



DEPARTMENT OF PHYSICS
MUHAMMED ABDURAHIMAN MEMORIAL
ORPHANAGE (MAMO) COLLEGE

[Govt. Aided First Grade College & Affiliated to University of Calicut.
Re-Accredited by NAAC with A Grade]

CURRICULUM FOR CERTIFICATE
COURSE IN

CERPH008: SYNTHESIS OF THIN
FILMS

OFFERED DURING THE
ACADEMIC YEAR 2020-21
[APPROVED BY ACADEMIC COMMITTEE, MAMO COLLEGE]



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INSTITUTIONAL VISION, MISSION & OBJECTIVES 01



VISION

VISION: Build Scientifically Oriented, Intellectually Accomplished, Morally Upright and Socially Committed youth who can play a constructive role in Nation Building.



MISSION

MISSION: Intellectual, social and economic empowerment of the youth in general and women, minorities, orphans and the destitute in particular by providing quality, value-based higher-education.



OBJECTIVES

OBJECTIVES: Pursuit of Excellence, Harnessing technology, Thrust on value-based education, Nurturing Excellence and Moulding the youth for Nation Building.



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VISION, MISSION, OBJECTIVES & CORE VALUES OF THE DEPARTMENT **02**



VISION

VISION: To build an effective and efficient scenario for the conceptually rich youth to create and revolutionize towards the overall integrity and Development of our Nation.



MISSION

MISSION: To provide an effective environment to enhance the scientific temperament and leadership Quality through Rationalism, critical and logic thinking in the students and thereby promoting them to be a socially committed, employable and responsible youth.



OBJECTIVES: (a) Emphasize the role of Physics in life. (b) Develop the ability to conduct, observe, analyzes and report an experiment and to deal with physical and mathematical models. (c) Improve the fundamental concepts and advanced techniques of Physics. (d) Enhance intellectual, computational, experimental, communication and analytical skills of the students. (e) Provide the students with the modern techniques in physics.



VALUES

CORE VALUES: Innovation, Quality & Excellence, Integrity, Ethical Conscience, Fairness & Justice, Service Mindedness, Professionalism, Global Outlook, Honesty and Discipline & Accountability.



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B.Sc PHYSICS: PROGRAMME EDUCATIONAL OBJECTIVES [PEOs] 03

After 4 to 5 years of graduation, the career and professional accomplishments attained by the Physics Graduates would reflect that the programme really prepared the graduates to deal with the real world, where they could apply and use the skills and knowledge they have learned to good use.

Specifically, the graduate would be able to:



PEO1: COMPETENCY SKILLS: To develop strong student competencies and its applications in a technology – rich, interactive environment.



PEO2: ADAPTABILITY TO THE CHANGING ENVIRONMENTS: Graduates will communicate effectively, recognize and incorporate societal needs and constraints in their professional endeavours, and practise their profession with high regard to legal and ethical responsibilities.



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PEO3: ENTHUSIASM IN RESEARCH: To develop strong student skills in research, and interpretation of complex information.



PEO4: SUSTAINABLE EXCELLENCE AND GROWTH IN THE CAREER: Have sufficient breadth of understanding to enable continued professional development and lifelong learning throughout their career..



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B.Sc PHYSICS: PROGRAMME SPECIFIC OUTCOME [PSOs] 04

On successful completion of a Bachelor Degree in Physics, the graduates would be able to:



PSO1: Introduce advanced techniques and ideas required in developing a suitable career in life.



PSO2: Understand and apply principles of Physics for understanding the scientific phenomenon in the recent research realms.



PSO3: Developing research oriented skills and to create an awareness on the impact of Physics on the society and development outside the scientific community.



PSO4: Enhance the ability of the students to use Mathematical and Statistical models in solving various problems in the course of study and also to make aware and handle various sophisticated instruments/equipment.



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B.Sc PHYSICS: PROGRAMME OUTCOMES [POs] 05

The students graduating from B.Sc Physics Programme should be able to:



PO1: SCIENTIFIC TEMPER & KNOWLEDGE: Apply knowledge of physics and its branches to provide solutions to complex problems.



PO2: PROBLEM SOLVING CAPABILITY: Identify, formulate, review research literature, and analyze complex real-life problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and computing.



PO3: ANALYTIC SOLUTIONS: Design practical solutions for complex real-life problems through proper case analysis and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.



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PO4: CRITICAL / LOGICAL THINKING: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.



PO5: ADAPTABILITY THROUGH TECHNOLOGY: Create, select, and apply appropriate techniques, resources, and modern computing and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.



PO6: THE RATIONALISM AND SOCIETY: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional practice.



PO7: ENVIRONMENT AND SUSTAINABILITY: Understand the impact of the professional computing solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.



