Department of Physics

Sri GVG Visalakshi College for Women, (Autonomous)
Affiliated to Bharathiar University
Re- Accredited at A+ Grade by NAAC (Fourth Cycle)
An ISO 9001:2015 Certified Institution
Udumalpet - 642128, Tamilnadu

Curriculum Design
Sri G.V.G Visalakshi College for Women (Autonomous)
Affiliated to Bharathiar University
Department of Physics

B.Sc. Physics

Scheme of Examination – CBCS Pattern
(For the students admitted during the academic year 2017-2018 onwards)

Sem	Course Code	Course Title	Ins. Hrs/ Week	Examination				Credits
				Dur. Hrs	CIA Marks	ESE Marks	Total Marks	
I	117TA1/ 117MY1/ 117HD1/ 117FR1	**Part I-** Language I	6	3	25	75	100	4
	117EN1	**Part II –** English I	6	3	25	75	100	4
	117P01	**Part III-** Core I- Mechanics, Properties of Matter and Sound	7	3	25	75	100	5
		Core Practical I	3	-	-	-	-	-
	117AP1	Allied I Chemistry I	4	3	25	50	75	3
		Allied Chemistry Practical	2	-	-	-	-	-
	117EVS	**Part IV**-Environmental Studies	2	2	50	-	50	2
II	217TA2/ 217MY2/ 217HD2/ 217FR2	**Part I-** Language II	6	3	25	75	100	4
	217EN2	**Part II -** English II	6	3	25	75	100	4
	217P02	**Part III –** Core II- Heat and Thermodynamics	4	3	25	75	100	4
	217P03	Core III - Optics	3	3	25	75	100	3
	217PP1	Core Practical I	3	3	40	60	100	3
	217AP2	Allied II Chemistry II	4	3	25	50	75	3
	217APP	Allied Chemistry Practical	2	3	20	30	50	2

	217VEC	**Part IV**-Value Education	2	2	50	-	50	**2**
III	**317TA3/ 317MY3/ 317HD3/ 317FR3**	**Part I –** Language III	6	3	25	75	100	**4**
	317EN3	**Part II** -English III	6	3	25	75	100	**4**
	317P04	**Part III** -Core IV- Atomic and Solid State Physics	4	3	25	75	100	**4**
		Core Practical II	3	-	-	-	-	**-**
	317AP3	Allied III – Mathematics I	6	3	25	75	100	**4**
	317NSE	**Part IV –** Non Major Elective – (Science in Everyday Life)	2	2	50	-	50	**2**
	317PS1	**Part IV**- Skill Enhancement Course I – Mechanical and Medical Instrumentation	3	3	75	-	75	**3**
IV	**417TA4/ 417MY4/ 417HD4/ 417FR4**	**Part I –** Language IV	6	3	25	75	100	**4**
	417EN4	**Part II**- English IV	6	3	25	75	100	**4**
	417P05	**Part III**- Core V Mathematical Physics	4	3	25	75	100	**4**
	417PP2	Core Practical II	3	3	40	60	100	**3**
	417AP4	Allied IV Mathematics II	6	3	25	75	100	**4**
	417NGA	**Part IV**- General Awareness and Information security	2	1	50	-	50	**2**
	417PS2	**Part IV**- Skill Enhancement Course- II – Electrical Instrumentation	3	3	75	-	75	**3**
	417ALP	**Advanced Learners Course – I** Space Physics	-	3	-	100	100	**4***
V	**517P06**	**Part III**- Core VI- Electronic Devices and Circuits	6	3	25	75	100	**5**
	517P07	Core VII- Nanosciences	5	3	25	75	100	**5**
	517PP3	Core Practical III	6	3	40	60	100	**3**
	517PE1 **517PE2**	Elective I – Scilab(T &P) / Atmospheric Science	5 5	3 3	40 25	60 75	100 100	**4**
	517PE3	Elective II- Project and Viva -voce	5	3	50	50	100	**4**
	517PS3	**Part IV**- Skill Enhancement Course- III Electronic instrumentation	3	3	75	-	75	**3**
VI	**617P08**	**Part III**-Core VIII- Electricity and Magnetism	5	3	25	75	100	**5**
	617P09	Core IX -Quantum	5	3	25	75	100	**5**

		Mechanics and Relativity						
	617P10	Core X -Digital Electronics and Microprocessors	5	3	25	75	100	**5**
	617PP4	Core Practical IV	6	3	40	60	100	**3**
	617PE4 **617PE5**	Elective III – Programming in C/ Programming in MATLAB	4	3	25	75	100	**4**
	617PE6 **617PE7**	Elective Practical- Programming in C/ Programming in MATLAB	2	3	20	30	50	**1**
	617PS4	**Part IV**- Skill Enhancement Course- IV – Institutional Training	3	-	75	-	75	**3**
	617EX1/ 617EX2/ 617EX3/ 617EX4/ 617EX5	**Part V**- Extension activity NCC/NSS/YRC/RRC/ Games	-	-	50	-	50	**2**
	617ALP	**Advanced Learners Course – II** Energy Physics	-	3	-	100	100	**4***

Total: 3500 140

Curriculum Design

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B.Sc. Physics

Scheme of Examination – CBCS Pattern

(For the students admitted during the academic year 2018-2019 onwards)

Sem	Course Code	Course Title	Ins. Hrs/ Week	Examination				Credits
				Dur. Hrs	CIA Marks	ESE Marks	Total Marks	
I	**117TA1/ 117MY1/ 117HD1/ 117FR1**	**Part I-** Language I	6	3	25	75	100	**4**
	117EN1	**Part II –** English I	6	3	25	75	100	**4**
	117P01	**Part III-** Core I- Mechanics, Properties of Matter and Sound	7	3	25	75	100	**5**
		Core Practical I	3	-	-	-	-	**-**
	117AP1	Allied I Chemistry I	4	3	25	50	75	**3**
		Allied Chemistry Practical	2	-	-	-	-	**-**

	117EVS	**Part IV**-Environmental Studies	2	2	50	-	50	**2**
II	**217TA2/ 217MY2/ 217HD2/ 217FR2**	**Part I-** Language II	6	3	25	75	100	**4**
	217EN2	**Part II -** English II	6	3	25	75	100	**4**
	217P02	**Part III –** Core II- Heat and Thermodynamics	4	3	25	75	100	**4**
	217P03	Core III - Optics	3	3	25	75	100	**3**
	217PP1	Core Practical I	3	3	40	60	100	**4**
	217AP2	Allied II Chemistry II	4	3	25	50	75	**3**
	217APP	Allied Chemistry Practical	2	3	20	30	50	**2**
	217VEC	**Part IV**-Value Education	2	2	50	-	50	**2**
III	**317TA3/ 317MY3/ 317HD3/ 317FR3**	**Part I –** Language III	6	3	25	75	100	**4**
	317EN3	**Part II -**English III	6	3	25	75	100	**4**
	317P04	**Part III** -Core IV- Atomic and Solid State Physics	4	3	25	75	100	**4**
		Core Practical II	3	-	-	-	-	**-**
	317AP3	Allied III – Mathematics I	6	3	25	75	100	**4**
	317NSE	**Part IV –** Non Major Elective – (Science in Everyday Life)	2	2	50	-	50	**2**
	317PS1	**Part IV-** Skill Enhancement Course I – Mechanical and Medical Instrumentation	3	3	75	-	75	**3**
IV	**417TA4/ 417MY4/ 417HD4/ 417FR4**	**Part I –** Language IV	6	3	25	75	100	**4**
	417EN4	**Part II-** English IV	6	3	25	75	100	**4**
	418P05	**Part III- Core V Classical Mechanics and Mathematical Physics**	4	3	25	75	100	**4**
	417PP2	Core Practical II	3	3	40	60	100	**4**
	417AP4	Allied IV Mathematics II	6	3	25	75	100	**4**
	417NGA	**Part IV-** General Awareness and Information security	2	2	50	-	50	**2**
	417PS2	**Part IV-** Skill Enhancement Course- II – Electrical Instrumentation	3	3	75	-	75	**3**
	417ALP	**Advanced Learners**	-	3	-	100	100	**4***

		Course – I Space Physics						
V	**517P06**	**Part III-** Core VI- Electronic Devices and Circuits	6	3	25	75	100	**5**
	517P07	Core VII- Nanosciences	5	3	25	75	100	**5**
	517PP3	Core Practical III	6	3	40	60	100	**3**
	517PE1 **517PE2**	Elective I – Scilab(T &P) / Atmospheric Science	5 5	3 3	40 25	60 75	100 100	**4**
	517PE3	Elective II- Project and Viva -voce	5	3	50	50	100	**4**
	517PS3	**Part IV**- Skill Enhancement Course- III Electronic instrumentation	3	3	75	-	75	**3**
VI	**617P08**	**Part III-**Core VIII- Electricity and Magnetism	5	3	25	75	100	**4**
	617P09	Core IX -Quantum Mechanics and Relativity	5	3	25	75	100	**4**
	617P10	Core X -Digital Electronics and Microprocessors	5	3	25	75	100	**4**
	617PP4	Core Practical IV	6	3	40	60	100	**4**
	617PE4/ **617PE5**	**Elective III – Computational Physics using C Programming/ Computational Physics using MATLAB Programming**	4	3	25	75	100	**4**
	617PE6/ **617PE7**	**Elective Practical- Computational Physics Practical using C Programming Computational Physics Practical using MATLAB Programming**	2	3	20	30	50	**2**
	617PS4	**Part IV**- Skill Enhancement Course- IV – Institutional Training	3	-	75	-	75	**3**
	617EX1/ **617EX2/** **617EX3/** **617EX4/** **617EX5**	**Part V**- Extension activity NCC/NSS/YRC/RRC/ Games	-	-	50	-	50	**2**
	617ALP	**Advanced Learners Course – II** Energy Physics	-	3	-	100	100	**4***

Total: 3500 140

B.Sc. Physics
Semester I & II
(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III – Core Practical I	**Course Code: 217PP1**
Semester: I & II	**No. of Credits: 3**
No. of hours : 45 hours /Semester	**P:R 30:15**
CIA Max. Marks: 40	**ESE Max. Marks: 60**

(P:Practical, R: Record)

Course Objectives: The Course aims

- To provide opportunities for developing the laboratory skills by applying theoretical knowledge.
- To develop a broad array of basic skills and tools for performing Physics experiments and data analysis.
- To understand the concept of direct observation in Physics principles and to distinguish between inferences based on theory and on the outcomes of experiments.
- Tounderstand the course responsibilities and ethical values while recording data.
- Todevelop collaborative learning skills that are vital to success in many lifelong endeavors

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	BTL
CO 1	Perform experiment with appropriate equipments and procedures for the determination of particular physical property	**A**
CO 2	Determine a particular property of a liquid by performing experiments, recording and analyzing the data	**A**
CO 3	Draw the electrical circuit, select the appropriate meters, perform the experiments, record and interpret the results	**A**

R-Remember U –Understand A-Apply

Syllabus:

Part III – Core Practical I - List of Practicals

(A minimum of 15 experiments)

1. Acceleration due to gravity – Compound pendulum
2. Young's modulus – Uniform bending – Pin & Microscope.
3. Young's modulus – Non-Uniform bending – Single optic lever and Telescope
4. Rigidity modulus of the material of the wire & Moment of Inertia of the disc – Torsion Pendulum.
5. Rigidity modulus of the material of the rod – Static Torsion

6. Y, η, σ – Searle's double bar pendulum.
7. Surface tension and interfacial tension – drop weight method.
8. Co-efficient of viscosity of highly viscous liquids (castor oil) – Stoke's method
9. Co-efficient of viscosity of water and comparison of radii of capillary tubes – Poiseullie's flow.
10. Verification of laws of stretched string & determination of unknown frequency of the tuning fork – Sonometer
11. Frequency of an electrically maintained tuning fork – Melde's string
12. Thermal conductivity of a bad conductor (Cardboard) –Lee's disc method.
13. Specific heat capacity of a liquid – Joule's Calorimeter
14. Refractive index of the material of the Prism – Spectrometer
15. Refractive index of the liquid – Hollow Prism and Spectrometer
16. Melting point of wax using thermistor – Ohm's law
17. Calibration of low range voltmeter – Potentiometer
18. Internal resistance of a cell - Potentiometer
19. Impedance and Power factor of an inductive circuit
20. Study of characteristics of a Junction diode

B.Sc. Physics
Semester III
(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part IV Skill Enhancement Course I – Mechanical & Medical Instrumentation	**Course Code: 317PS1**
Semester: III	**No. of Credits: 3**
No. of hours : 45	**C:T:P 27:6:12**
CIA Max. Marks: 75	**ESE Max. Marks: -**

(C:Contact hours, T:Tutorial, P:Practical)

Course Objectives: The Course aims

- To provide a strong foundation in the working concepts of instruments used for parametric measurements.
- To impart basic knowledge in the production and the measurement of low Pressure.
- To facilitate the learners to understand about the measurement of various levels of temperature using thermometers.
- To provide a knowledge about electrodes and physiological assist devicesused in Bio-medical systems.
- To familiarize the handling and maintaining of simple mechanical and medical instruments and their purposes by performing practical activity.

