Fourth Meeting of the Board of Studies

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

24.02.2022 &2.30 P.M

Minutes of Board of Studies

The Fourth Meeting of the Board of Studies of the Department of Physics was held on Thursday, the **24th February 2022 at 2.30 pm** in the Physics Lab, SAS Block, Sri Manakula Vinayagar Engineering College with the Head of the Department in the chair. The following members were present for the BoS meeting

Sl.No	Name of the Member with Designation and official Address	Responsibility in the BoS
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., (Ph.D)	Member
2	Dr.T. Sivaranjani M.Sc., M.Phil., Ph.D. SET	Member
3	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

BOS /2021/PH/UG/ 4.1	Welcome Address, Introduction about the Institution, Department and BoS Members
4.2	Confirmation of minutes of the Third meeting of the Board of Studies
4.3	To discuss and approve the Third Year Curriculum and Syllabus of the Bachelor of Physics Programme.
4.4	To discuss and recommend various active learning methods appropriate to different courses and the inculcation of innovative teaching and evaluation techniques for the benefit of student's community
4.5	To discuss and recommend the third year courses under the category of • Skill Enhancement Courses • Employability Enhancement Courses • Placement training
4.6	To discuss and recommend *Industrial Visit area
4.7	To discuss and recommend * Project area for the third year students
4.8	Any other item with the permission of chair

The Chairman proceeded with the presentation to deliberate on agenda items.

BOS /2021/ SAS /PH/ UG /4.1

Welcome Address, Introduction about the Institution, Department and BOS Members

The Chairman of the meeting formally welcomed the honorable members of the Board

4.2

Review and Confirm Minutes of BoS-3rd Meeting held on 06.08.2021

The BoS- 3rd Meeting for B.Sc. Physics under regulation 2020 held on 06-08-2021confirmed the following points.

The BoS members discussed elaborately and reviewed the Syllabi of semesters III and IV and suggested the following points.

- Suggested to give equal weightage to all units
- The members reviewed and discussed about **Discipline Specific Electives** offered in III and IV Semester Curriculum and suggested the following points.

S.No	Regulation	Semester	Course code	Discipline Specific Electives	Particulars
1	R2020	III	A20PHE303	Embedded Systems	Suggested to replace as **Microprocessor**
2		IV	A20PHE406	Thermal Physics	Suggested to replace as **Agricultural Physics**

- The members reviewed about the **Open Electives** offered to the other Departments and suggested the following points.

S.No	Regulation	Semester	Course Code	Open Electives	Particulars
1	R 2020	III	A20PHO322	Physics of Material Device	Suggested to replace as **Basics of Modern Communication Systems**
2			A20PHO323	C++ Programming and its application to Physics	Suggested to replace as **Astrophysics**
3			A20PHO324	Statistical Physics	Suggested to replace as **Bio Physics**
4		IV	A20PHO421	Communication Electronics	Suggested to replace as **Space Science**

- The members reviewed the improvised Syllabi of **Discipline Specific Core offered** Semesters I to IV and suggested the following points

S.No	Regulation	Semester	Course title with Code	Unit	Particulars
1	R 2020	**III**	Wave Oscillations and acoustics / A20PHT305	II & III	Suggested to combine and named as Transverse waves & Longitudinal waves (Unit-II)
				V	Suggested to include Application of ultrasonics as Unit V.
			Basic electronics /A20PHT306	I	Suggested to include diode and its applications.
2		**IV**	Applied Electronics / A20PHT408	IV	Suggested to change the title as Boolean Memory Devices.
			Laser and fiber optics Communication / A20PHT409	V	Suggested to change the title as Application of Fiber Optics.
3		**I-IV**	Physics Practical Lab A20PHL101- A20PHL404		Suggested to reduce the total number of experiments to10

The BoS members reviewed syllabi of **Allied Physics** offered in the curriculum (R-2020) to other Departments suggested following point.

S.No	Regulation	Course title with Code	Unit	Particulars
1	R 2020	Allied Physics – I A2CHD303 / A20MAD101	III	Suggested to change the content
			IV	Suggested to include Applications
			V	Suggested to include Applications
2		Allied Physics Lab I & II A2CHD304 / A20MAD102		Suggested to include the Experiments based on their syllabus

Minutes were Reviewed and Confirmed

4.3

To discuss and approve the Third Year Curriculum and Syllabus of the Bachelor of Physics Programme

The BoS members discussed elaborately and reviewed the Syllabi of **Discipline Specific Core** Semesters V to VI and suggested the following modifications

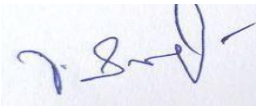
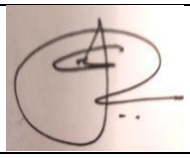
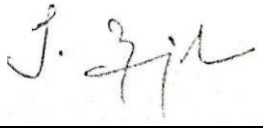
S.No	Regulation	Semester	Course title with Code	Unit	Particulars
1	R 2020	**V**	Quantum Mechanics, relativity and mathematical methods A20PHT512		Suggested to change the title as **Relativity and Quantum Mechanics** (Refer Annexure II)
				IV & V	Suggested to change Unit IV and V related to quantum and Relativity. (Refer Annexure II)
			Solid state Physics A20PHT511	V	Suggested to include High Temperature Superconductor and applications of super conductors (Refer Annexure II)
2		**VI**	Semiconductor device Physics A20PHT614	Suggested to change the title as **Semiconductor Device** (Refer Annexure I)	
			Atomic and Nuclear Physics A20PHT613	Suggested to change the title as **Nuclear And Radiation Physics** (Refer Annexure I)	

