FATIMA COLLEGE (AUTONOMOUS)

Re-Accredited with "A" Grade by NAAC (3rd Cycle)
74th Rank in India Ranking 2020 (NIRF) by MHRD
Maryland, Madurai- 625 018, Tamil Nadu, India

NAME OF THE DEPARTMENT: RESEARCH CENTRE OF PHYSICS

NAME OF THE PROGRAMME : M.SC

PROGRAMME CODE : PAPH

ACADEMIC YEAR : 2021-2022

Minutes of the Board of Studies Meeting.

To be implemented from 2021-2022 Onwards

Venue: PG Physics Lab.

Convened on 12.04.2021 at 2 PM

Members Present

1. Dr. A. Sheela Vimala Rani — Head of the Dept.

2. Dr. Basherrudin Mahmud Ahmed, — Subject Expert.
Asst. Prof.,
School of Physics,
Madurai Kamaraj University
Madurai

3. Dr. K. Marimuthu, — Subject Expert.
Asst. Prof.,
Dept. of Physics,
Gandhigram Rural Institute -
Deemed University,
Gandhigram

4. Dr. Euchrista Sylvia, — Subject Expert (ABSENT).
Head & Associate Prof., Dept. of Physics,
St. Mary's College,
Thoothukudi

5. Mr. Ramprakash, — Industrialist
Industrial Electronics Cop.,
Industrial Estate, Madurai.

6. Dr. R. Vishnu Priya, Alumna
Asst. Prof.,
Dept. of Physics
The Madura College,
Madurai.

7. Dr. Malathy, Dean of Academic Affairs
Asst. Prof.,
Dept. of Zoology,
Fatima College.

8. Mrs. S. Arulmozhi Packiaseeli S. Arulmozhi Packiaseeli
Associate Professor

9. Dr. Mathari Manisekar Mathari Manisekar
Associate Professor

10. Dr. L. Caroline Sugirtham L. Caroline Sugirtham
Associate Professor

11. Dr. G. Dheva shantha kumar
Associate Professor

12. Mrs. R. Alphonsa Fernando R. Alphonsa Fernando
Associate Professor

13. Dr. M. V. Leena Chandra
Assistant Professor

14. Mrs. I. Jeyasheela
Assistant Professor

15. Dr. Ancemma Joseph
Assistant Professor

16. Dr. M. Ragam
Asst. Professor

17. Dr. G. Jenita Rani
Asst. Professor

18. Dr. R. Jothimani
Asst. Prof.

19. Dr. R. Niranjana Devi
Asst. Prof.

Agenda for Board of Studies:

1. Preparation of Action taken Report

2. Updation and addition of Open Educational Resources in the list of references of courses.

3. Revision of Syllabus

4. New courses: At least one Interdisplinary Self learning Extra credit course/semester for UG / PG / Professional Advanced learners to be introduced.

5. Introduction of atleast one skill Embedded certificate / Dip / Adv. Dip. value added course

Others than the value added course that is already being offered.

6. Approval of Ph.D. Course work Syllabus

7. Internships & Projects:

a) Rubrics for Internships & Projects to be passed in the Board

b) Type of projects to be decided
   i) Field project /
   ii) Student Project
      1) Group - UG
      2) Individual - PG

Minutes of the Board of studies.

1. Presentation of Action taken Report:

Action taken Report for 2020-2021
UG PHYSICS.

S.No.	Common Suggestions offered in the previous board	Action Taken for academic year 2020-21
1)	Title of 19P2CC5 - Advanced Mechanics to be changed as Applied Mechanics.	Changed.

S.No.	Common Suggestions Offered in the previous board	Action taken Report for the academic year 2020-21
2)	Types of diodes must be included in 19P4CC10 - Analog Electronics	Included.
3)	To include Specific new materials in 19P4CC11 - Materials Science	Included.
4)	To include Simulation Experiments of FET in 19P3CC9 & 19P4CC12 (May. Practicals- III & IV)	Due to lockdown, it was not possible to include such new experiments & train the students
5)	To include uplink, downlink in 19P5CC13 Digital Electronics & Communication	Included.
6)	To include EX-NOR in 19P6CC19	Included in OBE syllabus to be implemented from 2020-21 onwards.
7)	In 19P6CC20, Particle Size determination, Ultrasonics, Biomass based Experiments to	Particle Size determination is included. Ultrasonics not included, because

it is not in their theory.
Biomass plant required to introduce Biomass Experiments

8) On 19P5CC14 optics- Book, Reference Books by Jenkins & White & Ghatak & Loganathanan to be included. — Included.