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	BTL
CO 1	Interpret characteristics of measuring instruments and errors in the measurements.	**A**

CO 2	Gain knowledge about the construction and working of various pumps, gauges and electrodes.	**R**
ÇO 3	Describe the working of different thermometers and its application in temperature measurements.	**A**
CO 4	Explain different bio signals through ionic potentials generated and also interpret the purpose of using different electrodes.	**U**
CO 5	Handle and maintain instruments and develop skill in using it.	**A**

R-Remember U –Understand A-Apply

Syllabus:

Unit I: Characteristics of instruments and measurements system	**6 hrs**
Methods of measurements – Classification of instruments – Analog and digital modes of operation – Static characteristics – True value – Static error – Static correction – Scale range and Scale pan – Reproducibility and Drift – Repeatability – noise – Accuracy and Precision – Significant figures – Limiting errors – Types of errors – Gross errors – Systematic errors – Instrumental errors – Observational errors – Random errors.	

Unit II Unit II Production and measurement of low pressure	**7 hrs**
Exhaust pumps – Characteristics – Rotary oil pump – Mercury Geissler pump – Diffusion-Condensation pump – Measurement of low pressure – The Bourdon gauge – McLeod gauge – The Pirani resistance gauge – Knudsen gauge.	

Unit III Measurement of Temperature	**7 hrs**
Electrical resistance thermometer: Platinum resistance thermometer – Salient features of resistance wire thermometers – Thermocouple thermometer – Thermocouple construction – Measurement of thermocouple output – Advantages and Disadvantages – Optical pyrometers – Disappearing filament type.	

Unit IV Electrodes & Physiological Assist Devices	**7 hrs**
Design and Components of the Bio-medical instrument system – Electrodes- half cell potential – Electrode paste – Metallic Microelectrode – Depth and Needle electrode – Surface electrode – Chemical Electrode – pH Electrode. Model of the heart lung machine – Oxygenators – Bubble oxygenators – Blood pumps – Non-Pulsatile pump.	

Unit V Practicals:	**12 hrs**
1. Handling and maintaining microscope 2.Handling and maintaining spectrometer	

3.Handling and maintaining telescope 4. Handling and maintaining glucometer and digital pressure meter 5. Measurements in Physics (Vernier calipers& Screw gauge) 6. Errors in measurements.

Books for study:

Unit	Name of the Book	Authors	Publishers with Edition
I – III	Electrical and Electronic Measurements and instrumentation	A.K.Sawhney	Dhantpat Rai & Sons Publications, 4th Edition 1991
IV	Biomedical Instrumentation	Dr.M.Arumugam	Anuradha Agencies, Kumbakonam, 2nd Edition, 2003

Books for Reference:

S.No	Name of the Book	Authors	Publishers with Edition
1	Instrumentation Devices and Systems	C.S. Rangan, G.R.Sharma and V.S.V.Mani	Tata Mc Graw Hill Publishing Ltd, New Delhi, 11th Reprint 1992
2	Experimental methods for Engineers	J.P.Holman	Mc Graw Hill International Book Company, Fifth edition
3	Biomedical Instrumentation and Measurements	Leslie Cromwell and Fred S.Weibeil	Printice Hall of India, New Delhi, 1980
4	Hand book Biomedical Instrumentation	R.S Khandpur	Tata McGraw Hill publishing co, 9th Edition 1996.

B.Sc. Physics

Semester IV

(For the students admitted during the academic year 2018 – 2019 and onwards)

Course: Part III - Core V Classical Mechanics and Mathematical Physics	**Course Code: 418P05**
Semester: IV	**No. of Credits 4**
No. of hours : 60	**C:T - 52:8**
CIA Max. Marks: 25	**ESE Max. Marks:75**

(C:Contact hours, T:Tutorial)

Course Objectives: The Course aims

- To provide an understanding of basic vector function and vector identities.
- To disseminate the vector theorems and facilitate the learners to apply Gauss divergence theorem for Physics problems.
- To impart knowledge in the understanding of fundamentals of classical mechanics, Lagrangian and Hamiltonian.
- To familiarize numerical method of solving algebraic equations, differential equations and integral equations and to develop the skills in finding the approximate solutions for the problems.

Course Outcomes: On completion of the Course, the student will be able to

CO	Statement	Bloom's Taxonomy level
CO 1	Explain Gauss divergence theorem, Stokes theorem and Green's theorem and its applications to solve Physics problems	**U**
CO 2	Write gradient, divergence, curl and Laplacian in different co-ordinate systems.	**A**
ÇO 3	Describe Lagrangian and Hamiltonian and D'Alembert's Principle	**U**
CO 4	Solve the problems for different physical systems under Classical Mechanics.	**A**
CO 5	Obtain the solution for the problems involving differentiation, integration and simultaneous algebraic equations numerically.	**U**
CO 6	Discuss the need for finding approximate solution by using numerical methods and able to assess the reliability of the solution	**A**

R-Remember U –Understand A-Apply

Syllabus:

Unit I: Vectors- I	**10hrs**
Line, Surface and Volume integrals – Divergence and Curl of a vector function – Simple Problems – Important vector identities – Gauss divergence theorem and Proof – Problems using Gauss divergence theorem – Equation of Continuity.	

Unit II Vectors- II	**10 hrs**
Stoke's theorem and Proof – Problems using Stoke's theorem – Green's theorem and its Proof using Gauss divergence theorem – Green's theorem in a plane – Classification of vector fields. Orthogonal curvilinear coordinates – Gradient, Divergence, Laplacian and Curl in terms of orthogonal curvilinear coordinates – Spherical polar coordinates and differential operators.	

Unit III Classical Mechanics - Lagrangian	**10hrs**
Constraints and degrees of freedom – Holonomic and non-holonomic constraints Generalised co-ordinates – Generalised notations – Generalised displacement – Generalised velocity – Generalised momentum – Generalised force - D'Alembert's principle – Lagrange's equations from D'Alembert's principle for Conservative system – Application of Lagrange's equation of	

motion: Linear Harmonic Oscillator – Simple Pendulum.

Unit IV Classical Mechanics - Hamiltonian **11hrs**
Hamilton's variational principle – Deduction of Lagrange's equations of motion from Hamilton's principle for conservative system - Phase space and the motion of the system – Hamiltonian–Hamilton's Canonical equations of motion –Physical Significance of H – Deduction of Canonical Equation from a variational principle –Applications of Hamilton's equations of motion: Simple Pendulum.

Unit V Numerical Methods **11hrs**
Solution of algebraic equations – Bisection method – Newton-Raphson method – Solution of linear algebraic equations – Gauss elimination method. Numerical integration – Quadrature formula for equidistant co-ordinates –Trapezoidal rule – Simpson's rule – Numerical solution of ordinary differential equations – Taylor's series method – Fourth order Runge-Kutta method.

Books for study:

Unit	Name of the Book	Authors	Publishers with Edition
I & II	Mathematical physics	Satya Prakash	Sultan & sons, Reprint 2014
III & IV	Classical Mechanics	Dr. S.L. Gupta, Dr.V. Kumar & Dr. H.V. Sharma	PragatiPrakashan Publishing, Meerut Third revised edition 2010
V	Numerical methods	A.Singaravelu	Meenakshi Publications New revised edition 2014

Books for Reference:

S.No	Name of the Book	Authors	Publishers with Edition
1.	Mathematical physics	Rajput	PragatiPrakashan Publishing, Meerut, 1995 Edition
2.	Classical Mechanics	Herbert Goldstein	Poole &Safko, 2002 Edition
3	Numerical methods	S.Kalavathi& M. Joicepunitha	McGraw Hill Publications, 2nd Edition, 2010

B.Sc. Physics
Semester III & IV
(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III – Core Practical II	**Course Code: 417PP2**
Semester: III & IV	**No. of Credits: 3**
No. of hours : 45 hours /Semester	**P:R 30:15**

CIA Max. Marks: 40	ESE Max. Marks: 60

(P:Practical , R: Record)

Course Objectives: The Course aims

- To enhance a better Understand of theory through practicals.
- Tofamiliarize the equipments, develop observational skills and to foster critical thinking.
- To train the students in measuring, recording, analyzing and interpreting the results of the experiments involving electricity and electronics.
- Todevelop troubleshooting skills, independent thinking and team work

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	BTL
CO 1	Calibrate the given electrical meters using appropriate circuit components, record the data, draw the calibration graph and interpret the results	**A**
CO 2	Draw the electrical circuit, select the appropriate meters, perform the experiments, record and interpret the results	**A**
CO 3	Use magnetometer to determine the moment of the magnet and magnetic flux density	**A**
CO 4	Use optical sources and lasers for the determination of optical parameters with appropriate procedure, tabulate the findings and analyze the results	**A**

A-Apply

Syllabus:

Part III – Core Practical II - List of Practicals

(A minimum of 15 experiments)

1. Calibration of high range Ammeter – Potentiometer
2. Calibration of high range voltmeter – Potentiometer.
3. Calibration of low range Ammeter – Potentiometer
4. Temperature co-efficient of resistance of a coil – Carey-Foster's bridge.
5. Comparison of e.m.fs of two cells – B.G.
6. Figure of merit of B.G.
7. Moment of the magnet due to the field along the axis of the coil – Magnetometer.
8. Magnetic flux density due to the field along the axis of the coil – Magnetometer.
9. Wavelength of colors of Mercury spectrum – Grating – Normal Incidence Method – Spectrometer
10. i-d curve Spectrometer
11. Determination of Hartmann's constants – Spectrometer
12. Wavelength of LASER source – Grating
13. Refractive Index of liquid – Hollow prism and Laser Source
14. Determination of AC frequency – Sonometer.
15. Q factor of a series resonant circuit.
16. Q factor of a parallel resonant circuit.

17. Low pass and high pass filters. 18. Study of characteristics of a Zener diode. 19. Construction of low voltage power supply using diodes. 20. Tracing of Lissajou's figures – CRO. 21. Reconstruction of a Hologram – Demonstration

B.Sc. Physics
Semester IV
(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part IV Skill Enhancement Course II – Electrical Instrumentation	**Course Code: 417PS2**
Semester: IV	**No. of Credits: 3**
No. of hours : 45	**C:T:P 27:6:12**
CIA Max. Marks: 75	**ESE Max. Marks: -**

(C:Contact hours, T:Tutorial, P:Practical)

Course Objectives: The Course aims

- To impart fundamental knowledge about the principle, construction and working of the types of D'Arsonval movement.
- To provide an Understand about basics of voltmeters, ammeters, and their parameters such as sensitivity, loading effect, advantage etc.
- To enable the students to know about the construction and characteristic of current transformer.
- To provide an Understand about measuring of powers in AC, DC circuits.
- To conduct a hands on training in the handling of electrical instruments that are used for general purpose.

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	BTL
CO 1	Describe the construction and working of the types of galvanometers and ammeters.	**U**
CO 2	Express the knowledge about meter movements, their sensitivity, loading effects and merits.	**R**
ÇO 3	Discuss current transformers, their errors, rectification and power measurement in AC, DC circuits.	**U**
CO 4	Handle and maintainelectrical instruments	**A**

R-Remember U –Understand A-Apply

Syllabus:

Unit I: Galvanometers & Ammeters	**7hrs**
D'Arsonval Galvanometers – Construction of D'Arsonval Galvanometer – Torque Equation – Dynamic behaviour of Galvanometers – Equation of Motion – Ballistic Galvanometer – Construction of ballistic galvanometer – Types of Instruments - Errors in Ammeters and Voltmeters - Permanent magnet Moving Coil Instruments (PMMC) – construction of PMMC Instruments – Torque Equation – Ammeter Shunts - Multi range Ammeters.	