The BoS members reviewed and discussed about **Discipline Specific Electives** offered in V and VI Semester Curriculum and suggested the following modifications

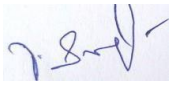
S.No	Regulation	Semester	Course code	Discipline Specific Elective	Particulars
1	R2020	V	A20PHE507	Digital Electronics	Suggested to change topic as A/D to D/A converter (Refer Annexure III)
			A20PHE508	Group theory and Spectroscopy	Suggested to give equal weightage to all Units (Refer Annexure III)
			A20PHE509	Nanomaterial	Suggested to combine Unit I & II and give Unit V as application of Nanomaterial (Refer Annexure III)
2		VI	A20PHE610	Astronomy and Astrophysics	Suggested to give equal weightage to all units (Refer Annexure III)

4.4	To discuss and recommend various active learning methods appropriate to different courses and the inculcation of innovative teaching and evaluation techniques for the benefit of student's community
	The Board elaborately discussed and suggested the following active learning methods for the benefits of student community • Industrial Visit • Summer Programme • Hands on Training • Entrepreneur Training • Group Projects • Short demonstrations followed by class discussion
4.5	To discuss and recommend the third year courses under the category of • Skill Enhancement Courses • Employability Enhancement Courses • Placement training
	➢ The Board appreciated the skill enhancement course and employability enhancement courses as per the curriculum. ➢ Further they members suggested to sign MOUs with industries in order to ensure practical understanding of theory learning.
4.6	To discuss and recommend *Industrial Visit area
	➢ The Board suggested to visit the place related to Physics like ISRO - (Bangalore and Kerala), IGCAR Kalpakam and more company related to Physics
4.7	To discuss and recommend * Project area for the third year students
	➢ The Board suggested to pair two students in a group and to give separate field for each group like electronics, basis of nano-materials, optical and electrical properties etc. to come out with recent advancement in each fields.
4.8	Any other item with the permission of chair
	➢ The Board suggested encouraging the students to register online courses like NPTEL certification, Swayam, MOOC, etc.

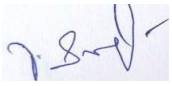
The Board of Studies approved the above suggestions for B.Sc. Physics. The meeting was concluded at 4:00 pm with vote of thanks by Dr.T.Jayavarthanan, Professor, Department of Physics.

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	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	

DEAN SAS
(Dr.S.Muthulakshmi)



Dr.T.Jayavarthanan
Professor / Physics
Chairman –BOS



SCHOOL OF ARTS AND SCIENCE

Department of Physics

Curriculum

Annexure - I

SEMESTER – I										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	A20XXX101	Language I*	**MIL**	3	0	0	3	25	75	100
2	A20GET101	General English I	**English**	3	0	0	3	25	75	100
3	A20PHT101	Mechanics and Properties of Matter	**DSC**	4	0	0	4	25	75	100
4	A20PHT102	Heat and Thermodynamics	**DSC**	4	0	0	4	25	75	100
5	A20PHD101	Allied Mathematics – I	**IDC**	3	1	0	4	25	75	100
Practical										
6	A20PHL101	Physics Practical – I	**DSC**	0	0	4	2	50	50	100
Skilled Enhancement Courses										
7	A20PHS101	Communication Skills lab	**SEC**	0	0	4	2	100	0	100
Employability Enhancement Course										
8	A20PHC101	MS Office	**EEC**	2	0	2	0	100	0	100
Ability Enhancement Compulsory Course										
9	A20AET101	Environmental Studies	**AECC**	2	0	0	2	100	0	100
			First Semester Total				24	475	425	900

SEMESTER – II										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	A20XXX202	Language II**	**MIL**	3	0	0	3	25	75	100
2	A20GET202	General English II	**English**	3	0	0	3	25	75	100
3	A20PHT203	Electricity and Magnetism	**DSC**	4	0	0	4	25	75	100
4	A20PHT204	Optics	**DSC**	4	0	0	4	25	75	100
5	A20PHD202	Allied Mathematics II	**IDC**	3	1	0	4	25	75	100
Practical										
6	A20PHL202	Physics Practical II	**DSC**	0	0	4	2	50	50	100
7	A20PHD203	Statistics Laboratory	**IDC**	0	0	4	2	50	50	100
Employability Enhancement Course										
8	A20PHC202	Programming in C and C++	**EEC**	2	0	2	0	100	0	100
Ability Enhancement Compulsory Course										
9	A20AET202	Public administration	**AECC**	2	0	0	2	100	0	100
Extension Activity										
10	A20EAL201	National Service Scheme	**EA**	0	0	2	1	100	0	100
Second Semester Total							25	525	475	1000