9) Suggested to have windmill construction as project work — Will be given

PG Physics.

1) Title of the foll. papers are to be Changed. — Title changes as

	old	new
i)	19PG1Pb - Mathematical Physics - I	- Advanced Mathematical Physics.
ii)	19PG3P11 - Solidstate Physics - I	- Condensed Matter Physics
iii)	19PG4Pb - Solid state Physics II	- Advanced Condensed Matter Physics
iv)	19PG4P14 - Molecular Spectroscopy.	- Not Changed.

2) Suggested to buy Digital Polarimeter for practicals	Request given to the management
3) To include dynamic Scattering method in 19PG4PE2A	Not included because the syllabus is already heavy.
4) 19PG4PE2A Suggested to change the title	Title: not changed because, Material Science Seems to be more appropriate
5) To include rayastronomy in 19PG4PE2B (Astro Physics)	Not-included. Because the Syllabus is already sufficient for 4 hours / week
6) To buy data logger for telescope	will be done in future.

1) Change of Course Title:

S.NO.	Old Course Code	New Course Code	Old Course Title	New Course Title	Need for Change
1)	19PG2 P6	19PG2 P7	Principles in Advanced Mathematical Physics	Advanced Mathematical Physics	Principles not relevant for this paper

2) Updation of Open Educational Resources in the list of references of each course

S.NO.	Course code	Course Title	Details of updation
1)	19P3CC8	Solid state Physics	Relevant video Modules are appended in the references
2)	19P4CC11	Materials Sience	
3)	19P5CC13	Digital Electronics & Communication	
4)	19P5CC14	Optics	
5)	19P6CC17	Thermodynamics & Statistical Mechanics	
6)	19P6CC18	Modern Physics	
7)	19P6ME2	Medical Physics	
8)	19P6ME3	Opto Electronics.	

3) Revision of Courses.

S.No.	Course Code	Course Title.	No. of Units Revised	Title of Revised	% of Revision	Need	Relevance	Scope
1)	19P3 CC8	Solid State Physics	Unit - III	X-ray Diffraction & Reciprocal Lattice	20 %.	To update & diff. principles relevant to SSP	National & Global	Emp & S.D.
2)	19P4 CC11	Materials Science	Unit - III	Nanomaterials	20%.	To update & recent develop. about nano materials	National & Global	Emp & S.D.

4) New Courses introduced

S.No.	Course Code	Course Title	Relevance To				Scope for			Need for Introduction
			L	R	N	G	EM	EP	SD	
1)	21PG1 P4	Applied optics	-	-	Y	Y	Y	-	Y	To update as per NET Syllabus
2)	21PG2 P10	Instrumentation & Micro Controller	-	-	Y	Y	Y	Y	Y	

5) Introduction of Skill Embedded Certificate / Diploma / Adv. Diploma value added Course other than the value added course that is already being offered

NOT APPLICABLE

6) Approval of Ph.D. Course Work Syllabus.

Syllabus for Research Methodology (21PHDRM03) and Research and Publication Ethics (21PHDREP04) are common for all scholars.

Course Work paper & Core-paper for each scholar are as follows.

PhD Scholar	Course Work Paper	Core Paper
A. Joana Preethi & T. Sharmili R. Meera Naachiyar & S. Aafsin Harpaara	21PHDCWP01 FM Nanostructures for Energy storage App.	21PHDCPP02 Nanoscience & Applications
	21PHDCWP01 Solid State Ionics	21PHDCPP03 Materials

7) Rubrics for Internship & Project

S.NO.	C1	C2	CIA TOTAL	EXTERNAL
1)	20 Mks	20 Mks	40 Mks	60 Mks.

8) Details of proposed/signed MoUs. NOT APPLICABLE

Minutes of BoS Meeting.

B.Sc. Physics (UAPH)

1) The existing Syllabus content was approved & highly appreciated by the board members.

2) Newly introduced self learning papers for all UG students are passed.

i) "Amazing Universe & Indian Space Missions (21P2SL1) offered by Dept. of Physics

ii) Interdepartmental self learning papers

"Microprocessor & Programming (21P4SLB2) offered by Dept. of Physics & Computer Science

iii) "Space Science (21P6SLM3) offered by Dept. of Physics & Maths

Board Members suggested the syllabus for

3) above self learning paper has to be simple to motive them to opt.