Unit II Voltmeters and Ohmmeters	**7hrs**
Multirange d.c. Voltmeters - Sensitivity of PMMC Voltmeters - Sensitivity of PMMC Voltmeters and their Loading Effects – Advantage s and Disadvantages of PMMC Instruments - Series type Ohmmeter - Shunt type Ohmmeters – Multimeter or Volt - Ohm - Milli – ammeter(V.O.M) - Megger .	

Unit III Transformers	**6hrs**
Use of Instrument Transformers – Current Transformers – Characteristics of Current Transformers – Causes of Errors in Current Transformers – Means to reduce Errors in Current Transformers – Construction of Current Transformers**.**	

Unit IV Measurement of Power and Watt meters	**7hrs**
Power in D.C. Circuits – Power in A.C. Circuits – Electrodynamometer Wattmeter – Construction of Electrodynamometer wattmeter – Measurement of Medium Resistance – Ammeter Voltmeter Method – Wheatstone Bridge – Application of D.C. Potentiometers.	

Unit V Practicals:	**12 hrs**
1 Handling and maintaining power supply 2. Handling and maintaining multimeter 3. Voltage measurement using Voltmeter 4. Current measurement using Ammeter 5. Handling and maintaining step down transformer 6. Calibrating resistance boxes.	

Books for study:

Unit	**Name of the Book**	**Authors**	**Publishers with Edition**
I – IV	A Course in Electrical and Electronic Measurements and Instrumentation	A.K.Sawhney	Dhantpat Rai & Sons Publications, Reprint 2008

Books for Reference:

S.No	**Name of the Book**	**Authors**	**Publishers with Edition**

1	Modern Electronic Instrumentation and Measurement technique	Albert D Helfrick and William D.Hooper	Prentice Hall of India, New Delhi, Reprint 2008

B.Sc. Physics
Semester V
(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III – Core Practical III	**Course Code: 517PP3**
Semester: V	**No. of Credits: 3**
No. of hours : 90 hours	**P:R : 60:18**
CIA Max. Marks: 40	**ESE Max. Marks: 60**

(P:Practical , R: Record)

Course Objectives: The Course aims

- To gain practical knowledge by applying the experimental methods to correlate with Physics theory.
- To provide an experience in handling the equipments for the synthesis of nanomaterials.
- Todevelop the ability to record and analyse the experimental data.
- Todevelop intellectual communication skills and discuss the basic principles of scientific concepts in a group
- Todevelop troubleshooting skills, independent thinking and team work

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	BTL
CO 1	Use optical sources and lasers to study the optical parameters, record the data and interpret the results.	**A**
CO 2	Draw the electrical circuit, select the appropriate meters, perform the experiments, record and interpret the results	**A**
CO 3	Determine the physical constants such as Plank's constant, compressibility, dielectric constant, for solids, bandgap energy of thermistor with the use of appropriate devices, record the data and analyze the results	**A**
ÇO 4	Construct OP-AMP as Adder, Subtractor, Inverter, Non inverter and peaking amplifier, with appropriate electrical components and devices, record the data and interpret the results.	**A**

A-Apply

Syllabus:

Part III – Core Practical III - List of Practicals

(A minimum of 15 experiments)

1. Cauchy's constants – Spectrometer.
2. Absolute measurement of capacity – B.G.
3. High resistance by leakage – B.G.
4. Band gap energy of a Thermistor.
5. Determination of Planck's constant
6. Determination of Dielectric constant for solids
7. Study of absorption of laser light on various filters – Demonstration.
8. Characteristics of LED – Laser Source
9. Study of variation of magnetic field with current
10. Determination of magnetic susceptibility of paramagnetic solution
11. Determination of compressibility of liquids-Acousto optic effect
12. Differentiating and Integrating Circuits
13. FET Characteristics
14. Voltage Doubler.
15. Clipping Clamping circuits
16. Single stage RC coupled amplifier.
17. Construction of Bridge rectifier
18. Hartley oscillator using BJT
19. Colpitt's oscillator using BJT.
20. Inverting and Non-Inverting amplifier using OPAMP 741
21. Adder and subtractor using OPAMP 741
22. Peaking Amplifier using OPAMP 741
23. Synthesis of Nano particles.
24. Coating of thin film.

B.Sc Physics
Semester V
(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III – Elective I Scilab (T&P)	**Course Code: 517PE1**
Semester: V	**No. of Credits: 4**
No. of hours : 75	**C:T:P 26:10:39**
CIA Max. Marks: 40	**ESE Max. Marks: 60**

(C: Contact hours, T: Tutorial, P: Practical)

Course Objectives: The Course aims

- To familarise Scilab environment and the syntax, data types, operators , Graphics and Blocks of SCILAB.

- Toprovide a practical exposure to solve problems in Mechanics, Electronics and other fields of Physics.
- To provide foundation in the use of SCILAB for real time applications

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO 1	Explain about the main features of SCILAB environment	**U**
CO 2	Explain Scilab data types, graphics and its Programming structures	**U**
ÇO 3	Apply working knowledge of Scilab to solve Physics problems and to the electrical circuits in Physics	**A**
CO 4	Solve and simulate the electrical circuits in Scicos environment	**A**
CO 5	Realize the importance of the course and evaluate, analyse and present the results	**A**
CO 6	Identify the errors and predict the output of the program	**A**

U –UnderstandA-Apply

Syllabus:

Unit I	**5 hrs**
Getting started with SCILAB- Command line – Scilab data types: Constants – Constant Matrices –String Matrices – Polynomials-Boolean operations –Objects - Matrix operations	

Unit II	**5 hrs**
Programming with Scilab: Programming structures - General operators – Arithmetic operators – Boolean operators – Conditional structure – Loop structures- Functions	

Unit III	**5 hrs**
Scilab Environment : General display commands – Output commands –Input commands – Commands for files	

Unit IV	**5 hrs**
Graphics under Scilab: Graphics window – Plotting parameters – 2D plotting – 3D plotting	

Unit V	**6 hrs**
Scicos (Scilab Connected Object Simulator): Running Scicos – Basic blocks -Editing a model – Block construction – Diagram simulation – Changing block parameters – Activation generation	

Programs (Any 7) 39 hrs
1. Matrix operations
2. Ohm's law to find R
3. Hooke's law to find spring constant
4. Resistances combination
5. Radio active decay
6. Half wave rectifier
7. Logic gates
8. Projectile problem
9.Series Resonant circuit
10. Black body radiation and the Planck's function
11. Drawing 2D, 3D plots
12. Programs using blocks

Books for study:

Unit	Name of the Book	Authors	Publishers with Edition
I-V	Programming in Scilab 4.1	Vinu V Das	New age International (P) Limited, Publishers, 2009, First Edition

B.Sc. Physics

Semester V

(For the students admitted from the academic year 2017 – 2018 and onwards)

Course: Part III - Elective II Project and Viva-voce	**Course Code: 517PE3**
Semester: V	**No. of Credits: 4**
No. of hours : 60	
CIA Max. Marks: 50	**ESE Max. Marks:50**

Course Objectives: The Course aims

- To motivate the students to do project at micro level in Physics.
- To familiarize the students with the recent areas of research in Physics
- To explore the knowledge about the experimental methods
- To enhance the presentation skills in the report working
- To raise the confidence level of students in pursing higher studies and research in future

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	BTL
CO 1	Develop the skill of identifying an area for Project work at micro level.	**U**

CO 2	Choose appropriate equipments for their project	**U**
CO 3	Acquire skill of handling equipments used for Project in an effective way	**A**
CO 4	Analyse and interpret the results of their work	**A**
CO 5	Write a report and present it with suitable figures, graphs, circuit diagrams, photos etc.	**A**
CO 6	Work confidently and behave with high ethical standards, team spirit and integrity	**A**

U –Understand A-Apply

Course Evaluation Methods:

Direct Methods		**Indirect Methods**
Internal	Experimental Work and Analysis Completion of work, Report Submission and Internal Viva Voce	**Course Exit Survey**
External	Report Viva Voce	

Internal Assessment components:

Components	**Experimental Work and Analysis (Rubric based component)**	**Completion of work, Report Submission and Internal Viva Voce**	**Total**
Marks	**25**	**25**	**50**

End Semester Examination: Project and Viva-voce

Components	**Report**	**Viva Voce**	**Total**
Marks	**30**	**20**	**50**

B.Sc. Physics
Semester V
(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part IV Skill Enhancement Course III – Electronic Instrumentation	**Course Code: 517PS3**
Semester: V	**No. of Credits: 3**

No. of hours : 45	**C:T:P - 27:6:12**
CIA Max. Marks: 75	**ESE Max. Marks: -**

(C:Contact hours, T:Tutorial, P:Practical)

Course Objectives: The Course aims

- To impart fundamental knowledge in the of design, working and applications of CRO
- To expose knowledge in the fundamentals of analog and digital acquisition systems.
- To provide practical exposure in the use of electronic equipments

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	BTL
CO 1	Explain CRO for its design, operation and application	**U**
CO 2	Sketch A/D acquisition systems and discuss its applications	**U**
ÇO 3	Describe data converters and computer controlled instrumentation systems.	**U**
CO 4	Handle the equipments CRO, AFO and test for its performance and to test ICs, diodes and resistors for its functioning	**A**

U –Understand A-Apply

Syllabus:

Unit I: Oscilloscopes **7hrs**
Oscilloscope block diagram – CRT – Electrostatic – Deflection – Screens – Graticules – CRT circuits – Vertical deflection system - Horizontal deflection system – Oscilloscope techniques – Determination of frequency – Digital storage oscilloscope – Block diagram explanation only.

Unit II Data converters6hrs
Digital to analog converters – Basic inputs and outputs - Weighted resistor network technique – Analog to Digital converters – Basic inputs and outputs - Successive approximation technique.

Unit III Analog and Digital data acquisition systems. 7hrs
A/D data acquisition systems – Block diagram – Interfacing transducers to electronic control and measuring systems – Instrumentation amplifier – Voltage to current converter (current loop) – Digital to Analog multiplexing – Analog to Digital Multiplexing.

Unit IV Computer controlled – Test systems 7hrs
Testing a Radio receiver – Instruments used in computer controlled instrumentation – Frequency counter for operation with IEEE 488 bus – Signal generator interfaced with IEEE 488 bus – IEEE 488 electrical interface.
Unit V Practicals: 12 hrs

1 Maintaining of AFO 2. Maintaining of CRO 3. Designing input output devices for digital electronics experiments 4. Construction of power supply (5V) **5.** Handling and maintaining of electronic equipments 6.Testing of IC's ,Diodes and Resistors

Books for study:

Unit	Name of the Book	Authors	Publishers with Edition
I – IV	A Course in Electrical and Electronic Measurements and instrumentation	A.K.Sawhney	Dhantpat Rai & Sons Publications, Reprint 2008

Books for Reference:

S.No	Name of the Book	Authors	Publishers with Edition
1	Modern Electronic Instrumentation and Measurement technique	Albert D Helfrick and William D.Hooper	Prentice Hall of India, New Delhi, Reprint 2008

B.Sc. Physics

Semester VI

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III - Core VIII Electricity and Magnetism	Course Code: 617P08
Semester: VI	**No. of Credits: 5**
No. of hours : 75	**C:T - 65 :10**
CIA Max. Marks: -25	**ESE Max. Marks: 75**

(C: Contact hours, T: Tutorial)

Course Objectives: The Course aims

- To impart knowledge about the basic concepts of electric and magnetic field.
- To expose the types of capacitors and energy stored in capacitor
- To provide knowledge about the magnetic field due to the current carrying conductor, electromagnetic induction.
- To facilitate the applications of electrostatics, Electromagnetics and circuit analysis.
- To develop problem solving skills in electricity.
- To introduce the concept of circuit elements and network theorems

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	BTL
CO 1	Recollect the basic concepts in electricity, magnetism, circuit parameters	**R**

