FATIMA COLLEGE (AUTONOMOUS)

Re-Accredited with "A++" Grade by NAAC (4th Cycle)
Maryland, Madurai- 625 018, Tamil Nadu, India

NAME OF THE DEPARTMENT	**:**	**PHYSICS**
NAME OF THE PROGRAMME	**:**	**Ph.D**
PROGRAMME CODE	**:**	**DSPH**
ACADEMIC YEAR	**:**	**22-23**

Minutes of the Board of Studies Meeting

To be implemented from 2022-2023 onwards

Venue : A1

Convened on 23-03-2022 at 2pm

Members Present :

1. Dr. A. Sheela Vimala Rani — Head of the Dept
2. Dr. Basherrudin Mahmud Ahmed — University Nominee
   Asst. Prof. School of Physics
   Madurai Kamaraj University
   Madurai
3. Dr. K. Marimuthu — Subject Expert
   Asst. Prof
   Department of Physics
   Gandhigram Rural Institute – Deemed University
   Gandhigram
4. Dr. M. Umadevi — Subject Expert
   ~~Associate~~ Professor & Head
   Department of Physics
   Mother Teresa Women's University
   Kodaikanal
   23/03/22

5. Mr. Ramprakash
Industrial Electronics
Corporation No. 1,
Industrial Estate
Madurai

Industrialist

V. Ramprakash

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

Alumnae

Vishnu Priya

7. Dr. Malathi
Asst. Prof.
Dept. of Zoology
Fatima College

Dean of Academic Affairs

Malathi
23/3/2022

8. Dr. L. Caroline Sugitham
Associate Prof.

L. Caroline Sugitham

9. Mrs. R. Alphonsa Fernando
Associate Professor

R. A. Fernando

10. Dr. M. V. Leena Chandra
Asst. Prof.

M. V. Leena Chandra

11. I Jeyashealan
Asst. Prof.

I. Jeyashealan

12. Dr. Ancemma Joseph
Asst. Prof.

Ancemma Joseph

13. Dr. M. Ragam
Asst. Prof.

14. Dr. G. Jenita Rani
Asst. Prof.

15. Dr. R. Jothimani
Asst. Prof.

16. Ms. I. Janet Sherly
Asst. Prof.

17. Ms. J. R. Sofia
Asst. Prof.

18 Dr. R. Niranjana Devi
Asst. Prof.

AGENDA FOR BOARD OF STUDIES

1. Preparation of Action taken report
2. To carry out atleast 5-10% changes in a minimum - 20% or more in the courses offered (Approximately 8-10 courses minimum)
   (a) courses with revision less than 20% - same code
   (b) courses with revision more than 20% - New code - to be prefixed with 22...
3. New courses to be introduced
   • Course code to be prefixed with 22...

4. New Value-Added Courses can be introduced or the titles can be changed

5. Each department to offer atleast one Value-Added Courses per year

6. Frequency of the courses to be increased

7. Possibilities of the Credit transfer of SWAYAM MOOC Course to be explored

8. Both the Elective Courses have to be offered simultaneously.

MINUTES OF THE BOARD OF STUDIES

1. Presentation of Action taken report.

Action taken report for 2021-22
UG PHYSICS

SNo.	SUGGESTIONS IN THE PREVIOUS BOARD	ACTION TAKEN IN THE ACADEMIC YEAR 2021-22
1.	Self learning papers for all UG students namely "Amazing Universe and Indian Space Missions" (21P2SL1) offered by Physics dept.	These papers were introduced with the suggested syllabus

S.No.	SUGGESTIONS IN THE PREVIOUS BOARD	ACTION TAKEN IN THE ACADEMIC YEAR 2021-22
	Interdepartmental self learning papers "Microprocessor and Programming" (21P4SLB2) offered by Physics and Computer Science, "Space Science" (21P6SLM3) offered by Physics and Maths department were passed and syllabus were suggested	from the academic year 2021-22 onwards
2.	Reference book for Self learning paper "Microprocessor and Programming" by Ramesh Gaonkar shall be appended	The suggested book is included
3.	Board suggested to introduce "Physics for Competitive Exams" as Self Learning paper in the forth coming year	It will be introduced in the next year
4	Reference book by S.O. Pillai suggested for "Solid State Physics" paper	Reference book is included