SEMESTER – III										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	A20PHT305	Waves, Oscillations and Acoustics	**DSC**	3	1	0	4	25	75	100
2	A20PHT306	Basic Electronics	**DSC**	3	1	0	4	25	75	100
3	A20PHEXXX	Discipline Specific Elective- I*	**DSE**	3	1	0	4	25	75	100
4	A20CHD304	Allied Chemistry – I	**IDC**	3	0	0	3	25	75	100
5	A20XXOXXX	Open Elective – I**	**OE**	0	3	0	2	25	75	100
Practical										
6	A20PHL303	Physics Practical III	**DSC**	0	0	4	2	50	50	100
7	A20CHL322	Allied Chemistry Practical I	**IDC**	0	0	4	2	50	50	100
Skilled Enhancement Courses										
8	A20PHS302	Quantitative Aptitude and Logical Reasoning – I	**SEC**	2	0	0	2	100	0	100
Employability Enhancement Course										
9	A20PHC303	Embedded systems using Arduino	**EEC**	2	0	2	0	100	0	100
Third Semester Total							23	425	475	900

SEMESTER – IV										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	A20PHT408	Applied Electronics	**DSC**	3	1	0	4	25	75	100
2	A20PHT409	Laser and Fiber Optics Communication	**DSC**	3	1	0	4	25	75	100
3	A20PHEXXX	Discipline Specific Elective-II*	**DSE**	3	1	0	4	25	75	100
4	A20CHD406	Allied Chemistry – II	**IDC**	3	0	0	3	25	75	100
5	A20XXOXXX	Open Elective – II**	**OE**	0	3	0	2	25	75	100
Practical										
6	A20PHL404	Physics Practical IV	**DSC**	0	0	4	2	50	50	100
7	A20CHL423	Allied Chemistry Practical II	**IDC**	0	0	4	2	50	50	100
Skilled Enhancement Courses										
8	A20PHS403	Essentials of Electricity	**SEC**	2	0	0	2	100	0	100
Employability Enhancement Course										
9	A20PHC404	Java	**EEC**	2	0	2	0	100	0	100
Fourth Semester Total							23	425	475	900

SEMESTER – V										
Sl. No.	**Course Code**	**Course Title**	**Category**	**Periods**			**Credits**	**Max. Marks**		
				L	**T**	**P**		**CAM**	**ESM**	**Total**
Theory										
1	A20PHT510	Atomic and Molecular Spectroscopy	**DSC**	3	1	0	4	25	75	100
2	A20PHT511	Solid state Physics	**DSC**	3	1	0	4	25	75	100
3	A20PHT512	Relativity and Quantum Mechanics	**DSC**	3	1	0	4	25	75	100
4	A20PHEXXX	Discipline Specific Elective-III**	**DSE**	3	1	0	4	25	75	100
Practical										
5	A20PHL505	Physics Practical V	**DSC**	0	0	4	2	50	50	100
6	A20PHL506	Physics Practical VI	**DSC**	0	0	4	2	50	50	100
Skilled Enhancement Course										
7	A20PHS504	Renewable Energy and Energy Harvesting	**SEC**	2	0	0	2	100	0	100
Employability Enhancement Course										
8	A20PHC505	Basics of Python	**EEC**	2	0	2	0	100	0	100
			Fifth Semester Total				22	400	400	800

SEMESTER – VI										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	A20PHT613	Nuclear& Radiation Physics	**DSC**	3	1	0	4	25	75	100
2	A20PHT614	Semiconductor Device	**DSC**	3	1	0	4	25	75	100
3	A20PHEXXX	Discipline Specific Elective – IV**	**DSE**	3	1	0	4	25	75	100
Practical										
4	A20PHL607	Physics Practical VII	**DSC**	0	0	4	2	50	50	100
5	A20PHL608	Physics Practical VIII	**DSC**	0	0	4	2	50	50	100
Project										
6	A20PHP601	Project	**DSC**	0	0	10	5	40	60	100
Skilled Enhancement Course										
7	A20PHS605	Weather Forecasting	**SEC**	2	0	0	2	100	0	100
Employability Enhancement Course										
8	A20PHC606	Data Science using Python	**EEC**	2	0	0	0	100	0	100
Sixth Semester Total							23	415	385	800

DISCIPLINE SPECIFIC ELECTIVE COURSES*

Discipline Specific Elective – I (Offered in Semester III)		
Sl. No.	**Course Code**	**Course Title**
1	A20PHE301	Materials Science
2	A20PHE302	Physics for electronic devices
3	A20PHE303	Microprocessor
Discipline Specific Elective – II (Offered in Semester IV)		
1	A20PHE404	Medical Physics
2	A20PHE405	Energy Physics
3	A20PHE406	Agricultural Physics
Discipline Specific Elective – III (Offered in Semester V)		
1	A20PHE507	Digital Electronics
2	A20PHE508	Group Theory and Spectroscopy
3	A20PHE509	Nanomaterial
Discipline Specific Elective – IV (Offered in Semester VI)		
Sl. No.	**Course Code**	**Course Title**
1	A20PHE610	Astronomy and Astrophysics
2	A20PHE611	Geo Physics
3	A20PHE612	Numerical Methods & Basic Computer Programming

SCHOOL OF ARTS AND SCIENCE

Department of Physics

Annexure - II

DISCIPLINE SPECIFIC CORE

SEMESTER - V

		L	T	P	C	Hrs
A20PHT510	ATOMIC AND MOLECULAR SPECTROSCOPY	3	1	0	4	60

Course Objectives

- To understand the concepts of atomic structure
- To explain the concepts of Discharge Phenomenon
- To elaborate the Energy levels
- To know the basic knowledge about the Photoelectricity
- To understand the concepts of spectroscopy

Course Outcomes

After the completion of this course, students will be able to

CO1 – Acquire knowledge through discharge phenomenon through gases
CO2 – Get the basic knowledge of atomic structure
CO3 – Acquire knowledge ionization potential and splitting of energy levels
CO4- Acquire knowledge ionization potential and splitting of energy levels
CO5 – Understand the Fundamental knowledge of Spectroscopy

UNITI: DISCHARGE PHENOMENON THROUGH GASES (12Hrs)

Motion of a charge in transverse electric and magnetic fields–specific charge of electron–Dunnington's method – Magnetron method – positive rays – Thompson parabola method – Aston and Dempster's mass spectrograph.