CO 2	Explain Coulombs law and Gauss law of electrostatics and its applications	**U**
ÇO 3	Discuss the types of capacitor and energy stored in the capacitor	**U**
CO 4	Explain the concept of magnetic field due to steady current	**U**
CO 5	Demonstrate the principle of electromagnetic induction, measurement of inductance and its applications	**U**
CO 6	Sketch the DC and AC circuits, explain its operation and solve problem related to it.	**A**
CO 7	Use appropriate concepts and equations to solve problems in electricity and magnetism.	**A**
CO 8	Develop an Understand of network theorems and apply the concepts of nodes, branches and network theorems to solve circuit problems.	**A**

R-Remember U –Understand A-Apply

Syllabus:

Unit I Electrostatics	**12hrs**
Gauss's law & proof – Gauss's law in differential form – Gauss's law and Coulomb's law – Laplace and Poisson's equation – Applications: Electric field due to an uniformly charged sphere – field due to two concentric spherical conductors – Field of a line charge – Field of a charged conductor – Force on the surface of a charged conductor – Demonstration of mechanical force – **Worked out examples.**	

Unit II Capacitors and Magnetic field	**12hrs**
Parallel plate capacitor – Cylindrical capacitor – Spherical capacitor – Guard Ring Capacitor – Energy stored in a capacitor – Force of attraction between capacitor plates – Dielectric constant - Dielectric strength . Magnetic field due to steady current **:**Bio-Savart Law - Ampere's circuital law and proof – Applications of Ampere's law –**B** near a long wire – B for a Solenoid – B for a Toroid – Character of **B** lines and the divergence of **B**– Ampere's law in curl form – **Worked out examples.**	

Unit III Electromagnetic Induction	**12 hrs**
Inductor and inductance – Self inductance– Physical significance of self inductance – Self inductance of a Solenoid – Two parallel wires – Toroidal coil of circular cross section – Energy stored in magnetic field – Measurement of self inductance by Rayleigh's method – Mutual inductance – Mutual inductance of concentric solenoids – Relation between mutual inductance and self inductance– Inductances in series and in parallel Measurement of mutual inductance – **Worked out examples.**	

Unit IV Electromagnetic oscillations	**12hrs**

Simple R-L circuit: Growth anddecay of current (Helmolholtz Equation) – RC Circuit Charge and discharge of a condenser – Determination of high resistance by leakage method – Series LCR circuit –Charge and discharge–**Worked out examples.**

A.C circuit: A Parallel (or Anti) resonant circuit – Parallel resonant circuit when inductance L have some resistance – Condition for unity power factor – Current magnification – Selectivity of a parallel resonance circuit –Comparative study of a series resonant and parallel resonant circuit – Power in AC circuit – Choke coil – **Worked out examples.**

Unit V Circuit Analysis	**12 hrs**

Classification of circuits – Laws and Theorems for Circuit Analysis: Superposition theorem – Thevenin's theorem – Norton's theorem – Maximum power transfer theorem – **Worked out examples.**

AC Bridges: AC Bridges for the measurement of inductance- Maxwell's bridges – Owen's bridge – AC bridge for the measurement of capacitor, Desauty's AC bridge – Wein's bridge.

Books for study:

Unit	Name of the Book	Authors	Publishers with Edition
I-V	Electricity and Magnetism	Dr. K.K. Tewari	S.Chand & Co. Ltd.,New Delhi Revised edition 2011.

Books for Reference:

S.No	Name of the Book	Authors	Publishers with Edition
1.	Electricity and Magnetism	R. Murugeshan	S.Chand& Co. Ltd., New Delhi , 10th edition, 2017.
2.	Electricity and Magnetism	D.Chattopadhyay P.C.Rakshit	New Central Book Agency (P) LTD, Kolkata, 2005.
3.	Fundamentals of magnetism and Electricity	D.N. Vasudeva	S. Chand & Company Ltd, Reprint 2007.

B.Sc. Physics
Semester VI
(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III - Core X Digital Electronics and Microprocessors	**Course Code: 617P10**
Semester: VI	**No. of Credits: 5**
No. of hours : 75	**C:T – 60: 15**
CIA Max. Marks: 25	**ESE Max. Marks: 75**

(C: Contact hours, T:Tutorial)

Course Objectives: The Course aims

- To acquire the basic knowledge of digital logic levels and its applications.
- To instill the foundation level knowledge in the digital circuits for arithmetic, logic and sequential operations such as counting, storing etc.
- To familiarize the technology involved in the manufacturing of the linear and digital ICs and their applications
- To impart knowledge in the design of semiconductor and magnetic memory systems and memory decoding systems.
- To introduce the basic concepts of microprocessor and to familiarize the assembly language programming skills

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	BTL
CO 1	Develop a digital logic and apply it to solve real life problems.	**R**
CO 2	Design, implement and analyse sequential logic circuits.	**U**
ÇO 3	Explain step by step industrial method of IC Fabrication	**R**
CO 4	Discuss the fundamentals and areas of applications for the integrated circuits.	**U**
CO 5	distinguish Semiconductor Memories such as RAM, ROM andmagnetic memories	**U**
CO 6	Apply the fundamentals of assembly level Programming of Microprocessors	**A**
CO 7	Demonstrate the ability to design practical circuits that perform the desired operations.	**A**

R-RememberU –UnderstandA-Apply

Syllabus:

Unit I Arithmetic Circuits **12 hrs**
Binary addition – Binary subtraction – Logic gates – NAND and NOR as Universal gates – Postulates of Boolean Algebra – Theorems of Boolean Algebra – Simplification of Boolean expressions using Karnaugh maps and gates – Half adder – Full adder – Half subtractor – Full subtractor – Encoder – Decimal to BCD encoder – Decoder – Seven-segment decoders – **Worked out examples.**

Unit II Sequential circuits **12 hrs**
Flip flops – RS flip flop – D flip flop – JK flip flop – Asynchronous counter – MOD-16 ripple counter – Synchronous counter – Decade counter and wave forms – Shift registers – Serial IN Serial OUT Shift registers – Ring counter – application to digital clock.

Unit III IC Technology and its applications **12 hrs**
Introduction – Advantages of ICs-Classification by structure and function – IC terminology – IC technology: Fabrication of components like transistors, diodes, resistors and capacitors – Characteristics of Logic Families – TTL Circuit – TTL Subfamilies – MOS Family – PMOS

Circuit – NMOS Circuit – CMOS Circuit

Unit IV Memory **12 hrs**
Semiconductor memory – Characteristics – RAM – ROM – ROM, PROMs and EPROMs : Programming – EEPROM : Flash memory – RAMs – SRAM – Sequential programming logic devices – PLD – CPLD – Magnetic memory – Magnetic recording – Magnetic bubble memories.

Unit V INTEL 8085 Microprocessor **12 hrs**
Organization of a Microprocessor based system – Operating system – Single board Microprocessors – Microprocessor INTEL 8085 – Architecture details – Instruction Format – Instruction set of 8085 – Microprocessor addressing modes (with examples) – Programs to add two 8 bit numbers, to subtract two 8 bit numbers, to sort 8 bit numbers in ascending and descending order.

Books for study:

Unit	Name of the Book	Authors	Publishers with Edition
I,II, IV	Digital Principles and applications	A.P.Malvino and D.P.Leach	McGraw Hill Publishing, 4th edition Chand & Co. Ltd.
III	Basic electronics solid state	B.L. Theraja	1stedition 1998, Reprint 2002, New Delhi
V	Microprocessor, Architecture Programing and Application with 8085	Ramesh S.Gaonkar	Penram International Publishing, 3rd edition
V	Digital Electronics and Microcomputers	R.K.Gaur	Dhanpat Rai Publications, 3rd Revised and enlarged Edition

Books for Reference:

S.No.	Name of the Book	Authors	Publishers with Edition
1	Digital Principles and applications	Albert Malvino and D.P. Leach	Tata McGraw Hill Publishing, 3rd and 6th edition, New Delhi.
2	Introduction to Microprocessors	Aditya Mathur	Tata McGraw Hill Publishing, 2017.

B.Sc. Physics

Semester VI

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III – Core Practical IV	**Course Code: 617PP4**
Semester: VI	**No. of Credits: 3**
No. of hours : 90 hours	**P:R : 60:18**

CIA Max. Marks: 40	ESE Max. Marks: 60

(P:Practical , R: Record)

Course Objectives: The Course aims

- To provide practical exposure by applying the experimental methods to correlate with the Physics theory.
- Tofamiliarize ICs, Electronic meters for various measurements.
- Tofamiliarize 8085 Microprocessor and to provide hands on experience in the assembly language Programs using 8085 Microprocessor
- Todevelop intellectual communication skills and discuss the basic principles of scientific concepts in a group
- To develop troubleshooting skills, independent thinking and team work.

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	BTL
CO 1	Use optical sources and lasers to study the optical parameters, record the data and interpret the results.	**A**
CO 2	Draw the electrical circuit, select the appropriate meters, perform the experiments, record and interpret the results	**A**
CO 3	Determine the physical constants such as Stefan's constant, dielectric constant, e/m of an electron using appropriate devices and analyse the results	**A**
ÇO 4	Construct the logic circuits using appropriate IC's to verify gates, Universal building block, flip flops, De-Morgans theorem, counters and verify the output.	**A**
CO 5	Write assembly language program execute it for its output using microprocessor 8085.	**A**

A-Apply

Syllabus:

Part III – Core Practical IV - List of Practicals

(A minimum of 15 experiments)

(Use of LabView software)

1. Stoke's formula – Spectrometer.
2. Measurement of thermo e.m.f. using thermo couple and Potentiometer
3. Absolute measurement of mutual inductance – B.G.
4. High resistance by charging – B.G.
5. Determination of Stefan's Constant
6. Determination of Dielectric constant for liquids
7. IC regulated power supply (5V regulator using 7805).
8. Determination of divergence & Beam spot of the laser source.

9. Measurement of Numerical aperture – Optical fiber & Laser source
10. Characteristics of Photo detector – Laser Source
11. Determination of particle size (Nano particles)
12. Determination of charge to mass ratio of an electron
13. Logic gates using discrete components & Verification of gates – OR, AND, NOT, NAND, NOR & XOR using IC's.
14. NAND gates as universal building block.
15. NOR gates as universal building block
16. J-K flip-flop.
17. De-Morgan's theorems
18. R-S flip-flop.
19. Half adder and Full adder using ICs.
20. Half subtractor and Full subtractor using ICs.
21. Decade counter using ICs.
22. Addition & Subtraction of two 8 bit numbers using 8085 microprocessor.
23. Ascending & descending order of an array using INTEL 8085 microprocessor.
24. Multiplication & division of two 8 bit numbers using 8085 microprocessor.
25. Biggest number of elements in an array.

B.Sc. Physics
Semester VI
(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part –III- Elective III Computational Physics using C Programming	**Course Code: 617PE4**
Semester: VI	**No. of Credits: 4**
No. of hours : 60	**C:T - 52:8**
CIA Max. Marks: -25	**ESE Max. Marks: 75**

(C:Contact hours, T:Tutorial)

Course Objectives: The Course aims

- To impart knowledge in the basic structure of the C Programming, declaration and the usage of the variables
- To expose the loop and decision making statements to solve the problem
- To implement different operations on arrays
- To exercise user-defined function to solve the problems
- To exercise file concept to show input and output files in C

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	BTL
CO 1	Describe the basic features of C programming	**U**
CO 2	Explain the format of the branching and looping structures in C programming.	**U**
ÇO 3	Implement operations on arrays	**U**
CO 4	Handle character arrays and strings in c	**A**
CO 5	Write program using user-defined functions and arrays	**A**
CO 6	Write C code for a given problem	**A**

U –Understand A-Apply

Syllabus:

Unit I	**11hrs**
Constants, Variables and Data types -Basic structure of a C program–Character set – C tokens – Key words and identifiers – Constants, Variables – Data types – Declaration of variables – Assigning values to variables – Defining symbolic constants. **Operators and expressions -** Arithmetic operators – Relational operators – Logical operators – Assignment operators – Increment and Decrement operators – Conditional operators – Bit wise operators – Special operators – Arithmetic expressions – Evaluation of expressions – Precedence of operators – Mathematical functions.	