3) Reference Book for self learning paper "Microprocessor & Programming' by Ramesh Gaonkar shall be appended.

4) Board suggested to introduce 'Physics for competitive Exam' as self learning paper in forth-coming years.

5) Board members approved the Revision carried out in II B.Sc Core papers 19P3CC8 - Solid state Physics & 19P4CC11 - Materials scienc Reference Book by S.O. Pillai was suggested for SSP.

6) Board Suggested to introduce Skill Embedded certificate course on 'Non Convrentional Energy Sources"

7) Syllabus for allied papers of BCA department on "Digital Principles & Computer Organization' (19P4ACJ4)

& IT Department on "Digital Principles & Computer Architecture" (19P3 AC13) are passed.

8) Reference Book Malvino & Gates are recommended as reference books in Digital Electronics & Communication (19P5CC13)

M. Sc. Physics (PAPH)

1) Existing Syllabus Content was approved & highly appreciated by the board members.

2) Self learning paper offered by Physics department to all other Science department PG students. titled on "Nanotechnology for all" is passed

3) New papers 'Applied Optics (21PG4P4) & "Instrumentation and Microcontoller (21PG2P10) are passed

4) Title "Principles in advanced Mathematical Physics" Changed to Advanced Mathematical Physics as the term 'principles is a misnomer in Mathematical Physics.

5) Following Reference books were suggested for Quantum Mechanics & Advanced Quantum Mechanics

i) Principles in Quantum Mechanics - A. Shankar

ii) Introduction to Quantum Mechanics Powell & Crable Roan

iii) Quantum Mechanics: Concepts & applications - Nourdine Zettili

6) Industrialist Suggested to replace currently existing self learning paper for advanced learners titled on "Instrumentation & Experimental Methods' by paper on "Digital Signal Processing

7) Reference Book Malvino & Gates are recommended as Reference books for Applied Electronics Paper

Ph.D.

1) Research Methodology & Research & Publication Ethics papers are passed

2) Course work paper & core paper relevant to research Specialization for each scholar are passed

Board Members approved & highly appreciated syllabus content.

1) Dr. A. Sheela Vima Rani — A. Sheela Vima R

2) Dr. Basheeruddin Mahmud — A. Basheer.

3) Dr. K. Marimuthu

4) Dr. Euchrista Sylvia — ABSENT

5) Mr. Ramprakash. — Ramprakash

6) Dr. R. Vishnu Priya — R. Vishnu Priya.

7) Dr. Malathy — Malathi

8) Mrs. S. Arulmozhi Packiaseeli — S. Arulmozhi Packiaseeli.

9) Dr. Mathavi Manisekar — Mathavi Manisekar

10) Dr. L. Caroline Sugirtham — L. Caroline Sugirtham

11) Dr. G. Dheivashantha Kumari — Dheivashantha Kumari

12) Mrs. R. Alphonsa Fernando — R. Alphonsa Fernando

13) Dr. M. V. Leenachandra — Leenachandra

14) Mrs. I. Jeyasheela — I. Jeyasheela

15) Dr. Ancemma Joseph — Ancemma Joseph

16) Dr. M. Ragam — M. Ragam

17) Dr. Sr. G. Jenita Rani — G. Jenita Rani

18) Dr. R. Tolkimani — R. Tolkimani

19) Dr. R. Narayana Devi. — R. Narayana Devi

12/04/2024

FATIMA COLLEGE (AUTONOMOUS), MADURAI-18

DEPARTMENT OF PHYSICS

For those who joined in June 2019 onwards

MAJOR CORE – 70 CREDITS

PROGRAMME CODE: PAPH

COURSE CODE	COURSE TITLE	HRS / WK	CREDIT	CIA Mks	ESE Mks	TOT. MKs
SEMESTER – I						
19PG1P1	Introduction to Mathematical Physics	5	3	40	60	100
19PG1P2	Applied Electronics	5	3	40	60	100
19PG1P3	Classical Mechanics	5	3	40	60	100
21PG1P4	Applied Optics	4	3	40	60	100
19PG1P5	Practicals-I Non Electronics	4	2	40	60	100
19PG1P6	Practicals-II Electronics	4	2	40	60	100
Total		**27**	**16**			
SEMESTER – II						
19PG2P7	Advanced Mathematical Physics	5	3	40	60	100
19PG2P8	Quantum Mechanics	5	3	40	60	100
19PG2P9	Electromagnetic Theory	5	3	40	60	100
21PG2P10	Instrumentation and Microcontroller	4	3	40	60	100
19PG2P11	Practicals-III Non Electronics	4	2	40	60	100