S.No.	SUGGESTIONS IN THE PREVIOUS BOARD	ACTION TAKEN IN THE ACADEMIC YEAR 2021-22
5	Board suggested to introduce Skill embedded Certificate courses on "Non conventional energy sources"	A Skill based course "Solar cell and its applications" introduced
6	Syllabus for allied papers of BCA department on "Digital Principles and Computer Organization" (19P4AC14) and IT department on "Digital Principles and Computer Architecture" (19P3AC13) are passed	It was implemented
7	Reference book Malvino and Gates also recommended as reference book in Digital Electronics and Communication (19P5CC13)	The book is included

PG PHYSICS

S.No.	SUGGESTIONS IN THE PREVIOUS BOARD	ACTION TAKEN IN THE ACADEMIC YEAR 2021-22
1.	The title "Principles in advanced Mathematical Physics" can be changed to Advanced Mathematical Physics as the term "Principles" is a misnomer in Mathematical Physics	Title is changed
2	The following reference books were suggested for Quantum Mechanics and Advanced Quantum Mechanics (i) Principles in Quantum Mechanics - A. Shankar (ii) Introduction to Quantum Mechanics - Powell and Craftsman (iii) Quantum Mechanics: Concepts and applications - Nouredine Zettili	The books are included
3.	Industrialistic suggested to replace the currently existing self learning paper	

S.No.	SUGGESTIONS IN THE PREVIOUS BOARD	ACTION TAKEN IN THE ACADEMIC YEAR 2021-22
	for advanced learners entitled on "Instrumentation and experimental methods" by paper entitled on "Digital Signal Processing"	This paper is to be passed in this board

2. REVISION OF COURSES:

S.No.	Course Code	Units revised	% of revision	Course Title
1.	19P1ACC1/ 19M3ACP1/ 19G3ACP1	Unit II - Bernoulli's theorem, Unit III entropy, Unit IV ohms laws	15%.	Allied Physics - I
2.	19P2ACC3/ 19M4ACP2/ 19G4ACP2	Unit II - Frank-Hertz expt	18%.	Allied Physics - II
3	19P5CC14	Unit II - Lasers removed Unit-V Spectroscopy included	15%.	OPTICS
4	19P6CC17	Unit I - Work done included	5%.	Thermodynamics & Statistical Mechanics Revised
5	19P5CC16	Non-electronics Practicals	15%.	

S.No.	Course Code	Units revised	% revision	Course Title
6	19PGME2	Medical Physics - Unit V - Imaging Techniques	10%	Medical Physics
7	19PG1P2	Unit V - Semiconductor memories included	10%	Applied Electronics
8	19PG3P13	Unit V - Quantum Electrodynamics, SU3 symmetry included	10%.	Nuclear and Partic Physics

3 NEW COURSES INTRODUCED:

	PROGRAM	COURSE CODE	COURSE TITLE
1.	B.Sc.	22P4CC11	Mathematical Meth
2.	B.Sc.	22P4SB2	Solar Cell and its Applications
3	M.Sc.	22PGSL2	Batteries and its Applications
4	M.Sc.	22PGSLP1	Digital Signal Processing

4. NEW VALUE ADDED COURSE:

Course Code	Course Title
22PGVAPC1	PG Diploma in Instrumentation on Electrochemical Workstation

5. Approval of Ph.D. Course Work Syllabus:

Course Work paper and Core paper for the Research Scholar are as follows:

Ph.D. Scholar	Course work paper	Core paper
P. Mohanaa Muthuselvi	22PHDCWP01 Solid State Ionics	22PHDCPP02 Materials Science

6. SUGGESTIONS GIVEN BY THE BOARD MEMBERS:

UG

* The new course Mathematical Methods can be offered as elective / skill based paper
* The nomenclature for the above paper can be changed into Numerical Methods
* A paper on Mathematical Physics can be included as core paper which will form a basis to studying papers like Mechanics, Quantum theory, Solid State Physics etc.
* "Interference" can be shifted from Allied Physics - II to Allied Physics - I to be on-par with the practicals

* The Board suggested to include "Principles of Electronics" by Mehta as one of the reference books.
* In the elective paper (19P6ME1), instead of Timer and Counter Assemblers and Compilers can be included.