Unit II	**11hrs**
Managing input and output operations -Reading a character – Writing a character – Formatted input – Formatted output. **Decision Making and Branching -** Decision making with if statement – Simple if statement – The if. else statement – Nesting of if…else statement – The else… if ladder – The switch statement – The ? Operator – The go to statement.	

Unit III	**10hrs**
Decision Making and Looping - The While statement – The do statement – The for statement – Jumps in loops. **Arrays** – One dimensional arrays – Declaration of one dimensional arrays – Initialization of one dimensional arrays – Two dimensional arrays – Initializing two dimensional arrays.	

Unit IV	**10hrs**
Handling of character arrays and strings – Declaring and initializing string variables – Reading strings from terminal – Writing string to screen – String handling functions. **User defined functions:** Elements of user defined function – Definition of function –Return values and their types – Function calls – Function declaration – Category of functions – No arguments and no return values – Arguments but no return values – Arguments with return	

values – No arguments but returns values – Recursion.

Unit V	**10hrs**
Structure –Defining a structure – Declaring structure variable – Accessing a structure member – Structure initialization – Structures within structures. **File management in C** –Defining and opening a file – Closing a file – Input / Output operations on files – Error handling in files.	

Books for study:

Unit	Name of the Book	Authors	Publishers with Edition
I-V	Programming in ANSI C	E.Balagurusamy	Tata McGraw Hill Publishing Co. Ltd, New Delhi, 7th Edition, 2016.

Books for Reference:

S.No	Name of the Book	Authors	Publishers with Edition
1.	Let us C	Yashavant Kanetkar	BPB Publications, New Delhi, 16th Edition, 2016.
2.	A text book on C Fundamentals, Data Structures and Problem Solving	E.Karthikeyan	Prentice Hall India Learning Private Limited, 2008 Edition.

B.Sc. Physics
Semester VI
(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III - Elective Practical - Computational Physics Practical using C Programming	**Course Code: 617PE6**
Semester: VI	**No. of Credits: 1**
No. of hours : 30	**P:R – 22 : 8**
CIA Max. Marks: 20	**ESE Max. Marks: 30**

(P:Practical , R: Record)

Course Objectives: The Course aims

- To make the student to learn a programming language and to develop the skill of writing programs in C.
- To practice the use of conditional and looping statements.
- To implement arrays and functions in the Program.
- To gain skills to handle strings and files.

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO 1	Write algorithm and C code for Physics problems, execute it and analyze for its output	**A**
CO 2	Write C program for problem based on numerical analysis and mathematical concepts,execute it for its output.	**A**
ÇO 3	Write C program by using characters, arrays and execute it for its output.	**A**

A-Apply

Syllabus:

Part III - Elective Practical -Computational Physics Practical using C Programming - List of Programs

(A Minimum of 8 Programs)

1. Temperature conversion.
2. Roots of a quadratic equation.
3. Matrix multiplication.
4. Ascending and Descending order of an array.
5. Computation of AC current in a circuit that contains resistance, inductance and capacitance in series.
6. Program using Simpson's rule and Trapezoidal rule.
7. Projectile problem.
8. Program for fourth order Runge - Kutta method.
9. Product of factorials of 'n' numbers using recursion.
10. Program using string handling functions.
11. Arranging Strings in alphabetical order
12. Mark list using files.

B.Sc. Physics
Semester VI

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part IV – Skill Enhancement Course- IV Institutional Training	**Course Code: 617PS4**
Semester: VI	**No. of Credits: 3**
No. of hours : 45	**I:R 30:15**
CIA Max. Marks: 75	**ESE Max. Marks: -**

(I: Internship Training , R:Report writing)

Preamble:

Measurement systems are traditionally used to measure physical and electrical quantities, such as mass, temperature, pressure, capacitance and voltage etc. However, they can also be designed to locate things or events, such as the epicenter of an earthquake, employees in a building, partial discharges in a high voltage power cable, or a land mine. Often, a measurement system is called upon to discriminate and count objects, such as red blood cells, or fish of a certain size swimming past a checkpoint. A measurement system is often made a part of the control system. The old saying ***'if you can't measure it, you can't control it'*** is certainly a valid axiom for both the Control Technician as well as an Instrumentation engineer.

Knowledge of instrumentation is critical in light of the highly sensitive and precise requirements of modern processes and systems. Rapid development in instrumentation technology coupled with the adoption of new standards makes a firm, up-to-date foundation of knowledge more important than ever in most science and engineering fields. Based on the requirement of these knowledge and expertise for the Industry, the students are acquainted with latest equipments and testing methods and also the calibration by undergoing a Hands-on Training in Calibration and measurements during their Internship programme.

Course Objectives: The Course aims

- To familiarize the latest Equipments and Standards available for various levels such as industry standards, Research standards, laboratory standards etc.
- To learn the techniques of operation of the devices for the purpose.
- To learn and perform practical work with equipments and observe various parameters related to errors, corrections, drifts, noise, repeatability, reproducibility, accuracy and precision.
- To make a record of these and conduct analysis of the results to disclose about the safety and security of the instruments and also their accuracy in the parametric measurements.

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	BTL
CO 1	gain a knowledge about the availability of testing methods and calibration techniques.	**R**
CO 2	familiarize about the equipments and will be able to handle them with care during the programme as well as in future.	**U**
ÇO 3	acquire an Understand about the parametric measurements and the need to conduct the testing for the purpose.	**U**
CO 4	interpret on the results obtained by conducting the analysis in-depth and thus generating an awareness about validity and performance of the equipments	**A**
CO 5	Write a Report and present it with suitable figures, graphs, tabulations etc	**A**
CO 6	Work confidently and behave with high ethical standards, team spirit and integrity,	**A**

R-Remember U –Understand A-Apply

B.Sc. Mathematics / B.Sc. Chemistry
Semester I & II
(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III- Allied Physics Practicals	**Course Code: 217AMP/217ACP**
Semester: I & II	**No. of Credits: 2**
No. of hours : 30 hours /Semester	**P:R - 22:8**
CIA Max. Marks: 20	**ESE Max. Marks: 30**

(P: Practical, R: Record)

Course Objectives: The Course aims

- To impart practical knowledge in various areas of Experimental Physics.
- To develop skills in measurements using instruments working with Physics principles.
- To correlate the theory with practicals to improve the level of Understand.
- To instill a confidence in the handling of equipments.
- To delineate the concepts of Physics with a mathematical approach.

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	BTL
CO 1	Perform experiment with appropriate equipments and procedures for determination of particular physical property	**A**
CO 2	Use optical sources for the determination of optical parameters with appropriate procedures	**A**
CO 3	Calibrate the given electrical meters using appropriate circuit components, record the data, draw the calibration graph and interpret the results	**A**
ÇO 4	Draw the electrical circuit, select the appropriate meters, perform the experiments, record and interpret the results	**A**
CO 5	Draw the logic circuits choose appropriate IC's to verify gates, Universal building block, De-Morgans theorem, Adder, solving Boolean equations	**A**

A-Apply

Syllabus:

Part III- Allied Physics Practicals - List of Practicals

(A minimum of 15 experiments)

1. Acceleration due to gravity – Compound pendulum
2. Young's modulus – Non-uniform bending – Optic lever, Scale and Telescope.
3. Young's modulus – Cantilever depression – Scale and Telescope.
4. Rigidity modulus of the material of the wire – Torsion Pendulum.
5. Rigidity modulus of the material of the rod – Static torsion.
6. Refractive index of the material of the prism – Spectrometer
7. AC frequency – Sonometer
8. Calibration of low range voltmeter – Potentiometer.
9. Calibration of high range ammeter – Potentiometer.
10. Measurement of specific resistance – Potentiometer.
11. Temperature co-efficient of resistance – Ohm's law - Thermistor.
12. Characteristics of a Zener diode.
13. Characteristics of FET.
14. Characteristics of a junction diode.
15. Verification of AND, OR, NOT, NAND, NOR & XOR gates – IC's.
16. Half adder & Full adder using IC's.
17. NAND as universal building block.
18. De-Morgan's theorems using logic gates.
19. NOR as universal building block.
20. Solving Boolean equations using logic gates.

Department of Physics

Sri GVG Visalakshi College for Women, (Autonomous)
Affiliated to Bharathiar University
Re- Accredited at A+ Grade by NAAC (Fourth Cycle)
An ISO 9001:2015 Certified Institution
Udumalpet - 642128, Tamilnadu

Curriculum Design

Sri G.V.G. Visalakshi College for Women (Autonomous)

Affiliated to Bharathiar University

Post Graduate Department of Physics

M.Sc. Physics

Scheme of Examination – CBCS Pattern

(For the students admitted during the academic year 2018 - 2019 only)

Semester	Course Code	Course Title	Ins. Hrs / week	Examination				Credits
				Dur .Hrs	CIA Marks	ESE Marks	Total Marks	
I	**17MP01**	Core I - Classical Mechanics	5	3	25	75	100	**4**
	17MP02	Core II - Mathematical Physics I	5	3	25	75	100	**4**
	17MP03	Core III - Modern optics	4	3	25	75	100	**4**
	17MP04	Core IV - Semiconductor Circuits and Applications	5	3	25	75	100	**4**
	17MPP1	Practical I	6	4	40	60	100	**4**
	17MPE1/	Elective I: Nano science and Nanotechnology/	5	3	25	75	100	**4**
	17MPE2	Thin film Technology	5	3	25	75	100	
II	**17MP05**	Core V - Mathematical Physics II	5	3	25	75	100	**4**
	17MP06	Core VI -Quantum Mechanics I	5	3	25	75	100	**4**
	17MP07	Core VII - Condensed Matter Physics	4	3	25	75	100	**4**
	17MP08	Core VIII– Statistical Mechanics	4	3	25	75	100	**4**
	17MPP2	Practical II	6	4	40	60	100	**4**

	17MPE3 / 17MPE4	Elective II - Digital Electronics and Microprocessor / Energy Physics	4 4	3 3	25 25	75 75	100 100	**4**
	17MGCS	Cyber Security	2	2	50	-	Grade	**Grade**
	17MPA1	Advanced Learner's Course I – Astrophysics		3	-		100	**4***
III	**17MP09**	Core IX - Quantum Mechanics II	5	3	25	75	100	**4**
	17MP10	Core X - Electromagnetic Theory	5	3	25	75	100	**4**
	17MP11	Core XI - Molecular Spectroscopy	5	3	25	75	100	**4**
	17MP12	Core XII - Nuclear and Particle Physics	4	3	25	75	100	**4**
	17MPP3	Practical III	6	6	40	60	100	**4**
	17MPE5/ 18MPE6	Elective III - Analog and Digital Communications / **Biophysics**	5 5	3 3	25 25	75 75	100 100	**4**
	17MPIS	Internship/ Summer Fellowship			150	-	150	**6**
IV	**18MP13**	**Core XIII - Computational Physics (Theory & Practical)**	5	3	40	60	100	**4**
	18MPPV	**Project and Viva-voce**	25		100	100	200	**8**
	18MPA2	**Advanced Learner's Course II - Plasma Physics /Advanced Materials/Online Courses – SWAYAM/ NPTEL/MOOC**		3			100	**4***

M.Sc. Physics

Scheme of Examination – CBCS Pattern

(For the students admitted from the academic year 2019 - 2020 onwards)

Semester	**Course Code**	**Course Title**	**Ins. Hrs / week**	**Examination**				**Credits**
				Dur.Hrs	**CIA Marks**	**ESE Marks**	**Total Marks**	