COURSE CODE	COURSE TITLE	HRS / WK	CREDIT	CIA Mks	ESE Mks	TOT. MKs
19PG2P12	Practicals-IV Electronics	4	2	40	60	100
Total		**27**	**16**			
SEMESTER – III						
19PG3P11	Condensed Matter Physics	6	5	40	50	100
19PG3P12	Statistical Mechanics	6	5	40	60	100
19PG3P13	Nuclear and Particle Physics	6	5	40	60	100
19PG3P14	Practicals – V Advanced Non Electronics	4	2	40	60	100
19PG4P15	Practicals – V1 Computational Programming	4	2	40	60	100
Total		**26**	**19**			
SEMESTER – IV						
19PG4P16	Advanced Condensed Matter Physics	6	5	40	60	100
19PG4P17	Molecular Spectroscopy	6	5	40	60	100
19PG4P18	Advanced Quantum Mechanics	6	5	40	60	100
19PG4P19	Practicals –VII Advanced Electronics	4	2	40	60	100
19PG4P20	Practicals –VIII PROGRAMMING IN C++	4	2	40	60	100
Total		**26**	**19**			
	Total	**106**	**70**			

MAJOR ELECTIVE / EXTRA DEPARTMENTAL COURSE / INTERNSHIP/ PROJECT -20 CREDITS

S. No	SEM.	COURSE CODE	COURSE TITLE	HRS	CREDITS	CIA Mks	ESE Mks	TOT. Mks
1.	I	19P1EDC	Modern Photography	3	3	40	60	100
2.	II	19P2EDC	Modern Photography	3	3	40	60	100
3.	III	19PG3PE1A/ 19PG3PE1B	Communication system/ Numerical methods and Programming in C++	4	4	40	60	100
4.		19PG3PSI	Summer Internship	-	3	40	60	100
5.	IV	19PG4PE2A/ 19PG4PE2B	Material Science / Astro Physics	4	4	40	60	100
6.		19PG4PPR	Project		3	40	60	100
			TOTAL	**14**	**20**			

I M.Sc. PHYSICS

SEMESTER – I

For those who joined in 2021 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PAPH	21PG1P4	Applied Optics	Theory	4	3

COURSE DESCRIPTION

The aim of this course is to provide an overview of the fields of laser, nonlinear optics, Fourier optics and holography.

COURSE OBJECTIVES

This course gives a description of fundamental concepts of nonlinear optics encompassing laser theory, harmonic generation principles, optical mixing, Fourier optics, optical signal processing and holography.

UNIT –I **(12 HRS)**

Properties of Laser beams and types of lasers

Introduction – Coherence properties of Laser light – Ruby Laser – The He-Ne Laser – Four level solid state Lasers – Carbon dioxide Lasers – Dye Lasers – Semiconductor Lasers

UNIT –II **(12 HRS)**

Nonlinear Optics

Introduction – Second order nonlinear phenomena – Wave Propagation in nonlinear media – Optical second order harmonic generation – Optical mixing – frequency up conversion – Optical mixing in vapour

UNIT –III **(12 HRS)**

Fourier Optics

Analysis of Two – Dimensional signals and systems: Fourier Analysis in Two Dimensions- Linear systems- Two Dimensional sampling theory: The Whittaker – Shannon sampling Theorem.

Foundation of scalar Diffraction Theory: Historical introduction- From a vector to scalar theory- some Mathematical Preliminaries: The Helmholtz Equation, Green's Theorem, the integral theorem of Helmholtz and Kirchhoff.

UNIT –IV **(12 HRS)**

Fresnel and Fraunhofer Diffraction

The Huygens – Fresnel Principle in rectangular Coordinates. The Fresnel Approximation- The Fraunhofer Approximation-Examples of Fraunhofer Diffraction Patterns.

Wave – optics analysis of coherent optical systems: A thin lens as a Phase Transformation and Fourier transforming properties of lenses.

UNIT –V **(12 HRS)**

Holography

Historical Introduction- The wavefront reconstruction problem: Recording amplitude and Phase, The recording medium, Reconstruction of the original wavefront, linearity of the Holographic Process, image formation of Holography. The Gabor Hologram – The Leith- Upatnieks Hologram.

UNIT –VI DYNAMISM (For CIA only)

Discussion on the application of lasers and nonlinear optical devices.

