> . [Second Edition]. Oxford University Press, UK.			

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3. Kothari, D.P, Singal, K.C. and Rajan, R. 2011. **Renewable Energy Sources and Emerging Technologies**. [Second Edition]. Prentice Hall of India, New Delhi.

**Web References:**

1. <http://www.nptel.ac.in>
2. <https://ocw.mit.edu/courses/physics/>

**COURSE OUTCOMES (CO)**

After completion of the course, the student will be able to

CO 1	Recognize the sources of energy and energy conservation technology.
CO 2	Understand the basic principle of energy conversion from solar into other form.
CO 3	Recognize the wind energy and principle of wind energy conversion to electrical energy.
CO 4	Understand the natural fuel like biomass energies.
CO 5	Knowing the energy storage devices.

**MAPPING**

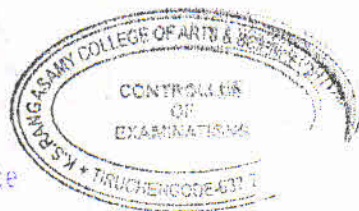
CO \ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	M	M
CO 2	H	H	M	M	L
CO 3	M	M	H	H	M
CO 4	H	H	M	L	H
CO 5	L	M	M	M	L

H-High; M-Medium; L-Low

*M.P.*



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18UPHEL502	ELECTIVE I: GEOPHYSICS	SEMESTER - V	
<b>Course Objectives:</b> The course aims <ul style="list-style-type: none"> <li>To develop knowledge about Earth in terms of its physical properties such as gravity, magnetic field, surface wave, earthquakes and structure of Earth.</li> </ul>			
Credits: 4		Total Hours: 45	
UNIT	CONTENTS	Hrs.	CO
I	<b>Introduction and Seismology:</b> Introduction - P waves - S waves - velocities - Time distance curves and the location of epicenters - Effect of boundaries - Major discontinuities and resulting phase of seismic waves - Derivation of properties from the velocities.	9	CO 1
II	<b>Surface Waves and Seismometry:</b> Rayleigh waves and Love waves - Study of Earth by surface waves - Horizontal seismograph and seismography equation - Strain seismograph.	9	CO 2
III	<b>Earthquakes and Gravity:</b> Focus - Magnitude - Frequency - Detection and prediction - Gravity - Potential (Laplace's equation and Poisson's equation) - Absolute and relative measurements of gravity - Hammond Faller method - Worden gravimeter.	9	CO 3
IV	<b>Geomagnetism:</b> Fundamental equations - Measurements: Gauss-Saturation induction magnetometers - Theories of Earth's magnetism - Dynamo theories. <b>Internal structure of the Earth:</b> Variation of mechanical properties with depth - Materials and equation of state of the interior of the earth.	9	CO 4
V	<b>Geochronology:</b> Radioactivity of the Earth - Radioactive dating of rocks and minerals geological time scale - Age of the Earth - <b>Geothermal Physics:</b> Flow of heat to the surface of the Earth - Sources of heat within the Earth - Process of heat transport - Internal temperature of the Earth.	9	CO 5
<b>Text Book</b>			
1. William Lowrie, 2007. <b>Fundamentals of Geophysics.</b> [Second Edition]. Cambridge University Press, Cambridge, New York.			
<b>Reference Books</b>			
1. Cook, A. H., 1973. <b>Physics of the Earth and Planets.</b> 1 <sup>st</sup> Edition, McMillan Press,			

London.

- Telford, W.M., Geldart, L.P., Sheriff, R.E. 1990. **Applied Geophysics**. 2<sup>nd</sup> Edition, Cambridge University Press, Cambridge, New York.
- Garland, G.D., 1979. **Introduction to Geophysics**. 11<sup>th</sup> Edition, W.B. Saunder Company, London.