I	**17MP01**	Core I - Classical Mechanics	5	3	25	75	100	**4**
	17MP02	Core II - Mathematical Physics I	5	3	25	75	100	**4**
	17MP03	Core III - Modern optics	4	3	25	75	100	**4**
	17MP04	Core IV - Semiconductor Circuits and Applications	5	3	25	75	100	**4**
	17MPP1	Practical I	6	4	40	60	100	**4**
	17MPE1/ **17MPE2**	Elective I: Nano science and Nanotechnology/ Thin film Technology	5 5	3 3	25 25	75 75	100 100	**4**
II	**17MP05**	Core V - Mathematical Physics II	5	3	25	75	100	**4**
	17MP06	Core VI -Quantum Mechanics I	5	3	25	75	100	**4**
	17MP07	Core VII - Condensed Matter Physics	4	3	25	75	100	**4**
	17MP08	Core VIII– Statistical Mechanics	4	3	25	75	100	**4**
	17MPP2	Practical II	6	4	40	60	100	**4**
	19MPE3/ **19MPE4**	**Elective II - Digital Circuits, Microprocessor and Microcontroller /** **Solar Energy and its Utilization**	4 4	3 3	25 25	75 75	100 100	**4**
	17MGCS	Cyber Security	2	2	50	-	Grade	**Grade**
	19MPA1	**Advanced Learner's Course I – Astrophysics / Photovoltaic Cells / Online Courses (NPTEL / SWAYAM / MOOC)**		3	-		100	**4***
III	**17MP09**	Core IX - Quantum Mechanics II	5	3	25	75	100	**4**
	17MP10	Core X - Electromagnetic Theory	5	3	25	75	100	**4**
	17MP11	Core XI - Molecular Spectroscopy	5	3	25	75	100	**4**
	17MP12	Core XII - Nuclear and Particle Physics	4	3	25	75	100	**4**
	17MPP3	Practical III	6	6	40	60	100	**4**

	17MPE5/	Elective III - Analog and Digital Communications /	5	3	25	75	100	**4**
	18MPE6	Elective III – Biophysics	5	3	25	75	100	
	17MPIS	Internship/ Summer Fellowship			150	-	150	**6**
IV	**18MP13**	Core XIII - Computational Physics (Theory & Practical)	5	3	40	60	100	**4**
	18MPPV	Project and Viva-voce	25		100	100	200	**8**
	18MPA2	Advanced Learner's Course II - Plasma Physics /Advanced Materials/Online Courses (SWAYAM/ NPTEL/MOOC)		3			100	**4***

M.Sc. Physics

Semester I

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Core II – Mathematical Physics -I	Course Code: 17MP02
Semester: I	No. of Credits: 4
No. of hours : 75	C:T - 60:15
CIA Max. Marks: 25	ESE Max. Marks: 75

(C: Contact hours, T:Tutorial)

Course Objectives:

- To impart knowledge in the field of tensors and group theory.
- To disseminate knowledge in Laplace and Fourier transforms and its Applications in solving differential equations and periodical wave functions.
- To develop skill in solving problems of partial differential equations.
- To gain a working knowledge of mathematical methods used in physics.

Syllabus:

Unit I Tensors	**12 hrs**
Kronocker delta symbol– Scalars, Contra variant Vectors and Covariant Vectors –Tensors of Higher ranks – Algebraic operations of Tensors – Symmetric and Anti symmetric tensors – Invariant tensors $g_{\mu\nu}$, $g^{\mu\nu}g^{\mu}{}_{\nu}$– Conjugate or Reciprocal Tensors – Christoffel's 3-index symbols – Transformation laws of Christoffel's symbols.	

Unit II Group Theory	**12hrs**
Concept of a group – Abelian group – Generators of a finite group – cyclic group –Group multiplication table- subgroups – co-sets – Conjugate elements and classes- Conjugate sub-groups – Isomorphism and Homomorphism – Permutation groups – Cayley's theorem – The group of symmetry of an equilateral triangle – group of symmetry of a square – Reducible and Irreducible Representations .	

Unit III Laplace Transforms	**12 hrs**
Definition of Laplace Transform – Properties of Laplace Transforms: Linearity Property – Change of scale property – First Translation property and second translation property – Derivative of Laplace Transform – Laplace Transform of the Derivative of a function. Laplace Transform of Periodic Functions: Saw tooth wave – Square wave- Half wave rectifier – Inverse Laplace Transform – Properties of inverse Laplace transform: Linearity Property – Change of scale property – First translation property – Second translation property. Application of Laplace Transforms to Differential equations: ordinary differential equation with constant coefficients – Ordinary differential equation with variable coefficients.	

*** Unit IV Fourier series and Fourier Transform**	**12hrs**
Fourier series – Evaluation of the coefficients of Fourier series –Drichlet's conditions – Problems – Complex form of Fourier series – Fourier series in the interval (0,T) Fourier Transform – Fourier Sine and Cosine Transforms – Properties of Fourier transform – Fourier transform of a derivative.	

Unit V Partial Differential Equations in Physics	**12 hrs**
Introduction – Solution of Partial differential equations by the method of separation of variables – Solution of Laplace's equation in Cartesian coordinates-Two dimensional Steady flow heat – Diffusion equation or Fourier equation of heat flow-Two dimensional flow heat – The equation of motion for the vibrating string – D' Alembert's Solution.	

***Self Study Unit**

Books for study:

Unit	Name of the Book	Authors	Publishers with Edition
I - V	Mathematical Physics	Sathyaprakash	Sultan Chand & sons 5th Revised Edition, 2011
I - V	Mathematical Physics	P.K.Chattopadhyaya	New age index publishers 2nd Edition, 2013

Books for Reference:

S.No.	Name of the Book	Authors	Publishers with Edition
1.	Mathematical Physics	B.D.Gupta	Vikas Publishing House, 4th Edition, 2010
2.	Applied Mathematics for Engineers and Physicists	B.S. Rajput	PragatiPrakashan, 25th Edition, 2014
3.	Mathematical Physics	H.K.Dass and Dr. Ramaverma	S.Chand Publication,1st Edition, 2012
4.	Mathematical Physics	Sadri Hassini	Springer International Publication, 2nd Edition, 2013

M.Sc. Physics

Semester I

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Core IV Semiconductor Circuits and Applications	**Course Code: 17MP04**
Semester: I	**No. of Credits: 4**
No. of hours : 75	**C:T - 65:10**
CIA Max. Marks: 25	**ESE Max. Marks: 75**

(C: Contact hours, T:Tutorial)

Course Objectives:

- To impart knowledge about semiconductor devices.
- To familiarize the basic materials and properties of semiconductors with application to the tunnel diode, photo diodes and SCR.
- To provide knowledge in structure, operational principle, mode and characteristics of FET, UJT and Op-Amp.
- To inculcate an in-depth knowledge in Op-amp & its applications.

Syllabus:

Unit I Diodes and Thyristors	**13 hrs**
Introduction – Tunnel diode – Diode parameters – Applications – Photo diodes – Characteristics – Applications – Photoconductive cells – Characteristics – Applications – Liquid crystal display – Solar cells – Thyristors – Applications – Silicon Controlled Rectifiers (SCR) – SCR characteristics and rating – Applications : Temperature controller – Light activated SCR – Diac – Diac in proximity detector – Triac – Triac in Phase (power) control – UJT-Characteristics	

Unit II Field Effect Transistors	**13 hrs**
JFET-Construction and operations – Characteristics of JFET: Drain characteristics – Effect of gate to source voltage on drain Characteristics – Transfer Characteristics – Specification sheet of JFET – JFET-Parameters – Comparison between FET and BJT – MOSFETs – Depletion type MOSFET-Construction and operation – Characteristics of Depletion type MOSFET – Enhancement type MOSFET – Construction, operation and characteristics of Enhancement MOSFET – Advantages of N-channel over P-channel MOSFETs – MOSFET handling –CMOS VMOS.	

Unit III FET Amplifiers	**13 hrs**
Biasing the FET – Gate bias- self bias- setting a Q-point – Setting a Q-point using load line – Voltage divider bias – Current source bias – FET Amplifier – Common Source Amplifier – Analysis of Common Source Amplifier – Effect of AC load on Amplifier Parameters – Effect and external source resistance on voltage gain – FET Amplifier**:** Low frequency	

response – High frequency response – Enhancement MOSFET amplifier – Motion detecting system using JFET.

***Unit IV Oscillators**	**13 hrs**
Comparison between an amplifier and an oscillator – Barkhausen criterion – FET Hartley oscillator – FET Colpitt's oscillator – Principle of RC oscillator – FET Phase shift oscillator – Wien bridge oscillator – Non sinusoidal oscillator – Astable multivibrator – Monostable multivibrator – Bistable multivibrator – Schmitt trigger – Blocking oscillator – UJT Relaxation oscillator-Problems	

Unit V Operational Amplifiers (OP AMPs)	**13 hrs**
The Ideal OP-AMP – Inverting, Non-Inverting & Differential Amplifiers –Input offset voltage – Input offset current – CMRR – OP-AMP Characteristics – Open Loop Input Output Characteristics – Frequency Response and Slew rate – OP-AMP Applications **:** Adder, Subtractor, Integrator, Differentiator – Comparator – Voltage to Current Converter – Current to Voltage Converter – Electronic Analog Computation (Solving simultaneous equations) **-** Problems	

***Self Study Unit**

Books for study:

Unit	Name of the Book	Authors	Publishers with Edition
I	A Text book of Applied Electronics	R.S.Sedha	S.Chand and Company Reprint 2015
II & III	Electronic Devices and Circuit theory	Robert L.Boylestad and Louis Nashelsky	Prentice Hall of India Private Ltd, 4th impression, 2016
IV	OP-AMPs & Linear Integrated Circuits	RamakantA.Gayakwad	Prentice Hall of India Private Ltd, 9th Edition, 2008
V	Linear Integrated circuits	D.RoyChoudhury and Shail Jain	New Age International (P) Ltd 10th Reprint, 2014.

Books for Reference:

S.No.	Name of the Book	Authors	Publishers with Edition
1	Basic electronics – Solid state	B.L.Theraja	S.Chand& Co. Ltd, New Delhi, Reprint 2010
2	Integrated Electronics: Analog and Digital Circuits and Systems	Jacob Millman, Christos C.Halkias	McGraw Hill International Book Company 2nd Edition, 2012

M.Sc. Physics

Semester I

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Practical I	**Course Code: 17MPP1**
Semester: I	**No. of Credits: 4**
No. of hours : 90 hours	**P:R 66:24**
CIA Max. Marks: 40	**ESE Max. Marks: 60**

(P:Practical , R: Record)

Course Objectives:

- To gain practical knowledge by applying the experimental methods to correlate with the Physics theory.
- To provide an experience in handling equipments for the synthesis of nanomaterials.
- To develop the ability to record and analyse the experimental data.
- To develop intellectual communication skills and discuss the basic principles of scientific concepts in a group
- To develop troubleshooting skills, independent thinking and team work

Syllabus:

LIST OF PRACTICALS

(A minimum of 12 Experiments)

1. Young's Modulus – Hyperbolic Fringe Method
2. Determination of λ – Michelson's Interferometer
3. Measurement of Hall voltage in semiconductors
4. Resistivity Measurement– Four Probe Method
5. Dielectric constant of Benzene and Dipole moment of Acetone
6. Velocity of Ultrasonics in liquids – Ultrasonic Interferometer
7. Characteristics of Photo diode & Photo transistor – Laser Source
8. Inversion temperature of Thermocouple
9. Characteristics of Tunnel Diode
10. Characteristics of FET – BFW 10/11

11. Construction of an Astable Multivibrator

12. RC Coupled Amplifier – Single stage using FET

13. Colpitt's Oscillator

14. Hartley Oscillator

15. IC Regulated power supply (9 – 0 – 9) V

16. Half Adder, Full Adder (NAND circuits)

17. R-S & J-K Flip Flop

18. Construction of a Low pass and a High pass filter using OPAMP 741

19. Construction of an Adder and a Subtractor using OP AMP 741

20. Wien Bridge Oscillator using FET

M.Sc. Physics

Semester II

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Core V Mathematical Physics II	**Course Code: 17MP05**
Semester: II	**No. of Credits: 4**
No. of hours : 75	**C:T - 60:15**
CIA Max. Marks: 25	**ESE Max. Marks: 75**

(C: Contact hours, T:Tutorial)

Course Objectives:

- To educate the concepts related to the various types of differential equations of various order and arriving at solutions.
- To make the students to understand the complex variable concepts and methods & rules that govern the differential equations
- To impart the knowledge about the statistical distribution using probability concepts.
- To make the students to understand the applications of the differential equations and arrive at solutions for physical problems.