PG

* The nomenclature for the New Value added course was discussed in detail.
* The above course can be offered as "certificate course".
* So the title of the New Value added course is

Certificate Course on Instrumentation on Electrochemical techniques.

* In the Nuclear and Particle Physics course, the Board

suggested to include "Nuclear Physics - Theory and Experiments" by Roy and Nigam as reference book.

* In the Applied Electronics paper, the Industrialist suggested that Pulse width Modulation and Switching regulators can be introduced instead of registers and counters.

* Mr. Ramprakash also recommended to include Assemblers and Simulators in the course "Instrumentation and Microcontroller" 21PG2P10 and to reduce the content of programming in 8051.

* The subject experts strongly recommended to specify the details of sections in the books for study in all the units of the syllabus for both UG and PG programs.

The specifications of the sections would enable the students to learn more precisely. The detailed sections in all units would feciliate the examiner also.

* CREDIT TRANSFER OF SWAYAM MOOC COURSE:

The board members suggested the credit transfer of Swayam-MOOC course is possible:

1) Both the syllabus should be same

2) Number of hours should mat

1) Dr. A. Sheela Vimala Rani

2) Dr. Basheeruddin Mahmud Ahmed

3) Dr. K. Marimuthu

4) Dr. M. Umadevi 23/03/22

5) Mr. Ramprakash

6) Dr. R. Vishnu Priya 23/03/22

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18) Dr. R. Niranjana Devi R. N

23/3/22

COLLEGE PROFILE

Fatima College (Autonomous), Mary Land, Madurai, is a Post Graduate and Research Institution for Women affiliated to Madurai Kamaraj University. It is a Catholic Minority institution established and run by St. Joseph's Society of Madurai (of the Congregation of the Sisters of St. Joseph of Lyons, France). This institution came into existence through the tireless efforts of the missionary sisters of St. Joseph of Lyons and the zeal and heroic sacrifice of Rev. Sr. Rose Benedicta, the Foundress of the College.

The College was started in St. Joseph's Campus Madurai as a Second Grade College with 63 students in 1953. It was upgraded into a Post Graduate College in 1964; Autonomous in 1990 and a Research Institute in 2004. The College now offers 21 Undergraduate Programmes, 13 Postgraduate Programmes, 2 Professional Programme, 5 M.Phil. Programmes and 6 Departments have become Research Centres. It has strength of 4134 Students, 206 Teaching Staff and 100 Non-Teaching Staff.

The comprehensive assessment by NAAC in 1999 placed Fatima College in Five Star Status of merit. The college strives to sustain excellence, quality and relevance while equipping the students to meet the demands of higher education in India. In 2004 UGC conferred on Fatima College the status of College with Potential for Excellence. In 2006 and 2013 NAAC Re-Accredited the College with 'A' Grade. The College was ranked 94th in the All India NIRF Ranking in 2019 by MHRD.

VISION

WOMEN'S EMPOWERMENT THROUGH EDUCATION

The vision of the college is to empower women by developing human capabilities through quality education based on Christian values, making them responsible citizens who can work for the advancement of the society and promote communal harmony in the multi-religious and multi-cultural reality of India eventually evolving into women of communion.

MISSION

- To enhance quality of life through the development of individuals.
- To enable women to become contributors in the economic, social and political development of India.
- To equip the students with 21st century skill-sets with a focus on problem-solving abilities
- To motivate them to work for social justice
- To give preference to the rural economically backward and first-generation learners
- To enable students to be employed in the technology oriented competitive market

VISION OF THE DEPARTMENT

Educate , Empower and Excel

MISSION OF THE DEPARTMENT

- To ignite the young minds and impart quality education in basic Physics
- To promote enthusiasm in the study of physics through innovative and dedicated teaching methodologies
- To discover the budding talents in theoretical and experimental physics and ensure their global competency
- To provide a stimulating environment and strengthen basic and application oriented research aptitude among the students.