**Web References:**

- <http://www.nptel.ac.in>
- <https://ocw.mit.edu/courses/physics/>

**COURSE OUTCOMES (CO)**

After completion of the course, the student will be able to

CO 1	Understand the quantitative aspects of Seismology.
CO 2	Ability to interpret surface waves on the Earth.
CO 3	Determine earthquake gravity parameters.
CO 4	Understand the geomagnetic field and the principle.
CO 5	Understand the Geochronology and Geothermal Physics

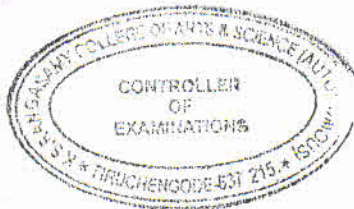
**MAPPING**

CO \ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	M	M	M	L
CO 2	H	H	M	M	L
CO 3	M	M	H	H	M
CO 4	H	H	M	L	H
CO 5	M	M	L	L	L

H-High; M-Medium; L-Low



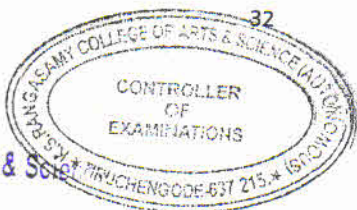
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18UPHEL601	ELECTIVE II: PHYSICS OF NANOSCALE	SEMESTER - VI	
<b>Course Objectives:</b> The course aims <ul style="list-style-type: none"> <li>To understand the basic concepts of Nanoscience and its Applications in various filed.</li> </ul>			
Credits: 4		Total Hours: 45	
UNIT	CONTENTS	Hrs.	CO
I	<b>Nanoscience:</b> Importance of nanoscale - classification of nanostructure - fundamental concept - Science behind nanoscience - Effects of nanoscale system - Particle nature of matter - Size and dimensionality effects - Quantum Confinement 1D,2D and 3D - Single electron tunneling.	9	CO 1
II	<b>Nanomaterials:</b> Fundamental concept of nanomaterials - Allotropes of carbon - Aggregated nanorods - Nanoribbons - Fullerene - Carbon nanotubes - Colloids - Nanocomposite - Nanocrystal.	9	CO 2
III	<b>Nano and Molecular Electronics:</b> Integrated circuits - Microelectro mechanical system - Nanowire - Nanocircuits - Quantum wire, well, dot - Molecular conductance - Molecular logic gates - Molecular wire - Nanorobotics.	9	CO 3
IV	<b>Nanotechnology in Solar/Fuel Cell:</b> Nanomaterials for solar cells, Dye-sensitized solar cells, Organic-inorganic hybrid solar cells, Carbon Nanotubes for energy storage, Hydrogen Storage in Carbon Nanotubes.	9	CO 4
V	<b>Nanomedicine:</b> Drug delivery - Cancer - Surgery - Visualization - Nanoparticle targeting - Neuro-electronics interfaces - Nanorobots - Cell repair machines - Nanonephrology.	9	CO 5
<b>Text Book</b>			
1. Phani Kumar. 2014. <b>Principles of Nanotechnology.</b> Second Edition. Scitech Publication Pvt. Ltd. India.			
<b>Reference Books</b>			
1. Mick Wilson, Kamali Kannangara Geoff Smit. 2005. <b>Nanotechnology- (Basic science and Emerging technologies)</b> [First Edition] THI, London.			
2. Charles P. Poole, Jr and Frank J. Owens. 2006. <b>Introduction to Nanotechnology,</b> John Wiley & Sons, Asia.			

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3. Lynn.E, Foste. 2006. **Nanotechnology- Science, innovation, and opportunity**, [First Edition], Pearson Education (P) Ltd, New Delhi.
4. T. Pradeep. 2009. **NANO the Essentials**, [Third Edition], Tata McGraw-Hill Publishing Company Ltd, New Delhi.