UNITII: ATOMIC STRUCTURE (12Hrs)

Vector atom model – Pauli's exclusion principle – explanation of periodic table – various quantum numbers – angular momentum and magnetic moment – coupling schemes – LS and JJ coupling – spatial quantization – Bohr magnetron Spectral terms and notations – selection rules – intensity rule and interval rule.

UNITIII: IONISATION POTENTIAL AND SPLITTING OF ENERGY LEVELS (12Hrs)

Excitation and ionization potential–Davis and Goucher's method–Zeeman effect–Larmor's theorem – Debye's explanation of normal Zeeman effect – Anomalous Zeeman effect – theoretical explanation-Lande's'g' factor and explanation of splitting of D1 and D2 lines of sodium – Paschen Back effect–theory–Stark effect(Qualitative treatment only)

UNITIV: PHOTOELECTRICITY (12Hrs)

Photoelectricity:Photoelectric emission laws–Lenard's experiment-Richardson and Compton experiment- Einstein photoelectric equation -experimental verification of Einstein's photoelectric equations by Millikan's experiment.

UNIT-V: SPECTROSCOPY (12Hrs)

Infrared spectroscopy, RAMAN, NMR, ESR – Principle – Instrumentation – applications - LASER, Principles of LASER, Semiconductor diode Laser, Nd-Yag Laser, Co_2 Laser - Applications

Textbooks

1. R.Murugeshan, *Modern Physics*,S.Chand&Co.,NewDelhi,2009.
2. N.Subramanian and BrijLal,*Atomic and Nuclear Physics*, S.Chand&Co.,2013.
3. J.B.Rajam,*AtomicPhysics*, S.Chand PublishingCo.,2010

ReferenceBooks

1. LipsonSG,LipsonH and TannhauserDS,*Optical Physics,* CambridgeUniversityPress,1995.
2. RajMG,*Fundamentals of Optics*,Anmol Publications Pvt.Ltd,New Delhi,1996.
3. G.Aruldhas,*Spectroscopy*,Vendeur BookVistas(NewDelhi,India),2009.

		L	T	P	C	Hrs
A20PHT511	**SOLIDSTATE PHYSICS**	**3**	**1**	**0**	**4**	**60**

Course Objectives

- To understand the concepts of bonding
- To explain the concepts of diffraction in solids
- To demonstrate the magnetism properties in solids
- To know the basic knowledge about the dielectrics
- To understand the concepts of superconductivity

Course Outcomes

After the completion of this course, students will be able to

CO1 - Learn the Fundamental of Bonds in Solids
CO2 - Learn the concepts of X-ray diffraction its applications in solids
CO3 - Understanding the properties of Magnetism and its applications in quantum physics
CO4 - Acquiring the knowledge of Dielectrics and its properties in various materials
CO5 - Gain the knowledge of Superconductivity and its applications

UNITI: BONDSINSOLIDS (12Hrs)

Crystal lattice- primitive and unit cell- seven classes of crystals– Bravais lattice- Miller indices- structure of crystals- simple cubic, Hexagonal close packed structure- Face centered cubic structure, Body centered cubic structure, Simple cubic structure-Sodium chloride structure, Zinc Blende structure, Diamond structure

UNITII: X-RAYDIFFRACTION (12Hrs)

Diffraction of x-rays by crystals- Bragg's law in one dimension-Experimental method in x-ray diffraction-Laue method, Rotating crystal method-Powder photograph method – von Laue's equations-Point defects-Line defects-Surface defects-Volume defects - Effects of crystal imperfections

UNITIII: MAGNETISM (12Hrs)

Different type of magnetic materials- Classical theory of Diamagnetism (Langevin theory)-Langevin theory of Paramagnetism – Weiss theory of Paramagnetism- Qualitative explanation of Heisenberg's Internal Field and Quantum Theory of Ferromagnetism.

UNITIV: DIELECTRICS (12Hrs)

Fundamentals definitions in dielectrics–different types of electric polarization - Frequency and Temperature Effects on Polarization – Dielectric loss – Local Field on internal field Clausius-Mosotti Relation- Determination of Dielectric Constant – Dielectric Breakdown – Properties of Different types of insulating materials

UNITV: SUPERCONDUCTIVITY (12Hrs)

Introduction - Meissner effect – Limitation – Type I & II Superconductivity – High Temperature Siperconductor - Vortex states - BCS Theory (Qualitative treatment only) - Josephson's effect - Copper pair tunneling.

TextBooks

1. K.Ilangovan, *Solid State Physics*, MJP Publication, 2012.
2. S.O.Pillai, *Solid State Physics,* New Age Science Publication, 2009.
3. Arumugam, *Materials Science*, Anuradha Publications, 2015.