REFERENCES

UNIT I - Lasers Theory and Applications -K.Thyagarajan and A.K.Ghatak . Chapter: 9

UNITII- Topics in Modern Optics – A.S. Parasnis, K.R.Sharma and R.K.Thareja , New Age International Publishers , Chapter: 13 (13.1-13.7)

UNIT III - Introduction to Fourier Optics – joseph W.Goodman- second edition- Chapter 2 : 2.1, 2.3, 2.4. Chapter 3: 3.1 -3.3

UNIT IV – Introduction to Fourier Optics – joseph W.Goodman- second edition- chapter 4: 4.1.2 - 4.4.

UNIT V - Introduction to Fourier Optics – joseph W.Goodman- second edition, Holography - Chapter 9 : 9.1 – 9.4.

Digital Open Educational Resources (DOER) :

1. https://en.wikipedia.org/wiki/Laser#:~:text=A%20laser%20is%20a%20device,in%201960%20by%20Theodore%20H.

2. https://en.wikipedia.org/wiki/Holography#:~:text=Holography%20is%20a%20technique%20that,recorded%20and%20later%20re%2Dconstructed.&text=A%20hologram%20is%20made%20by,recorded%20on%20a%20physical%20medium.

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 PROPERTIES OF LASER BEAMS AND TYPES OF LASERS				
1.1	Introduction	2	Chalk & Talk	Black Board
1.2	Coherence properties of Laser light	2	Chalk & Talk	Black Board
1.3	Ruby Laser	2	Lecture	Black Board
1.4	The He-Ne Laser	2	Lecture	Black Board
1.5	Four level solid state Lasers	1	Chalk & Talk	Black Board
1.6	Carbon dioxide Lasers	1	Chalk & Talk	Black Board
1.7	Dye Lasers	1	Chalk & Talk	Black Board
1.8	Semiconductor Lasers	1	Chalk & Talk	Black Board
UNIT -2 NONLINEAR OPTICS				
2.1	Introduction	3	Lecture	Black Board
2.2	Second order nonlinear phenomena	2	Chalk & Talk	Black Board
2.3	Wave Propagation in nonlinear media	3	Chalk & Talk	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
2.4	Optical second order harmonic generation	1	Chalk & Talk	Black Board
2.5	frequency up conversion	1	lecture	PPT
2.6	Optical mixing	1	Chalk & Talk	Black Board
2.7	Optical mixing in vapour	1	Chalk & Talk	Black Board
UNIT -3 FOURIER OPTICS				
3.1	Introduction to Analysis of Two – Dimensional signals and systems	1	Chalk & Talk	Black Board
3.2	Fourier Analysis in Two Dimensions	2	Chalk & Talk	Black Board
3.3	Linear systems	1	Chalk & Talk	Black Board
3.4	Two Dimensional sampling theory: The whittaker Shannon sampling Theorem.	2	Seminar	LCD
3.5	Foundation of scalar Diffraction Theory	1	Chalk & Talk	Black Board
3.6	Historical introduction	1	Seminar	LCD
3.7	From a vector to scalar theory	1	Chalk & Talk	Black Board
3.8	Some Mathematical Preliminaries: The Helmholtz Equation, Green's Theorem,	2	Chalk & Talk	Black Board
3.9	The integral theorem of Helmholtz and Kirchhoff.	1	Chalk & Talk	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -4 FRESNEL AND FRAUNHOFER DIFFRACTION				
4.1	The Huygens	1	Seminar	Black Board
4.2	Fresnel Principle in rectangular Coordinates	2	Chalk & Talk	Black Board
4.3	The Fresnel Approximation	2	Chalk & Talk	Black Board
4.4	The Fraunhofer Approximation	2	Chalk & Talk	Black Board
4.5	Examples of Fraunhofer Diffraction Patterns	1	Chalk & Talk	Black Board
4.6	A thin lens as a Phase Transformation	1	Seminar	PPT
4.7	Fourier transforming properties of lenses.	3	Seminar	PPT
UNIT -5 Holography				
5.1	Introduction to Holography	1	Chalk & Talk	Black Board
5.2	Historical Introduction	1	Seminar	LCD
5.3	The wavefront reconstruction problem: Recording amplitude and Phase	3	Chalk & Talk	Black Board
5.4	The recording medium, Reconstruction of the original wavefront	2	Chalk & Talk	Black Board
5.5	linearity of the Holographic Process	1	Chalk & Talk	Black Board
5.6	image formation of Holography	1	Seminar	PPT
5.7	The Gabor Hologram	2	Chalk & Talk	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
5.8	The Leith- Upatnieks Hologram.	1	Chalk & Talk	Black Board