PO8: ETHICS & HONESTY: Apply ethical principles and commit to professional ethics and responsibilities and norms of the computing practice.



PO9: INDIVIDUAL AND LEADERSHIP QUALITY: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.



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PO10: COMMUNICATION: Communicate effectively on complex computing activities with the team members and with society at large, such as, being able to comprehend and demonstrate in simple manner, and give and receive clear instructions.



PO11: PROJECT MANAGEMENT AND FINANCE: Demonstrate knowledge and understanding of the scientific and reasoning principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.



PO12: LIFE-LONG LEARNING: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.



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CERTIFICATE COURSE

CERPH008: SYNTHESIS OF THIN FILMS **06**

COURSE CURRICULUM

Course Name	Synthesis of Thin films
Course Code	CERPH008
Year	2020-21
Course Designer	Mr. Vishnu Prasad S.
Course Duration	30 Hrs
Course Schedule	November to February
Maximum Students Intake	60 Students



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1. COURSE LEVEL

Foundational, skill-oriented certificate programme.

2. PREREQUISITE

Plus two with Physics as one of the subjects.

3. COURSE INTAKE & ADMISSION

Maximum 60 students will be given admission to the course based on First-Come-First-Serve basis. All the students of the MAMO College are eligible for free enrolment for the course. The enrolment notification will be issued for the course well in advance of the commencement of the course.

4. COURSE COORDINATOR

Mr. Vishnu Prasad S, Assistant Professor, Department of Physics.

5. COURSE PREAMBLE

Thin film has become an essential aspect of human life, so that hardly can we find any field of activity where they are not present. The first use of thin films for optical purposes can be dated to exactly 1912. After that, thin film coatings use has extended to many other applications in the optics industry like e.g. anti-reflective coatings, scratch-resistant coatings, UV- and IR-reflective coatings, etc. In parallel, many other technological fields began to benefit from this technology: decorative coatings, tribologic coatings, biomedical coatings, self-cleaning coatings, etc.

6. DURATION

Total Duration: 30 Hrs. [Contact Class. 14 Hrs. Lab Hours 3, Course Woks: 7 and Assessment Works: 6]



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7. CURRICULUM FOCUS

Enhance the employability of the learners through curriculum enrichment for additional skill development.

8. COURSE OBJECTIVES

Learners are expected to

- (a) Learning of principles behind the synthesis of thin films
- (b) Knowledge of industry applications of thin films

9. SKILL EXPECTED

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

- (a) To notify the learner about the various techniques of nano-thin films.
- (b) To know about the growth of nanostructured thin films.
- (c) To have knowledge about synthesis of nanostructured thin films

10. COURSE OUTCOMES

Upon the successful completion of the course, learners will be able to:

CO No	Course Outcome(CO)	Skill/Knowledge Attainment Level Based on Revised Bloom's Taxonomy
CO1	To have knowledge about synthesis of nanostructured thin films	Understand
CO2	To notify the learner about the various techniques of nano-thin films.	Understand



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CO No	Course Outcome(CO)	Skill/Knowledge Attainment Level Based on Revised Bloom's Taxonomy
CO3	To have knowledge about applications of nanostructured thin films	Understand

11. MAPPING OF COs WITH PSO_s AND PO_s

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	2	2	3	2	3	1	1	1	2	2	3	2	1	1
CO2	3	1	1	2	3	1	1	0	1	1	1	2	2	3	2	1
CO3	3	0	0	2	3	1	3	0	1	1	2	3	3	2	1	2
AVG	3	0.7	1	2	3	1.3	2.3	0.3	1	1	1.6	2.3	2.6	2.3	1.3	1.3

12. MODULE-WISE COURSE CONTENTS

MODULE 1: INTRODUCTION TO NANO FILM TECHNOLOGY

MODULE DURATION: 15 Hrs. [Contact Hrs. 8 Hrs. Course Woks: 4 and Assessment Works: 3]

MODULE CONTENT: Basics of thin films and nanostructures, role of thin films in devices. Properties of thin films: Structural, electrical, magnetic, optical, thermal etc.

MODULE OUTCOME: On successful completion of the module learners can familiarize with the fundamental properties of thin films and their modification parameters



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MODULE 2: ADVANCED METHODS

MODULE DURATION: 15 Hrs. [Contact Hrs. 6 Hrs. Lab Hours: 3 Hrs.,
Course Woks:3 and Assessment Works: 3]

MODULE CONTENT: Growth: General features - Nucleation theories - Post-nucleation growth – Thin film structures-Structural defects Thin Film- Physical methods: Physical vapour deposition, Sputtering deposition, ion implantation, Chemical methods: Sol-gel synthesis, Spin coating, chemical vapour deposition, Cathodic arc deposition, Pulsed laser deposition, Molecular beam epitaxy, chemical solution deposition techniques – spray pyrolysis - laser ablation.