ReferenceBooks

1. C.Kittel, *An introduction to Solid State Physics,* 5thEdition, Published by JohnWiley & Sons Inc,1976.
2. Dekker A.J.*Solid State Physics*, Mac MillonInd.Ltd., 1985.
3. Ascroft & Mermin, *Solid State Physics*, Pacific Grove,CA:Brookscole,1976.

		L	T	P	C	Hrs
A20PHT512	**RELATIVITYAND QUANTUM MECHANICS**	**3**	**1**	**0**	**4**	**60**

Course Objectives

- To know the basics of mathematical methods
- To explain the principle of relativity
- To know the basic details about the wave Mechanics
- To understand the concepts of mathematical Physics
- To understand the special functions

Course Outcomes

After the completion of this course, students will be able to

CO1 - Understand the concept of Relativity and its special
CO2 - Learn the principles of time dilation
CO3 – Understand the de-Broglie and Heisenberg principle
CO4 – Understand the applications of Schrodinger wave equations
CO5 - Gain the knowledge about the concepts in Quantum mechanics

UNIT – I SPECIAL RELATIVITY

Inertial Frames, Principle of Relativity, Lorentz Transformations – Space time, Coordinates and Invariance - Relativistic Kinematics and Dynamics - Variational Principle for Free Particle Motion, Light Rays

UNIT-II RELATIVITY (12 Hrs)

Michelson – Morley experiment – significance of negative result – postulates of special theory of relativity– Length contraction–Time dilation – Relativity of simultaneity – Law of addition of velocities – variation of mass with velocity –relativistic kinetic energy equations – postulates of general theory of relativity – gravitational red shift.

UNIT-III WAVEMECHANICS (12 Hrs)

Matter Waves – de Brogile wavelength – wave velocity and group velocity–Heisenberg's Uncertainty principle – proof of Uncertainty principle for one dimensional wave packet – postulates of wave mechanics – properties of wave function–operator formalism (Basics only) – Eigen functions – Eigen values–expectation values.

UNIT-IV: SCHRODINGER EQUATIONS AND ITS APPLICATIONS (12 Hrs)

Schrodinger equation–time dependent and time independent – application of Schrodinger equations – linear harmonic oscillator – zero point energy – particle in a one dimensional box –barrier penetration and tunneling effect rigid rotator –hydrogen atom.

UNIT-V: CONCEPTS IN QUANTUM MECHANICS (12 Hrs)

Elementary concept of spin, Pauli Matrices and spin wave functions. Total angular momentum. Time-independent, non-degenerate, first – order Perturbation Theory, Spin – Orbit coupling. Ground and excited states of Helium atom and exchange degeneracy.

Text Books

1. V.Devanathan, *Quantum Mechanics*,Narosa,Chennai,2005.
2. R.Murugeshan, Kiruthigs, Sivaprasath, *Modern Physics,* S Chand & Co.,2007.
3. V.K.Thangappan, *QuantumMechanics*,WileyEastern,1985.

Reference Books

1. B.D.Gupta, *Mathematical Physics,*Vikas Publishing House;Fourth Edition,2009.
2. Ghatak and Loganathan, *Quantum Mechanics*, McMillan,2004.
3. A.Ghatak, *Basic Quantum Mechanics*,McMillanI ndia,2002.

SEMESTER – VI

A20PHT613	NUCLEAR & RADIATION PHYSICS	L	T	P	C	Hrs
		3	1	0	4	60

Course Objectives

- To demonstrate a knowledge of fundamental aspects of the structure of the nucleus
- To know various mechanisms for interaction between ionizing radiation and matter,
- To understand the introduction of radiation
- To know the applications such as detection of radiation, analytical methods, nuclear power generation,
- To Constituents and properties of nuclei, nuclear reactions and accompanying radiations

Course Outcomes

After the completion of this course, students will be able to

CO1 - Able to understand the Basic concept Nuclear Structure
CO2 – Acquire knowledge about Radio Active Decay
CO3 – Understanding the Construction & Working of various Particle Accelerators
CO4 - Able to know the Working of Nuclear reactors & Radiation
CO5 - Understand the Basic Classification of Elementary Particles

UNIT-1: NUCLEAR STRUCTURE (12Hrs)

Nuclear spin – determination of magnetic dipole moment, electric quadruple moment, parity of nuclei, isospin, theories of nuclear composition, proton and electron hypothesis ,proton–neutron hypothesis, nuclear forces–meson theory of nuclear forces. Liquid drop model – Bethe Weizacker's mass formula – application to alpha decay – Bohr theory – shell model – evidences – theory

UNIT-II: RADIOACTIVE DECAY (12 Hrs)

Radioactive disintegration – law of successive disintegration – transport and secular equilibrium – radioactive series – Geiger – Nuttal law – Age of earth – alpha particle disintegration energy – alpha particle spectra – theory of alpha decay(Qualitative treatment).Beta ray spectra – origin – neutrino theory of beta decay– gamma rays – determination of wavelength by Diamond–crystal spectrometer

UNIT-III: PARTICLE ACCELERATORS AND DETECTORS (12 Hrs)

Cyclotron – synchrocyclotron – Betatron – electron synchrotron – proton synchrotron (Bevatron)-GM counter – ionization chamber – bubble chamber – scintillation counter – photographic emulsion techniques.