FULL TIME DOCTOR OF PHILOSOPHY

PHYSICS - Year - I

For those who joined in 2022 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
DSPH	22PHDCWP01	SOLID STATE IONICS	Core	-	2

COURSE DESCRIPTION

This course emphasises the basic concepts of Solid State Ionics which involves its structure, properties and its applications in electrochemical devices.

COURSE OBJECTIVES

This course provides detailed information about the field of Ionics and its contribution in electrochemical devices.

UNITS

Unit I : Ionic Conductors

Types of Ionic solids- Fast Ionics Solids-Point Defect type-Sub Lattice type – Fast Ionic materials – alkali metal-ion conductors - β aluminas- Silver ion conductors- Cation conductors- Oxygen ion conductors – Halide ion conductors – Proton conductors – Electronic conductors with ionic transport.

Unit II : Preparation Methods

Various methods of preparation of amorphous/glassy, poly and single crystalline materials – thermal evaporation– sputtering – glow – discharge decomposition –chemical vapour deposition – melt quenching – gel dissociation –crystal growth technique – X-ray diffraction and differential thermal analysis-Glass transition – factors determining glass transition temperatures – structure – microscopic structure – modelling– microscopic structure – examples.

Unit III : Transport Mechanism

Point Defect Type: Point defect type super ionic conductors – transport mechanism through defects – jumpfrequency – ionic conductivity and diffusion co-efficient – defect concentration – pure and doped crystals –impurity vacancy association – coulomb interactions-Application of transport theory to fluoride and Oxygen ion conductors: Molten Sub-lattice type: Molten Sub-lattice type solid state ionic conductors – Hypermann's theory –Rices Strassler & Toouch's theory – Welch Dieme's theory – Lattice gas theory – Path Probability and Moute Carlo Methods – Ionic Percolation theory – Jahn Teller Model-Dynamics- ion transport – free ion model – domain model – jump diffusion model and frequency dependent conductivity.

Unit IV : Characterization Techniques

Macroscopic properties – electrical conductivity – diffusion thermo electric power-Microscopic properties – X- ray diffraction studies – a.c. conductivity – dielectric relaxation – NMR – ESR – far IR – Mossbauer Spectroscopy –Raman Scattering – Photo Electron Spectroscopy – Cyclic Voltametry – cycle stability of electrodes and electrolytes.

Unit V : Electro Chemical Devices

Thermodynamic studies – general aspects of solid state batteries – electrolyte – compatibility between electrode substance and solid electrolytes – electrode structure –interface between electrode and solid electrolyte – Fuel cell-Proton exchange membrane fuel cell-

High temperature fuel cells – solid state potentiometer gauges for gaseous species – coulometer – electro-chemical capacitor- electro chromic display system.

Text Book:

1. Anthony R. West, Solid State Chemistry and its Applications , Wiley, 2014

2. S. Chandra, Superionic solids: Principles and applications, Elsevier North-Holland, 1981

3. L. L. Hench and J. K. West, Principles of Electronic Ceramics,JohnWiley& Sons, New York, 1990

BOOKS FOR REFERENCES:

1. Solid state Ionics. (Eds. T Kudo and Fueki) VCH Publishers, Kodansha 1990.

2. Lectures on solid state physics (Eds. G Bush and H Schade), international series on Natural Philosophy Vol. 79 Pergamon, press 1976.

3. "Solid Electrolyte" (Eds. S Geller) Springer Verlag New york 1977.

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	understand the basic ideas on ion conductors	K1, K2	PSO1,PSO2

CO 2	Explore the different preparation methods of ionic conductors	K1, K2, K3	PSO3,PSO4
CO 3	understand the transport mechanism of super ionic conductors	K1, K2	PSO1,PSO3
CO 4	discussion on various characterization techniques that can be used for the analysis of super ionic solids	K2, K2, K3& K4	PSO4, PSO5
CO 5	Study that involves the applications of solid state Ionics in various electrochemical devices	K1, K2, K3 & k4	PSO3,PSO4& PSO5

COURSE DESIGNER: Dr. M. V. Leena Chandra

Forwarded By

Dr. A. Sheela Vimala Rani

HoD'S Signature & Name

FULL TIME DOCTOR OF PHILOSOPHY

PHYSICS - Year - I

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
DSPH	22PHDCPP02	MATERIALS SCIENCE	Ph.D Core	-	2

COURSE DESCRIPTION

This course aims at providing the theoretical aspects of materials science.