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1	T2	Seminar	Assignment	OBT/ PPT				
	10 Mks.	10 Mks.	5 Mks.	5 Mks	5 Mks	35 Mks.	5 Mks.	40Mks.	
K2	4	4	-	-	-	8	-	8	20 %
K3	2	2	-	5	-	9	-	9	22.5 %
K4	2	2	-	-	5	9	-	9	22.5 %
K5	2	2	5	-	-	9	-	9	22.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA	
Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

- **PG CIA Components**

			Nos		
C1	-	Test (CIA 1)	1	-	10 Mks
C2	-	Test (CIA 2)	1	-	10 Mks
C3	-	Assignment	2 *	-	5 Mks
C4	-	Open Book Test/PPT	2 *	-	5 Mks
C5	-	Seminar	1	-	5 Mks
C6	-	Attendance		-	5 Mks

****The best out of two will be taken into account***

COURSE OUTCOMES

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

S.NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	Understand and explain the properties of Laser beams and types of lasers	K2 & K3	PSO1& PSO4
CO 2	Describe the basic concepts of nonlinear optics and principles	K2&K4	PSO2&PSO3

S.NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
	of second harmonic generation and optical mixing		
CO 3	Acquire knowledge about the techniques of Fourier optics inclusive of diffraction	K2&K3	PSO1& PSO3
CO 4	Understand the fundamentals of optical signal processing and its techniques of analysis	K2&K4	PSO1 &PSO5
CO 5	Describe the principles and practical problems of holography	K2 &K4	PSO1& PSO2

Mapping of COs with PSOs

CO/ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**1**	**2**	**3**	**2**
CO2	**2**	**3**	**3**	**2**	**1**
CO3	**3**	**2**	**3**	**1**	**2**
CO4	**3**	**2**	**2**	**1**	**3**
CO5	**3**	**3**	**2**	**1**	**2**

Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3	PO4
CO1	2	1	2	3
CO2	1	3	3	2
CO3	3	2	2	1
CO4	3	2	1	1
CO5	3	3	3	1

Note: ♦ Strongly Correlated **– 3** ♦ Moderately Correlated **– 2**

♦ Weakly Correlated -**1**

COURSE DESIGNER:

1. **Dr. M. V. Leena Chandra**
2. **Dr. R. Jothi Mani**

Forwarded By

Dr. A. Sheela Vimala Rani

HoD's Signature & Name

I M.Sc. PHYSICS

SEMESTER –II

For those who joined in 2021 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
PAPH	21PG2P10	INSTRUMENTATION AND MICROCONTROLLER	Theory	4	3

COURSE DESCRIPTION

This course introduces the physics of various transducers inclusive of resistive, inductive, capacitive, optical, digital and electrochemical transducers architecture of 8051 Microcontroller used in measurement systems.

COURSE OBJECTIVES

To enable the students to comprehend the working principle behind the various transducers and to make them assess and describe the basic properties and architecture of 8051 Microcontroller and to solve basic arithmetic operations and perform the necessary programming for it.

UNIT I: RESISTIVE TRANSDUCER (10 HRS)

Introduction-Electrical Transducer-Selecting a transducer-Resistive Transducer- Potentiometer-Resistance Pressure Transducer- Resistive position Transducer-Strain Gauges-Semiconductor Strain Gauge-Resistance Thermometer-Thermistor

UNIT II: INDUCTIVE AND CAPACITIVE TRANSDUCER (12 HRS)

Inductive Transducer-Differential Output Transducers-Linear Variable Differential Transducer (LVDT)-Rotational Variable Differential Transducer (RVDT)-Pressure Inductive Transducer- Inductive Position Transducers (Synchro's)- Capacitive Transducer (Pressure), Load Cell (Pressure Cell)-Piezo Electrical Transducer

UNIT III : OPTICAL, MECHANICAL, DIGITAL AND ELECTROCHEMICAL TRANSDUCERS (14 HRS)

Photo Electric Transducer-Photo Multiplier Tube-Photo Cell-Photo Voltaic Cell-Semiconductor Photo Diode-The Photo-Transistor – Temperature Transducers-Resistance Temperature Detector (RTD) -Platinum Thin Film Sensors-Thermo couple-Semiconductor Diode Temperature Sensor-Pyrometers- Frequency Generating Transducer-Mechanical Transducers-Digital Transducer- Electrochemical Sensing Elements-Electrochemical gas sensors-Hall effect sensors