UNIT-IV: REACTORS AND RADIATION PHYSICS (12 Hrs)

Nuclear fission–Chain reaction–four-factor formula–reactor theory–critical size of a reactor Control– classification of reactors– Pressurized heavy water reactor–fast breeder reactor- Introductionto recent reactors. Radiation hazards–biological effects of radiation- radiation sickness— radioisotopes used for therapy –nuclear medicine – industrial applications.

UNIT-V: ELEMENTARYPARTICLES (12 Hrs)

Classification – types of interaction – symmetry and conservation laws – hadrons–leptons–baryons–mesons– strangeness–hyperons– antiparticles – antimatter – basic ideas about quarks–types of quarks.

TextBooks

1. Brijlal and N.Subramaniam-Modern Physics
2. D.C.Tayal, *Nuclear Physics*, Himalaya Publishing House,2011.
3. R.Murugeshan, *Modern Physics* S.Chand &Co.,2009.

ReferenceBooks

1. S.N.Ghoshal, *Nuclear Physics,* S Chand & Co.Edition, 2003.
2. M.L.Pandya,R.P.S.Yadav,*Elements of Nuclear Physics*, Kedar Nath & RamNath Publishers,2000.

A20PHT614	SEMICONDUCTOR DEVICE	L	T	P	C	Hrs
		3	1	0	4	60

Course Objectives

- To introduce semiconductor fundamentals.
- To learn the number system, arithmetic operation and sequential codes of digital electronic circuits.
- To introduce the fundamental concepts and working principle of JT, FET.
- To learn the basic Boolean laws, K-maps, SOP and POS method to design logic circuits.
- To understand combinational and sequential circuits.

Course Outcomes

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

CO1 - Demonstrate and analyze the behavior of semiconductor devices
CO2 - Able to get an insight about junction theory.
CO3 - Analyze and develop new application diodes
CO4 - Solve the sequential codes based problems of digital electronics
CO5 - Ability to understand and analyze Sequential circuits

UNIT-1: SEMICONDUCTOR FUNDAMENTALS (12Hrs)

Intrinsic and extrinsic Semiconductors, elemental and compound Semiconductor, Carrier Concentration and Fermi Level of intrinsic and extrinsic semiconductor, Thermal Effect, conductivity and carrier mobility in semiconductors, Hall effect.

UNIT-2: JUNCTION THEORY (12Hrs)

PN Junction ,Junction Potential, biasing of PN junctions, I-V relationships, static & dynamic resistances, Breakdown Phenomena- avalanche and zener Processes, zener diode.

UNIT-III: APPLICATION OF DIODES: (12Hrs)

Sinusoidal inputs, Rectifiers (half full wave), ripple factor, power supply filtering, circuit applications of diodes, clippers, clampers, Inductive loads and diode protection

UNIT-IV: TRANSISTORS DEVICE (12Hrs)

Bipolar junction transistors, fundamentals of operation,(CB,CE,CC configuration), Transistors parameters, leakage current, biasing Amplification, field effect transistors (FET).

UNIT-V: COMBINATIONAL AND SEQUENTIAL CIRCUITS: (12Hrs)

Basic theorems and properties of Boolean algebra, logic operation, digital logic gates, combinational circuits: adder and subtractor, comparator, decoder, encoder, multiplexer de-multiplexer .sequential circuits-flip flops-SR, D, JK and T

Text Books

1. Kanaan Kano, semiconductor Devices, PHI, 2005.
2. S.O.Pillai, Solid state Physics, New Age International Pvt.Ltd, 7th Edition 2015.
3. M.Morris Mano, Digital logic and Computer design, Pearson.

Reference Books

1. Robert Boylestad, Electronic Devices and circuit Theory, Pearson (Tenth Edition).
2. Pallab Bhattacharya, semiconductor optoelectronic Devices, PHI, 2004.
3. M.S.Tya. semiconductor physics and devices, John Wiley sons, 2004.

SCHOOL OF ARTS AND SCIENCE

Department of Physics

Annexure - III

DISCIPLINE SPECIFIC ELECTIVE

A20PHE507 **DIGITAL ELECTRONICS**

L	T	P	C	Hrs
3	1	0	4	60

Course Objectives

- To understand the fundamental concepts of digital
- To explain the Logic circuits
- To know the basic knowledge arithmetic circuits
- To know basic principles of A/D and D/A converters
- To understand the concepts of microprocessors

Course Outcomes

After the completion of this course, students will be able to

CO1 - Learn the Fundamental of Digital electronics & Microprocessor
CO2 - Study the functions of Boolean algebra
CO3 - Obtaining the knowledge about Arithmetic circuits & Sequential Logic circuits
CO4 - Learn about the working of D/A & A/D Converters
CO5 - Introduce the concepts and working of microprocessor 8085

UNIT–I DIGITAL FUNDAMENTALS (12 Hrs)

Number systems – decimal, binary, octal and hexadecimal systems – conversion from one number system to another Codes – BCD code – excess 3 code, Gray code – ASCII code – Binary arithmetic – Binary addition – subtraction – unsigned binary numbers – sign magnitude numbers – I's and 2's complement–Binary multiplication and division.