COURSE OBJECTIVES

This course provides the knowledge about phase diagrams, mechanical properties, ceramics, polymers, plastics and crystals.

UNITS

Unit –I: PHASE DIAGRAMS

Solid solutions and intermediate phases – Equilibrium phase diagrams, Cu-Ni, Pb-Sn, Al-Cu system phase diagrams – Free energy and equilibrium phase diagrams – Nucleation and growth – Martenstic transformation – Strengthening mehanisms – Iron Carbon system – Alloy steels – Aluminium-Copper system – Copper-Zinc system – Corrosion

Unit –II: MECHANICAL PROPERTIES

Stress- Strain curve – Elastic deformation: Characteristics, Atomic mechanism, Sheer stress, Bulk modulus, Strain energy, Strain

deformation – Viscous deformation: Spring-Dashpot models – Anelastic and Viscoelastic deformation: Viscoelastic models – Plastic deformation: Dislocations and Stress-strain curves, Plasticity theory – Fracture: Ideal fracture, Brittle fracture, Fracture mechanics, Cohesive models, Ductile fracture – Mechanical testing

Unit –III: CERAMICS

Structure of ceramics – Production of ceramics: Raw materials, Forming and Post-forming processes – Production of glass: Melting of glass, Glass forming and annealing – Mechanical properties of ceramics – Wear and erosion resistance – Thermal shock – Silica-Alumina system – Commercial systems: Zirconia, Sialones, Cement and Concrete

Unit – IV: Polymers and Plastics

Molecular structure: Monomers & Polymers, Synthesis, Molecular weight measurement, Branching & Tacticity, Copolymers and blend – Mechanics of polymer chain: Freely jointed chains, Entanglements, Rubber elasticity – Thermoplastic melts: Viscosity, Shear thinning, Processing, Extrusion – Amorphous polymers: Solidification, glass transition, Various models – Crystalline polymers – Crosslinked polymers: Elastromers, Thermosets – Liquid crystal polymers – Mechanical properties: Stress-Strain behavior – Chemical properties

Unit –V: Biomaterials

Classification of Amino acids - Zwitter ion formation and isoelectric point - Synthesis ofglycine, alanine, and phenyl alanine - Peptide

bond. Synthesis of peptides - Classification of proteins – Primary, secondary and tertiary structure of proteins - Denaturation of proteins - Tests for proteins - Carbohydrates - Properties of glucose, fructose and sucrose - Cyclic structures and Haworth projections of glucose, fructose, maltose and sucrose - Mutarotation. - Structure of starch and cellulose. Nucleic acids: Structure of pentose sugar, nitrogenous base, nucleoside and nucleotide - Double-helical structure of DNA - Differences between DNA and RNA- Energy rich molecules: Elementary structure of ATP, ADP and AMP.

BOOKS FOR STUDY AND REFERENCES:

1. J.C.Anderson, K.D.Leaver, P. Leevers and R.D.Rowlings, Materials Science for Engineers, Nelson Thomas Ltd, First Indian reprint, 2010.
2. M.Arumugam, Materials Science, Anuradha Agencies, Publishers, Sechond Edition, Fifth Reprint, 2005.
3. R,Balasubramaniam, Materials Science and Engineering, Wiley India (P) Ltd, 2010.
4. V.Raghavan, Materials Science for Engineering, Prentice Hall of India Pvt Ltd, 2006.

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	gain knowledge about the phase diagram	K1,K2	PSO1,PSO2
CO 2	know about the basic ideas of mechanical properties of the materials	K1, K2	PSO1,PSO2
CO 3	understand the basic concepts of ceramics	K1 , K2, K3	PSO2, PSO3
CO 4	know about the polymers and plastics	K1, K2, K3& K4	PSO4,PSO5
CO 5	gain information about the basic knowledge of structure and chemical composition of biomaterials.	K1, K2 , K3 & K4	PSO4,PSO5

COURSE DESIGNER: Dr. M. V. Leena Chandra

Forwarded By

Dr. A. Sheela Vimala Rani

HoD'S Signature & Name