UNIT IV: EMBEDDED INSTRUMENTATION-8051 MICROCONTROLLER (12 HRS)

Embedded Systems in Today's world- Need and advantages of using Microcontrollers in Instrumentation -Basics of microcontroller- Introduction to other microcontrollers viz. eZ80, PIC, AVR -8051 architecture:8051 microcontroller hardware-I/O pins, ports and circuits-External Memory-Counter and Timers-Serial data I/O Interrupts

UNIT V: 8051 PROGRAMMING (12 HRS)

8051 programming: Instruction syntax-moving data-logical operations-arithmetic operations- branching instructions-An 8051 Microcontroller design: Testing and Design

UNIT VI: DYNAMISM

Advancement in the new generation transducers in the current technology

Books for Study:

1. H S. Kalsi - Electronic instrumentation-McGraw Hill Education (2015)
2. John P Bentley - Principles of measurement systems-Pearson Prentice Hall (2005)
3. Kenneth.J. Ayala – The 8051 Microcontroller architecture, programming and applications – Penram International Publishing

Books for Reference:

1. Tattamangalam R. Padmanabhan - Industrial Instrumentation_ Principles and Design-Springer-Verlag London (2000)
2. K. Lal Kishore - Electronic Measurements & Instrumentation-Pearson Education (2012)
3. David A Bell - Electronic Instrumentation and Measurements-Prentice-Hall of India (2003)

4. Muhammad Ali Mazidi, Janice GillispieMazidi, Rolin D. McKinlay - The 8051 Microcontroller and Embedded Systems Using Assembly and C-Pearson (2006)
5. David Calcutt, Frederick Cowan, Hassan Parchizadeh - 8051 Microcontroller_ An Applications Based Introduction-Newnes (2004)
6. Tim Wilmshurst - Designing Embedded Systems with PIC Microcontrollers_ Principles and Applications-Newnes (2006)
7. Manish K Patel - The 8051 Microcontroller Based Embedded Systems-McGraw Hill Education (India) Private Limited (2014)

COURSE CONTENTS & LECTURE SCHEDULE:

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
UNIT -1 RESISTIVE TRANSDUCER				
1.1	Introduction-Electrical Transducer-	2	Chalk & Talk	Black Board
1.2	Selecting a transducer-Resistive Transducer-Potentiometer-	2	Chalk & Talk	Black Board
1.3	Resistance Pressure Transducer-	1	Chalk & Talk	Black Board
1.4	Resistive position Transducer-	1	Chalk & Talk	Black Board
1.5	Strain Gauges-Semiconductor Strain Gauge-	2	Lecture	LCD
1.6	Resistance Thermometer-Thermistor	2	Chalk & Talk	Black Board
UNIT -2 INDUCTIVE AND CAPACITIVE TRANSDUCER				
2.1	Inductive Transducer-	3	Chalk & Talk	Black Board
2.2	Differential Output Transducers-Linear Variable	3	Chalk & Talk	Black Board

Module No.	Topic	No. of Lectures	Teaching Pedagogy	Teaching Aids
	Differential Transducer (LVDT)-			
2.3	Rotational Variable Differential Transducer (RVDT)-	2	Lecture	LCD
2.4	Pressure Inductive Transducer- Inductive Position Transducers (Synchro's)-	1	Chalk & Talk	Black Board
2.5	Capacitive Transducer (Pressure), Load Cell (Pressure Cell)-	1	Lecture	LCD
2.6	Piezo Electrical Transducer	2	Lecture	LCD

UNIT -3 OPTICAL, MECHANICAL, DIGITAL AND ELECTROCHEMICAL TRANSDUCERS				
3.1	Photo Electric Transducer- Photo Multiplier Tube	2	Lecture	LCD
3.2	-Photo Cell-Photo Voltaic Cell- Semiconductor Photo Diode- The Photo-Transistor –	2	Chalk & Talk	Black Board
3.3	Temperature Transducers- Resistance Temperature Detector (RTD) - sensors-Hall effect sensors	1	Lecture	LCD
3.4	Platinum Thin Film Sensors- Thermo couple-	2	Lecture	LCD
3.5	Semiconductor Diode Temperature Sensor- Pyrometers-	1	Chalk & Talk	Black Board
3.6	Frequency Generating Transducer-	2	Lecture	LCD
3.7	Mechanical Transducers- Digital Transducer	2	Lecture	LCD