UNIT–II BOOLEAN ALGEBRA AND SIMPLIFICATION OF LOGIC CIRCUITS (12 Hrs)

Laws and theorems of Boolean algebra – De Morgan's theorems and their circuit implications –Duality theorem, simplification of Boolean equations –Karnaugh map – pairs,quads,octets–2,3 and 4 variables–SOP method–NAND–NAND circuits– POS method – NOR – NOR circuits.

UNIT-III ARITHMETIC CIRCUITS ANDSEQUENTIAL LOGIC CIRCUITS (12Hrs)

Arithmetic building blocks – Half adder – Full adder – parallel binary adder – Half subtractor – Full subtractor – The adder- subtractor–digital comparator–parity checker / generator. Flip-flops – JK flip flop – JK master slave flip-flop –Flip flop applications. Shift register functions- Shift right-shift left-Shift register applications.

UNIT–IV: A/D AND D/A CONVERTERS (12Hrs)

Introduction–variable resistor network – binary ladder – D/A converter– D/A accuracy and resolution– A/D converter–simultaneous conversion – A/D accuracy and resolution A/D converter applications, D/A applications.

UNIT–V: INTRODUCTION TO MICROPROCESSOR 8085 (12Hrs)

Basics of semiconductor memory- RAM, ROM, PROM and EPROM. Microcomputer organization- 8085 Microprocessor – pin functions – architecture – machine and assembly language-programmer's model of 8085-8085 addressing modes. Classification of instruction and format – 8-bit data transfer and arithmetic instructions.

Text Books

1. ArulThalapapathi, *Fundamentals of Digital Computers*, Comptek Publishers, Chennai,1995.
2. Vijayendran, *Fundamentals of Microprocessor 8085*, S.Viswanathan Printers & Publishers Pvt.Ltd,2006.
3. Vijayendran, *Integrated Electronics*,Viswanathan,S.,Printers&PublishersPvt.Ltd.,2009.

Reference Books

1. Malvino and Leech, *Digital Principles and Application*, 4thEdition, TataMc graw Hill,New Delhi,2000.
2. Millman and Halkias *Integrated Electronics*, International Edition,McGrawHill, NewDelhi,1972.
3. T.C.Bartee, *Computer Architecture and Logic Design*, Mc GrawHill, 1991.

A20PHE508	GROUP THEORY AND SPECTROSCOPY	L	T	P	C	Hrs
		3	1	0	4	60

Course Objectives

- To understanding of Physical aspects of quantum Mechanics
- To know the physical aspects of molecular electronic structure
- To understanding the mathematical aspects of quantum Mechanics
- To demonstrate the mathematical aspects of electronic structure
- To expose students to quantum mechanical operators and related mathematical topics.

Course Outcomes

After the completion of this course, students will be able to

CO1 – Acquire knowledge in quantum mechanics, group theory and molecular spectroscopy
CO2– Having an ability to be socially intelligent with good SIQ(Social Intelligence Quotient) and EQ
CO3 - Having computational thinking
CO4 – Apply theory to support experimental results
CO5 – Ability to know the vibrational analysis

UNIT - I GROUP THEORY (12Hrs)

Introduction to group theory, Properties of a group, Subgroup and Class, Symmetry elements and operations, Symmetry point groups, Matrix representation of groups, Operators and basis functions

UNIT – II SYMMETRY (12 Hrs)

Symmetry of Hamiltonian Operator, Unitary and Similarity transformation, Reducible and Irreducible representations, Great Orthogonality Theorem and its consequences, Character tables, Wavefunctions as bases for irreducible representation, direct product and significance.

UNIT – III SPECTROSCOPY (12Hrs)

Einstein A and B coefficients, dipolar interaction between light and matter – time dependent perturbation approach, Weak and strong field interaction, Transition probability and Transition moment integral, Fermi's golden rule, Rabi oscillations, Spectral broadening mechanisms.

UNIT – IV MOLECULAR SPECTROSCOPY (12Hrs)

Classification of vibrations , Energy level in molecules, Electronic transition in organic molecules Types of Molecular Spectroscopy, Recap of harmonic oscillator, Vibrations of diatomic and polyatomic molecules, Normal coordinates.

UNIT – V VIBRATIONAL SPECTROSCOPY (12Hrs)

Types of vibrational Spectroscopy Normal modes and their symmetry, Contribution of internal coordinates to normal modes, Selection rules for fundamental vibrational transitions, applications of FTIR and Raman.

Text Books

1. Spectra of Atoms and Molecules, P. F. Bernath, Oxford University Press, 2nd edn, (2005).
2. Molecular Spectroscopy, I. N. Levine, Wiley Publications, (1975).
3. Symmetry and Spectroscopy: An Introduction to Vibrational and Electronic Spectroscopy, D.C. Harris and Bertolucci, Dover.

Reference books

1. Basic Atomic and Molecular Spectroscopy, J. M. Hollas, John Wiley.
2. Chemical Applications of Group Theory, F. A. Cotton, Wiley
3. Modern Raman Spectroscopy- A practical Approach, E. Smith and G. Dent, Wiley.