**Web References:**

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2. <https://ocw.mit.edu/courses/physics/>

**COURSE OUTCOMES (CO)**


After completion of the course, the student will be able to

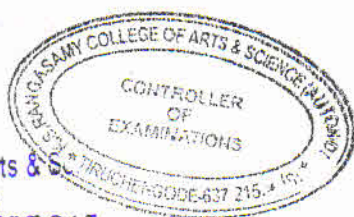
CO 1	Obtain the knowledge of Nanoscience in physics point of view.
CO 2	Understand the different potentials application of nanomaterials.
CO 3	Analyze the study and application of nanomolecular electronics.
CO 4	Knowing the application of nanotechnology in energy and fuel cell.
CO 5	Recognize the nanotechnologies in nanomedicine applications.

**MAPPING**

PSO CO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	M	L
CO 2	H	H	M	M	L
CO 3	M	M	H	H	M
CO 4	H	H	M	L	H
CO 5	H	M	H	M	H

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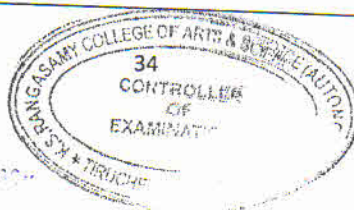
  
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18UPHEL602	ELECTIVE II: BIOMEDICAL INSTRUMENTATION	SEMESTER - VI	
<b>Course Objectives:</b> The course aims <ul style="list-style-type: none"> <li>• To introduce basic application of Physics in medical field.</li> <li>• To impart knowledge regarding of medical instruments.</li> </ul>			
Credits: 4		Total Hours: 45	
UNIT	CONTENTS	Hrs.	CO
I	<b>Introduction to Physiology and Anatomy:</b> Cell and its function - Anatomy and physiology of respiratory system - Cardio vascular system - Endocrine system - Central nervous system. <b>Bioelectric Phenomenon:</b> Basic biopotentials - Bioelectricity - Resting and action potentials - Sodium pump generation - Characteristics of electric signals from heart, brain and muscle.	9	CO 1
II	<b>Electrodes:</b> Half-cell potential - Electrode paste - Electrode material - Metal micro electrodes - Depth needle electrodes - Surface electrodes - Multi point and floating needle electrodes - Distortion in the measured signals - Chemical electrodes.	9	CO 2
III	<b>Diagnosing Instruments:</b> Computer axial tomography - Thermography - Blood pressure monitors - Respiration rate monitors - pH meters - Biomedical imaging.	9	CO 3
IV	<b>Recorders:</b> Introduction - Characteristics - Electrocardiography (ECG) - Electroencephalography (EEG) - Electromyography (EMG) - Electroretinography (ERG) - High accuracy recorders - offline analyzers - Recorders.	9	CO 4
V	<b>Assisting Devices:</b> Introduction - Pace makers - Artificial heart valves - Defibrillators - Nerve and muscle - Stimulators - Heart lung machine - Kidney machine.	9	CO 5
<b>Text Book</b>			
1. Arumugam, 2002. <b>Biomedical Instrumentation</b> . [Second Edition] Anuratha Agencies Publishers.			
<b>Reference Books</b>			
1. B. Jacobson and J.G. Webster, 2004. <b>Medicine and Clinical Engineering</b> , Prentice Hall of India.			
2. D.W. Hill. 1965. <b>Principles of Electronics &amp; Medical Research</b> , Butterworths, London.			

  
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**COURSE OUTCOMES (CO)**


After completion of the course, the student will be able to

CO 1	Obtain the knowledge of human body and its anatomy and physiology.
CO 2	Understand the different potentials and equivalent circuits for medical treatment.
CO 3	Analyze the study of diagnostic and therapeutic applications like computed tomography, ultrasound imaging and MRI.
CO 4	Knowing the characteristics of recorders like ECG, EEG, EMG and ERG.
CO 5	Apply the modern technologies and modern trends used in the biomedical instrumentation.


**MAPPING**

CO \ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	H	H	M	L	L
CO 2	H	H	M	M	L
CO 3	M	M	H	H	M
CO 4	H	H	M	L	H
CO 5	H	M	H	M	H

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