Syllabus:

Unit I Differential Equations	**12 hrs**
Legendre Differential Equation and Legendre function – Generating function of Legendre Polynomials – Rodrigue's formula for Legendre polynomials – Recurrence formulae for $P_n(x)$ – Laguerre's Differential Equation and Laguerre Polynomials – Generating function of Laguerre Polynomials – Recurrence relations for Laguerre polynomials	

Unit II Differential Equations	**12 hrs**
Bessel's Differential Equation and Bessel's function of first kind – Recurrence formulae for $J_n(x)$– Generating function for $J_n(x)$ –Hermite Differential Equation and Hermite Polynomials – Generating function of Hermite Polynomials – Recurrence formulae for Hermite Polynomials.	

Unit III Complex Variables	**12 hrs**
Review of Algebraic operation on Complex Numbers – Complex Conjugates – Modulus and argument of a complex number – Graphical representation on argand diagram and trigonometric form – Functions of a complex variable – Limit, Continuity and differentiability – Definitions : Analytic function – The necessary and sufficient conditions for f(z) to be analytic : Cauchy-Riemann Differential Equations – Laplace's equations : Harmonic functions – Line integral of a complex function – Cauchy's Integral theorem – Cauchy's Integral Formula – Taylor's series – Cauchy Residue theorem	

***Unit IV Probability**	**12 hrs**
Probability: Priori Probability – Empirical Probability – Theorem of total Probability – Binomial theorem of Probability – Measures of central tendency, averages – Measures of dispersion – Karl Pearson's Coefficient of Correlation – Standard deviation as the sum of distribution – Theoretical Distributions: Binomial distribution – Normal distribution – Theory of errors – Line of Regression.	

Unit V Numerical Methods	**12 hrs**
Numerical solutions of ordinary differential equations: Taylor series method Modified Euler's method – Fourth order Runge-Kutta method –Numerical Solutions of partial differential equations: Difference quotients and difference equations Solution of elliptic equations – Solution of Laplace's equations Numerical integration: Quadrature formula for equidistant ordinates – Trapezoidal rule – Simpson's rule – Approximate solution of algebraic and transcendental equations : Newton-Raphson method – Gauss elimination method for solving a system of linear equations.	

***Self Study Unit**

Books for study:

Unit	Name of the Book	Authors	Publishers with Edition
I-IV	Mathematical Physics	Sathya prakash	Sultan Chand & sons, 5th Revised Edition, 2011
V	Numerical Methods	A. Singaravelu	Meenakshi Publlication, New Revised Edition, January2014

Books for Reference:

S.No.	Name of the Book	Authors	Publishers with Edition
1	Mathematical Physics	B.D.Gupta	Vikas Publishing House, 4th Edition, 2010
2	Mathematical Physics	H.K.Dass and Dr. Ramaverma	S.Chand Publication,7th Edition, 2014
3	Mathematical Physics	P.K.Chattopadhyay	New Age Index Publishers, 2nd Edition, 2013

M.Sc. Physics

Semester II

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Practical II	**Course Code: 17MPP2**
Semester: II	**No. of Credits: 4**
No. of hours : 90 hours	**P:R 66:24**
CIA Max. Marks: 40	**ESE Max. Marks: 60**

(P:Practical , R: Record)

Course Objectives:

- To gain practical knowledge by applying the experimental methods to correlate with the Physics theory.
- To provide an experience in handling equipments for the synthesis of nanomaterials.
- To develop the ability to record and analyse the experimental data.
- To develop intellectual communication skills and discuss the basic principles of scientific concepts in a group
- To develop troubleshooting skills, independent thinking and team work

Syllabus:

LIST OF PRACTICALS

(A minimum of 12 Experiments)

1. Young's Modulus – Elliptical Fringe Method
2. Determination of Refractive index of glass –Michelson's Interferometer
3. Determination of Band Gap – Four Probe method

4. Numerical aperture of an optical fibre – Laser source
5. Determination of e/m using Thomson experiment
6. Magnetic Susceptibility- Quinck's method
7. Synthesis of thin Film – Chemical Bath Deposition Method
8. Synthesis of Nano Particles – Chemical Method
9. Synthesis of Nano Particles – Planetary Ball Mill
10. Characteristics of UJT
11. Relaxation Oscillator – UJT
12. RC Coupled amplifier – Two stage (FET/BJT)
13. 555 Timer – Astable Multivibrator
14. Four bit D/A converter using OPAMP
15. Constant current source using OPAMP
16. Half Subtractor, Full Subtractor (NAND circuits)
17. Characteristics of SCR
18. Construction of Integrator, Differentiator using OP AMP
19. 555 Timer – Mono stable Multivibrator
20. INTEL 8085A Microprocessor – Addition and Subtraction of two 8-bit numbers
21. INTEL 8051 MCS Microcontroller – Addition of two 16-bit numbers
22. Microcontroller – Find the maximum number from the given ten 8-bit numbers(INTEL 8051)

M.Sc. Physics
Semester III
(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Core Core XI - Molecular Spectroscopy	**Course Code: 17MP11**
Semester: III	**No. of Credits: 4**
No. of hours : 75	**C:T - 65:10**
CIA Max. Marks: 25	**ESE Max. Marks: 75**

(C: Contact hours, T:Tutorial)

Course Objectives:

- To provide an introduction to molecular spectroscopy and its fundamental concepts.
- To impart information about the instrumentation for UV, IR, NMR, NQR, and ESR.
- To learn the use of spectroscopic instruments in the determination of the structures of organic compounds.
- To understand the theory of the various instruments and the interpretation of spectra.
- To familiarize the applications of molecular spectroscopy to different areas of science.

Syllabus:

Unit I Infrared Spectroscopy	**13 hrs**
The Vibrating Diatomic molecule: The energy of a Diatomic molecule – The simple harmonic oscillator – The Anharmonic oscillator – The Diatomic Vibrating Rotator – Breakdown of the Born-Oppenheimer approximation: The interaction of Rotations and Vibrations – The Vibrations of Polyatomic molecules: Fundamental of vibrations and their Symmetry – The influence of rotation on the spectra of polyatomic molecules – Linear molecules – Techniques and Instrumentation: Outline – Fourier Transform Spectroscopy	

Unit II Microwave Spectroscopy and Raman Spectroscopy	**13 hrs**
Microwave Spectroscopy: The Rotation of molecules – Rotational spectra – Diatomic Molecules – The Rigid Diatomic Molecule – The Intensities of Spectral lines – Polyatomic molecules – Linear molecules – Symmetric top molecules – Techniques and Instrumentation – Chemical analysis by Microwave Spectroscopy – The Microwave oven. **Raman Spectroscopy:** Introduction – Quantum theory of Raman effect – Classical theory of Raman effect: Molecular Polarizability – Pure rotational Raman spectra: Linear molecules – Symmetric top molecules – Vibrational Raman Spectra: Raman activity of vibrations – Vibrational Raman spectra – Structure determination from Raman and Infra-Red spectroscopy – Techniques and Instrumentation.	

Unit III Electronic Spectroscopy of Molecules	**13 hrs**
Electronic spectra of Diatomic molecules: The Born-Oppenheimer Approximation – Vibrational Coarse Structure: Progressions – Intensity of Vibrational–Electronic spectra: The Franck-Condon Principle – Dissociation energy and Dissociation Products – Rotational Fine Structure of Electronic –Vibration Transitions – The Fortrat Diagram – Predissociation. Chemical Analysis by Electronic Spectroscopy – Techniques and Instrumentation. Molecular Photoelectron Spectroscopy – X-Ray Photoelectron Spectroscopy (XPES).	

Unit IV NMR and NQR Spectroscopy	**13 hrs**
NMR Spectroscopy: Introduction to NMR – Quantum description of NMR – Instrumentation – Chemical shift – Spin-spin coupling – Applications of NMR spectroscopy – Structural diagnosis by NMR – Exchange effects – Determination of Activation energy – Limitations of NMR. **NQR Spectroscopy** Introduction to NQR – Theory of NQR – Instrumentation – Sample requirements – Applications of NQR – Nature of chemical bond – Structural information of Group III Halides – Limitations.	

***Unit V ESR and Mossbauer Spectroscopy**	**13 hrs**
ESR Spectroscopy Introduction – Theory of ESR – Instrumentation – Presentation of ESR spectrum – Hyperfine splitting – Determination of g-value – Line width – Applications (Qualitative only) – Study of free radicals – structure determination – Analytical applications – Miscellaneous applications. **Mossbauer Spectroscopy** Principles of Mossbauer spectroscopy – Instrumentation – Applications of Mossbauer spectroscopy – Chemical shift – Quadrupole Effects – The	

effect of Magnetic Field.

***Self Study Unit**

Books for study:

Unit	Name of the Book	Authors	Publishers with Edition
I, II, III &V	Fundamentals of Molecular Spectroscopy	C.N.Banwell and E.M..McCash	Tata McGraw-Hill Publishing 35th Reprint 2010
IV & V	Instrumental Methods of Chemical Analysis	Gurdeep Chatwal and Sham Anand	Himalaya Publishing House 2th Edition, 1984

Books for Reference:

S.No.	Name of the Book	Authors	Publishers with Edition
1	Elements of Spectroscopy	S.L.Gupta, V.Kumar and R.C.Sharma	Pragathi Prakashan Pub.Co 24th Edition, reprint 2016
2	Molecular structure and spectroscopy	G.Aruldhas	Prentice Hall of India 2nd Edition, 2008
3	Spectroscopy	B.P.Straughan and S.Walker	Springer Netherlands 1976, Volume 3

M.Sc. Physics

Semester III

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Practical III	**Course Code: 17MPP3**
Semester: III	**No. of Credits: 4**
No. of hours : 90 hours	**P:R 66:24**
CIA Max. Marks: 40	**ESE Max. Marks: 60**

(P:Practical , R: Record)

Course Objectives:

- To gain practical knowledge by applying the experimental methods to correlate with the Physics theory.
- To provide an experience in handling equipments for the synthesis of nanomaterials.
- To develop the ability to record and analyse the experimental data.
- To develop intellectual communication skills and discuss the basic principles of scientific concepts in a group
- To develop troubleshooting skills, independent thinking and team work

Syllabus:

List of Practicals
(A minimum of 12 Experiments)

1. Magnetic Susceptibility–Guoy balance
2. Wavelength of Laser Beam – Fabry Perot Interferometer
3. e/m Magneton method using CRT
4. Characteristics of Solar Cell – Laser Source
5. Verification of Malus Law & Determination of Brewster's angle – Laser Source
6. Measurement of linear absorption co-efficient of a transparent material (Glass Slide) – Laser Source.
7. Determination of Particle size – Laser Source
8. Electrodeposition method of the particles
9. Conductivity Studies of Nano materials
10. Synthesis of Polymers
11. Crystal growth of materials
12. Construction of Bistable Multivibrator – BJT
13. Up-Down Counter using IC 74190, IC 7447 and LED 71312 (Seven Segment Display)
14. Frequency Modulation using 555 Timer
15. Construction of 12-0-12 VPower Supply – IC 7812 and IC 7912
16. Construction of Band Pass and Band rejection – OPAMP 741
17. Frequency Response of FET Amplifier (BFW10/11)
18. Schmitt Trigger – OPAMP 741 and 555 Timer
19. Sine Wave, Square Wave and Triangular Wave Generation – OPAMP 741
20. Voltage to Frequency Converter – OPAMP (741,709) and BFW10
21. Program to arrange the given ten 8-bit numbers in ascending order – INTEL 8051 Micro Controller.
22. Ascending and Descending order of an array of numbers – INTEL 8085A Microprocessor.

M.Sc. Physics
Semester III
(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Internship / Summer Fellowship	**Course Code: 17MPIS**
Semester: III	**No. of Credits: 6**
No. of hours : -	**C:T -**
CIA Max. Marks: 150	**ESE Max. Marks: -**

(C: Contact hours, T:Tutorial)

Course objectives

- To inspire and motivate the young students to take up a career in Science
- To create an awareness on various career options available for young Woman Scientists.
- To explore avenues for entrepreneur development for Woman through Science.
- To develop human resource that is comfortable with both Science and Technology and therefore tuned to converting knowledge into innovation for wealth generation.
- To gain knowledge about the specific areas of research.
- To familiarize the availability of new research equipments.