A20PHE509	NANOMATERIALS	L	T	P	C	Hrs
		3	1	0	4	60

Course Objectives

- To understand the dimensionality of the object at nanoscale
- To explain the properties of the material
- To understand the size and shape controlled synthesis of nanomaterial's
- To know the applications in industry
- To know the material characterization

Course Outcomes

After the completion of this course, students will be able to

CO1 - Learn the Fundamental of definitions and development on nanomaterial
CO2 – Study the basic scale dimensional structure of the nanomaterial
CO3 – Learn the properties of the nanomaterial
CO4 – Able to know the synthesis of nanomaterial
CO5 –Able to understand the applications of nanomaterial

UNIT - I INTRODUCTION TO NANOTECHNOLOGY (12 Hrs)

Basic Structure of Nanoparticles- Kinetics in Nanostructured Materials- Zero dimensional, size and shape of nanoparticles; one-dimensional and two dimensional nanostructures- clusters of metals and semiconductors, bio nano-particles.

UNIT – II FABRICATION AND CHARACTERIZATION OF NANOMATERIALS (12 Hrs)

Types of Nanomaterials (Quantum dots, Nanoparticles, Nanocrystals, Dendrimers, Buckyballs, Nanotubes); Gas, liquid, and solid –phase synthesis of nanomaterials; Lithography techniques (Photolithography, Dip-pen and Electron beam lithography); Thin film deposition; Electro spinning. Bio-synthesis of nanomaterial's.

UNIT – III PROPERTIES AND MEASUREMENT OF NANOMATERIALS (12 Hrs)

Optical Properties: Absorption, Fluorescence, and Resonance; Methods for the measurement of nanomaterials; Microscopy measurements: SEM, TEM, AFM and STM. Confocal and TIRF imaging.

UNIT – IV NANO STRUCTURES (12 Hrs)

Carbon Nanotubes, Fullerenes, Nanowires, Quantum Dots. Applications of nanostructures. Reinforcement in Ceramics, Drug delivery, Giant magneto resistance, etc. Cells response to Nanostructures.

UNIT – V APPLICATIONS OF NANOTECHNOLOGY

Nano electronics, Nano sensors, Nanotechnology in Diagnostics applications, Environmental and Agricultural Applications of nanotechnology, Nano technology for energy systems

Textbooks

1. The Physics and Chemistry of Nano Solids by Frank J. Owens and Charles P. Poole Jr, Wiley-Interscience, 2008.
2. Nanomaterials- Synthesis, Properties and Applications, Edited by A.S. Edelstein and R.C. Cammarata, Institute of Physics Publishing, London, 1998 (paperback edition)

Reference Books

1. Nanochemistry: A Chemical Approach to Nanomaterials, by G. Ozin and A. Arsenault, RSC Publishing, 2005
2. Nanophysics and Nanotechnology: An Introduction to Modern Concepts in Nanoscience, Edward L. Wolf, Wiley-VCH, 2nd Reprint (2005)

A20PHE610	ASTRONOMY AND ASTROPHYSICS	L	T	P	C	Hrs
		3	1	0	4	60

Course Objectives

- To know the history of the astronauts.
- To provide the knowledge about the astronomical related mechanics.
- To introduce learn the concepts of the stellar principles.
- To provide the understanding of astronomical instrumentation.
- To understand the evolution of solar system.

Course Outcomes

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

CO1 – Study about the History of Astronomy and Celestial Mechanics
CO2 – Learn the concepts of astronomical instrumentation
CO3 – Acquire Knowledge of Stellar Magnitudes and Colors
CO4 – Be familiar with the stellar structure
CO5 - Apply the knowledge of stellar evolution

UNIT- I ASTRONOMY (12Hrs)

History of Astronomy solar systems, relativity and cosmology, Celestial Mechanics; Distances in Astronomy; Magnitude Scale; Color-index Size and Time Scales, Examining rocks, terrain and material in space

UNIT - II ASTRONOMICAL INSTRUMENTATION (12Hrs)

Basic Optics; Spectrograph, Cosmic origin spectrograph and Space Telescope Imaging Telescope Optical Telescopes; Radio Telescopes; Infrared, Ultraviolet, X-ray, and Gamma-Ray Astronomy, image processing techniques.

UNIT - III STARS (12Hrs)

Stellar Magnitudes and Colors, Brightness and distance, Luminosity, temperature and spectral class, the motion of stars relative to the Sun, the masses of stars, types of stars.

UNIT - IV STELLAR STRUCTURE (12Hrs)

Equations of Stellar Structure– Solutions to Equations of Stellar Structure, Toy Stellar Models: Homologous Stellar Models, the Radiative Stellar Envelope, and Fully Convective Stars with H~Opacity, Observational Aspects of Stellar Atmospheres, Continuum Radiation, and Lines

UNIT - V STELLAR EVOLUTION (12Hrs)

Stellar evolution theory and stellar, elements of stellar evolution, Clusters Evolution of massive stars, Supernovae, Gamma-Ray bursts White Dwarfs, Chandrasekhar Limit, Neutron Stars, Pulsars GTR, Black holes.

Text Books:

1. Bradley Carroll & Dale Ostlie, An Introduction to Modern Astrophysics, 2006.
2. T Padmanabhan, Theoretical Astrophysics: Vol.I-II-III, Cambridge University Press (2005).
3. WM Smart and RM Greene, Textbook on Spherical Astronomy, Cambridge University Press (1986) Sixth Edition.

Reference Books:

1. Chandrasekhar S, An Introduction to the Study of Stellar Structure, Dover Publications (1967).
2. Clayton DD, Principles of Stellar Evolution and Nucleo synthesis, University of Chicago Press (1983).
3. Kippenhahn and Weigert, Stellar Structure and Evolution, Springer (1990).