MODULE OUTCOME: On successful completion of the module, learners will be able to know more about synthesis and best environment required for the thin film production for various industrial applications

REFERENCES

1. K. L. Chopra, *Thin Film Phenomena*, McGraw Hill 1969.
2. G. Cao, *Nanostructures & Nano-Materials: Synthesis, Properties & Applications*, Imperial College Press, 2004.

ADDITIONAL REFERENCES & STUDY MATERIALS:

3. W. T. S. Huck, *Nanoscale Assembly: Chemical Techniques (Nanostructure Science and Technology)*.
4. Y. Leng, *Materials Characterization: Introduction to Microscopic and Spectroscopic Methods*, John Wiley & Sons (Asia), 2008.



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13. DELIVERY MODE

The course employs multi-mode delivery mechanism including contact lecture, online videos, and Online and offline course works.

14. DELIVERY SCHEDULE

November to February.

15. DETAILED COURSE DELIVERY PLAN

Hour	Delivery Mode and Activity	Topics to be Covered
1	Contact Lecture 1	Discussion on the basics of nanotechnology
2	Contact Lecture 2	2D Nano materials
3	Contact Lecture 3	Thin films & Fabrication techniques
4	Contact Lecture 4	Role of thin films in current scenario
5	Course work 1	Data collection on different fabrication methods
6	Course work 2	Data collection on different fabrication methods
7	Assessment 1	Assignment on ancient applications of thin films
8	Contact Lecture 5	Effect of size on Basic properties
9	Contact Lecture 6	Change of electric & magnetic properties
10	Contact Lecture 7	Change of optical & mechanical properties
11	Contact Lecture 8	Thermal properties & Conductivity
12	Course work 3	Discussion on the tailoring of properties



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Hour	Delivery Mode and Activity	Topics to be Covered
13	Course work 4	Review on the video lecture 1& 2
14	Assessment 2	Assignments on the applications of thin films in various industries
15	Assessment 3	Multiple choice/ descriptive exam
16	Contact Lecture 9	Nucleation theories
17	Contact Lecture 10	Physical methods 1
18	Contact Lecture 11	Physical methods 2
19	Course work 5	Review on the video lecture 3& 4
20	Course work 6	Review on the video lecture 5& 6
21	Assessment 4	Assignment on the basics of a thin film coating unit
22	Assessment 5	Multiple choice/ descriptive exam
23	Contact Lecture 12	Chemical methods 1
24	Contact Lecture 13	Chemical methods 1
25	Course work 7	Review on the video lecture 7 & 8
26	Lab hour 1	Training on dip coating
27	Lab hour 2	Training on spin coating
28	Lab hour 3	Training on spray coating
29	Contact Lecture 14	Winding up the course
30	Assessment 6	Multiple choice/ descriptive exam

16. ASSESSMENT COMPONENTS

Total Marks: 100

CLASSROOM AND GROUP PARTICIPATION: 20 Marks. This component aims at testing the course content understanding and the reflection skills and their attainment levels.



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COURSE WORK: 30 Marks. This component aims at testing the skill attainment levels of the learners in analysing and implementing the real-world problem.

MID-COURSE ASSIGNMENT: 20 Marks. This component aims at testing the module-wise attainment levels of the course objectives and course outcome and module outcomes.

END-COURSE ASSESSMENT: 30 Marks. This component aims at testing overall attainment levels of the course with respect to course objectives, course outcome and module outcomes.

17. COURSE EVALUATION & GRADING

The course evaluation is done/coordinated entirely by the course coordinator. The following 10-point Indirect Grading System is used for awarding grades to students:

Percentage of Mark	Letter Grade	Interpretation	Class
95 and above	O	Outstanding	First Class with Distinction
85 to below 95	A+	Excellent	First Class with Distinction
75 to below 85	A	Very good	First Class with Distinction
65 to below 75	B+	Good	First Class
55 to below 65	B	Satisfactory	First Class
45 to below 55	C	Average	Second Class
35 to below 45	P	Pass	Third Class
Below 35	F	Failure	Fail
Incomplete	I	Incomplete	Fail
Absent	Ab	Absent	Fail



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The grade is awarded by the course-coordinator by considering the overall performance of the learner in all the assessment component of the course.

18. GRIEVANCE REDRESSAL

The grievances, if any, can be submitted to the Head of the Department for its redressal. Those grievances that cannot be redressed by HoD can be forwarded to Academic Council of the College for final decision on the matter.

19. ISSUANCE OF CERTIFICATES

The Course Completion Certificate will be issued to all the successful candidates showing the Total Marks and Grade Obtained.



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