3.8	- Electrochemical Sensing Elements-Electrochemical gas	2	Lecture	LCD
UNIT -4 EMBEDDED INSTRUMENTATION – 8051 MICROCONTROLLER				
4.1	Embedded Systems in Today's world- Need and advantages of using Microcontrollers in Instrumentation	2	Lecture	Black Board
4.2	-Basics of microcontroller-Introduction to other microcontrollers viz. eZ80, PIC, AVR -8051 architecture:	2	Lecture	LCD
4.3	8051 microcontroller hardware-I/O pins, ports and circuits-	3	Chalk & Talk	Black Board
4.4	External Memory-Counter and Timers-	3	Lecture	LCD
4.5	Serial data I/O Interrupts activity	2	Chalk & Talk	Black Board
UNIT -5 8051 PROGRAMMING				
5.1	8051 programming	3	Chalk & Talk	Black Board
5.2	Instruction syntax-	3	Lecture	LCD
5.3	Moving data-logical operations-	2	Chalk & Talk	Black Board
5.4	Arithmetic operations-branching instructions-	2	Chalk & Talk	Black Board
5.5	An 8051 Microcontroller design: Testing and Design	2	Chalk & Talk	Black Board

Levels	C1	C2	C3	C4	C5	Total Scholastic Marks	Non Scholastic Marks C6	CIA Total	% of Assessment
	T1	T2	Seminar	Assignment	OBT/ PPT				
	10 Mks.	10 Mks.	5 Mks.	5 Mks	5 Mks	35 Mks.	5 Mks.	40Mks.	
K2	4	4	-	-	-	8	-	8	20 %
K3	2	2	-	5	-	9	-	9	22.5 %
K4	2	2	-	-	5	9	-	9	22.5 %
K5	2	2	5	-	-	9	-	9	22.5 %
Non Scholastic	-	-	-	-	-		5	5	12.5 %
Total	10	10	5	5	5	35	5	40	100 %

CIA

Scholastic	35
Non Scholastic	5
	40

EVALUATION PATTERN

SCHOLASTIC					NON - SCHOLASTIC	MARKS		
C1	C2	C3	C4	C5	C6	CIA	ESE	Total
10	10	5	5	5	5	40	60	100

- **PG CIA Components**

			Nos		
C1	-	Test (CIA 1)	1	-	10 Mks
C2	-	Test (CIA 2)	1	-	10 Mks
C3	-	Assignment	2 *	-	5 Mks
C4	-	Open Book Test/PPT	2 *	-	5 Mks
C5	-	Seminar	1	-	5 Mks
C6	-	Attendance		-	5 Mks

****The best out of two will be taken into account***

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 1	To understand the basic knowledge on various resistive transducers	K1, K2	PSO1& PSO3
CO 2	To discuss the physics behind inductive and capacitive transducer	K2, K3	PSO2&PSO3
CO 3	To comprehend the working principle behind the various optical,mechanical , digital and electrochemical transducers.	K2 & K3	PSO1,PSO2&PSO3

NO.	COURSE OUTCOMES	KNOWLEDGE LEVEL (ACCORDING TO REVISED BLOOM'S TAXONOMY)	PSOs ADDRESSED
CO 4	To assess and describe the basic properties and architecture of 8051 Microcontroller	K2, K3 & K4	PSO3 & PSO5
CO 5	To solve basic arithmetic operations and perform the necessary programming for it.	K1 , K2	PSO4 &PSO5

Mapping of COs with PSOs

CO/ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**2**	**3**	**1**	**1**
CO2	**2**	**3**	**3**	**1**	**1**
CO3	**3**	**3**	**3**	**1**	**1**
CO4	**1**	**1**	**3**	**2**	**5**
CO5	**1**	**1**	**1**	**3**	**3**

Mapping of COs with POs

CO/ PSO	PO1	PO2	PO3
CO1	3	1	1
CO2	2	3	1
CO3	1	3	2
CO4	1	3	3
CO5	1	3	3

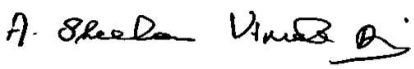
Note: ♦ Strongly Correlated **– 3** ♦ Moderately Correlated **– 2**
♦ Weakly Correlated -**1**

Course Designer

1.Dr. M.V. Leena Chandra

2.Dr. Ancemma Joseph

Forwarded By



Dr. A. Sheela Vimala Rani
HoD's Signature & Name