Course Evaluation Methods:

Internship Report (submission before the end of III Semester) a) Activity performed b) Material prepared c) Attendance	 25 marks 25 marks 25 marks
Viva- voce (Internal examiner only) a) Presentation prepared b) Delivery knowledge c) Response to Q &A	 30 marks 20 marks 25 marks

M.Sc. Physics

Semester IV

(For the students admitted during the academic year 2018 – 2019 only)

Course: Project & Viva – voce	**Course Code: 18MPPV**
Semester: IV	**No. of Credits: 8**
No. of hours : 25 hrs / Week	**C:R -**
CIA Max. Marks: 100	**ESE Max. Marks: 100**

(C: Contact hours, R: Report)

Course Objectives:

- To familiarize the students with the areas of research
- To impart knowledge in the collection of literature, list of references (books as on-line) - as well as references in the text.
- To explore the knowledge about the presentation of experimental methods.

- To facilitate the students about the choice of the material.
- To secure knowledge about the background of the current research.
- To develop the experimental skills in the synthesis of sample.
- To interpret the skills in the analysis of synthesized samples.
- To experience an independent learning.
- To develop a confidence in pursuing research in future.

Course Evaluation Methods:

Evaluation	Components	Marks	Marks Total
Internal	Literature Survey and Topic Confirmation Experimental Work and Analysis Completion of work, Report Submission and Internal Viva Voce by HOD and Guide	20 Marks 40 Marks 40 Marks	100
External	Report Viva- voce	50 Marks 50Marks	100

M.Sc. Physics
Semester IV

Course: Core XIII - Computational Physics (Theory & Practical)	**Course Code: 18MP13**
Semester: IV	**No. of Credits: 4**
No. of hours : 75	**C:P:A – 39:26:10**
CIA Max. Marks: 40	**ESE Max. Marks: 60**

(C: Contact hours, P:Practical, A: Assignment)

Course Objectives:

- To learn about Object Oriented Programming
- To learn the syntax and semantics of the **C++** programming language
- To learn how containment and inheritance promote code reuse in C++
- To demonstrate skills to write and develop simple programs in C++
- Formulate and computationally solve a selection of problems in physics
- Visualize physical problems and their solutions on a computer

Syllabus:

Unit I Principles of Object-Oriented Programming	**7 hrs**
Structure of C++ Program - Tokens – Keywords – Identifiers and Constants – Basic data types – User defined data types – Derived data types – Symbolic Constants – Type Compatibility – Declaration of Variables – Dynamic Initialization of Variables – Operators in C++ - Scope Resolution Operator – Manipulators.	

Unit II Expressions	**7 hrs**
Expressions and their types: Special Assignment Expressions – Implicit conversions – Control Structures	

Unit III Functions, Classes and Objects	**9 hrs**
Functions in C++ : The Main Function – Function Prototyping – Call by Reference – Return by Reference – Inline Functions – Default Arguments – Constant Arguments – Function Overloading – Math Library Functions. **Classes and Objects:** Specifying a class – Defining member functions – Making an outside function inline – Private member functions – Arrays within a class – Static Data members – Static member functions – Arrays of objects – Objects as function arguments – Friendly Functions.	

Unit IV Constructors and Inheritance	**9 hrs**
Constructors: Parameterized constructors – Multiple constructors in a class – Constructors with default arguments – Dynamic Initialization of objects – Copy constructors – Dynamic Constructors. **Inheritance:** Defining Derived Classes – Single Inheritance – Making a Private member inheritable – Multilevel Inheritance – Multiple Inheritance – Hierarchical Inheritance.	

*** Unit V Operator Overloading**	**7 hrs**
Defining Operator Overloading – Overloading unary Operators – Overloading binary Operators using Friends – Manipulation of strings using operators – Rules for overloading operators.	

***Self Study Unit**

List of Programs **(A minimum of 7 Programs)**	**26 hrs**
1. Binding energy per nucleon – Semi-empirical mass formula 2. Determination of Bond length for diatomic molecules 3. Determination of lattice parameters of a crystal 4. Determination of particle size 5. Eigen values for a Particle in a box 6. Program to solve electrical network 7. Acceptance angle & Numerical aperture of an optical fiber 8. Determination of half-life and Mean life period of radioactive elements 9. Overloading of Arithmetic Operators	

10. Operator Overloading – Strings 11. Resistances in Series and in Parallel

Books for study:

Unit	Name of the Book	Authors	Publishers with Edition
I,III,IV	Object Oriented Programming with C++	E.Balagurusamy	Tata McGraw-Hill Publishing 5th Edition, 2011
II, V	Object Oriented Programming with ANSI & Turbo C++	Ashok N.Kamthane	Dorling Kindersley (India) Pvt. Ltd., Licensees of Pearson Education in South Company Limited, New Delhi, Asia, 7th Impression, 2009

Books for Reference:

S.No.	Name of the Book	Authors	Publishers with Edition
1.	Let us C++	Yashavant Kanetkar	BPB Publications, 9th Edition, 2010
2.	Mastering C++	K.R.Venugopal, Rajkumar Buyya and T.Ravishankar	Connaught Place, New Delhi 2nd Edition, 2013
3.	Programming in C++	James P.Cohoon, Jack W.Davidson	Tata McGraw Hill Publishing Company Limited, New Delhi, 3rd Edition, 2008
4.	Programming in C++	D.Ravichandran	Tata McGraw Hill Publishing Company Limited, New Delhi 2nd Edition, 2002

M.Sc. Physics

Semester II

(For the students admitted from the academic year 2019 – 2020 onwards)

Course: Elective II Digital Circuits, Microprocessor and Microcontroller	**Course Code: 19MPE3**
Semester: II	**No. of Credits: 4**
No. of hours : 60	**C:T - 52:8**
CIA Max. Marks: 25	**ESE Max. Marks: 75**

(C: Contact hours, T:Tutorial)

Course Objectives:

- To provide a thorough understanding of the fundamental concepts and techniques used in digital electronics.
- To understand, analyze and design various combinational and sequential circuits.

- To develop skill to build and troubleshoot digital circuits.
- To able to understand the operation of latch circuit and flip-flop circuits.
- To impart knowledge about Microprocessors and its architecture.
- To foster ability to write the programming using 8085 microprocessor.
- To inculcate knowledge about microcontroller 8051.

Syllabus:

Unit I Data Processing Circuits (Or) Digital Data Circuit	**10 hrs**
Logic Gates – Boolean Algebra and De-Morgan's Theorem – Sum of Products Method – Karnaugh's Map and Simplifications – Half Adder , Full Adder – Half Subtractor, Full Subtractor – Binary Adder/Subtractor – Multiplexer – (16-1) Multiplexer – Demultiplexer – (1-16)- De multiplexer– Parity generators/ checkers.	

Unit II Flip Flops and Registers	**10 hrs**
RS Flip Flop – Clocked RS Flip Flop – D Flip Flop – Edge Triggered D-Flip Flop - JK Flip Flop – JK Master Slaved Flip Flop – 555 Timer Astable – 555 Timer Mono stable – Types of Registers – Serial-in Serial-out – Serial-in Parallel-out – Parallel-in Parallel-out – Parallel-in Serial-out.	

***Unit III Counters and Memories**	**10 hrs**
Types of Counters – Asynchronous and Synchronous Counter – MOD-5 and Decade Counters – Ring Counters – Digital to Analog Converter: Binary Ladder Method – 4 bit Digital to Analog converter –Analog to Digital converter: Successive Approximation Method – Memory: ROMs, PROMs, EPROMs and EEPROMs – RAMs : SRAM and DRAM.	

Unit IV Microprocessor	**10 hrs**
Intel 8085 Microprocessor – Architecture – Pin Configuration – Instruction format – Instruction Set of 8085 Microprocessor – Instruction Cycle – Timing Diagram – Op code Fetch Cycle – Memory Read Cycle for MOVE C, A & ADD M – Addressing Modes – Assembly Language Programming – Program to add and subtract two 8-bit numbers – Sort numbers by ascending and descending order	

Unit V Micro controllers	**12 hrs**
Microprocessor Vs Microcontroller– Applications of Microcontrollers (qualitative only) – INTEL 8051 Microcontroller – Features of 8051Microcontroller – Pin out of 8051Microcontroller - Architecture of INTEL 8051 Microcontroller – Addressing modes – 8051 Instruction execution – 8051 Instruction set – Data transfer Instructions – Arithmetic Instructions – Logic Instructions – Control transfer/Program control – 8051Microcontroller program to add two 16 bit numbers – 8051 Microcontroller program to find the maximum number from a given ten 8-bit numbers	

***Self Study Unit**

Books for study:

Unit	Name of the Book	Authors	Publishers with Edition
I	Digital Principles and Applications	A.P Malvino & D.P.Leach	Tata Mc Grw Hill, 7th Edition, 2011
II & III	Introduction to Microprocessors	AdityaP.Mathur	TataMcGrw Hill, 3rd Edition, 32nd Reprint 2010
V	Advanced Microprocessor and Microcontroller	Prof.S.K.Venkataram	University Science Press, 1st Edition, 2002 (Reprint 2008)

Books for Reference:

S.No.	Name of the Book	Authors	Publishers with Edition
1	Electronic Principles and Applications	A.B.Bhattacharya	New Central Book Agency (P) Ltd, Reprint 2006
2	Microprocessor Architecture, Programming and applications with the 8085	Ramesh Gaonkar	Penram International Publishing (India) Pvt., Ltd, 5th Edition, 2010

M.Sc. Physics

Semester II

(For the students admitted from the academic year 2019 – 2020 onwards)

Course: Elective II Solar Energy and its Utilization	Course Code: 19MPE4
Semester: II	No. of Credits: 4
No. of hours : 60	C:T - 52:8
CIA Max. Marks: 25	ESE Max. Marks: 75

(C: Contact hours, T:Tutorial)

Course Objectives:

- To understand the concept of solar radiation and solar radiation geometry.
- To describe the design of the solar collectors and its applications.
- To explain the design and the working principle of solar air heaters
- To express the operating principle of solar ponds and able to express the applications of solar ponds
- To analyse the applications of solar energy devices in various fields

Syllabus:

Unit I Solar Radiation	12 hrs
Introduction – Solar constant – Solar radiation outside the Earth's atmosphere – Solar Radiation at the Earth's surface – Instruments for measuring solar radiation and sunshine – Solar Radiation	

Geometry – Empirical equations for predicting the availability of solar – radiation – monthly average daily global Radiation monthly average daily diffuse radiation.

Unit II Solar Collectors: Liquid Flat Plate Collectors	**10 hrs**
Introduction – The liquid Flat -Plate collector – Materials for Flat-Plate collector – Efficiency of Flat-Plate Collectors – Overall heat loss co-efficient – Heat loss from the top of collector plate – forced convective Heat transfer from top cover- Sky temperature – Bottom loss co-efficient.	

Unit III Solar Air Heaters	**10 hrs**
Introduction – Types of air Heating collectors – Performance analysis of conventional Air Heaters – Heat transfer and Pressure drop in a parallel Plate Duct – Other types Solar Air Heaters: Air Heater with air flow above the absorber Plate – Two Pass Solar Cir Heater – Some novel designs.	

Unit IV Solar Ponds	**10 hrs**
Introduction – Principle of operation of solar ponds – Extraction of Thermal Energy – Theoretical Analysis of Solar Pond – Types of solar Ponds- applications of Solar Ponds.	

Unit V Solar Desalination and Drying of Food	**10 hrs**
Desalination: Introduction – Simple solar Still – Basics of Solar Still – experiments on Solar Still – Solar Disinfection. **Drying Food**: Introduction – Basics of Solar drying – Types of solar dryer – Forced circulation type dryers.	

Books for study:

Unit	Name of the Book	Authors	Publishers with Edition
I	Solar energy – Principles of thermal collection and storage	S.P. Sukhatme, J.K. Nayak	3rd edition, Tata MC Graw Hill Education – 2008
II, III & V	Solar Energy fundamentals and Applications	H.P. Garg, J. Prakash	1st revised edition, Zoor Tata MC Graw Hill.
IV	Solar Energy Utilisation	G.D.Rai	5th Edition, 2011, Khanna Publishers

Books for Reference:

S.No.	Name of the Book	Authors	Publishers with Edition
1	Energy Technology Non Conventional, renewable	S. Rao, Dr. B.B. Parulekar	Khanna publishers 4th edition, 2008.

	and Conventional		
2	Non- Conventional Energy sources	GD. RAI	Khanna publishers 4th edition, 2008