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## FIRST-YEAR OF MASTER OF SCIENCE PHYSICS REVISED SYLLABUS ACCORDING TO CBCS NEP2020

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**COURSE TITLE:-Semiconductor Physics and Devices  
SEMESTER-II  
W.E.F. 2023-2024**

**RECOMMENDED BY THE BOARD OF STUDIES IN PHYSICS  
AND  
APPROVED BY THE ACADEMIC COUNCIL**

Devrukh Shikshan Prasarak Mandal's

Nya. Tatyasaheb Athalye Arts, Ved. S. R. Sapre Commerce, and  
Vid. Dadasaheb Pitre Science College (Autonomous), Devrukh.  
Tal.Sanameshwar, Dist. Ratnagiri-415804, Maharashtra, India

Academic Council Item No: **03 dated 8 July 2023**

Name of the Implementing Institute	:	Nya. Tatyasaheb Athalye Arts, Ved. S. R. Sapre Commerce, and Vid. Dadasaheb Pitre Science College (Autonomous), Devrukh. Tal. Sangmeshwar, Dist. Ratnagiri-415804,
Name of the Parent University	:	University of Mumbai
Name of the Programme	:	Master of Science
Name of the Department	:	Physics
Name of the Class	:	First Year
Semester	:	Second
No. of Credits	:	02
Title of the Course	:	Semiconductor Physics and Devices
Course Code	:	S515PHT
Name of the Vertical in adherence to NEP 2020	:	Elective
Eligibility for Admission	:	BSc in Physics
Passing Marks	:	40%
Mode of Assessment	:	Formative and Summative
Level	:	PG
Pattern of Marks Distribution for TE and CIA	:	60:40
Status	:	NEP-CBCS
To be implemented from Academic Year	:	2023-2024
Ordinances /Regulations (if any)	:	

## Syllabus for First Year of Master of Science in Physics

(With effect from the academic year 2023-2024)

### SEMESTER - II

Course Title: Semiconductor Physics and Devices

No. of Credits - 02

Type of Vertical: Elective

COURSE CODE: S515PHT

#### Learning Outcomes Based on BLOOM's Taxonomy:

After completing the course, the learner will be able to...

Course Learning Outcome No.	Blooms Taxonomy	Course Learning Outcome
CLO-01	Remember	Recall the basics of semiconductors and devices
CLO-02	Understand	Understand the classification of semiconductors and carrier transport phenomenon
CLO-03	Analyze	Explain the fabrication of various semiconductor devices
CLO-04	Understand	Understand the working of devices like MESFET, MODFET etc

**Syllabus for First Year of Master of Science in Physics****(With effect from the academic year 2023-2024)****SEMESTER - II****Paper No–Physics–VI****Course Title: Semiconductor Physics and Devices****No. of Credits - 02****Type of Vertical: Elective****COURSE CODE: S515PHT**

<b>COURSE CONTENT</b>			
<b>Module No.</b>	<b>Content</b>	<b>Credits</b>	<b>No. of Lectures</b>
<b>1</b>	<b><i>Semiconductor Devices II:</i></b> Metal – Semiconductor Contacts: Schottky barrier – Energy band relation, Capacitance-voltage (C-V) characteristics, Current-voltage (I-V) characteristics; Ideality factor, Barrier height and carrier concentration measurements; Ohmic contacts. Bipolar Junction Transistor (BJT): Static Characteristics; Frequency Response and Switching. Semiconductor heterojunctions, Heterojunction bipolar transistors, Quantum well structures.	<b>01</b>	<b>15</b>
<b>2</b>	<b><i>Semiconductor Devices III:</i></b> Metal-semiconductor field effect transistor (MESFET)- Device structure, Principles of operation, Current voltage (I-V) characteristics, High frequency performance. Modulation doped field effect transistor (MODFET); Introduction to ideal MOS device; MOSFET fundamentals, Measurement of mobility, channel conductance etc. from $I_{ds}$ vs, $V_{ds}$ and $I_{ds}$ vs $V_g$ characteristics. Introduction to Integrated circuits.	<b>01</b>	<b>15</b>
	<b>Total</b>	<b>02</b>	<b>30</b>

**Main References:**

1. S.M. Sze; Semiconductor Devices: Physics and Technology, 2<sup>nd</sup> edition, John Wiley, New York, 2002.
2. B.G. Streetman and S. Benerjee; Solid State Electronic Devices, 5th edition, Prentice Hall of India, NJ, 2000.
3. W.R. Runyan; Semiconductor Measurements and Instrumentation, McGraw Hill, Tokyo, 1975.
4. Adir Bar-Lev; Semiconductors and Electronic devices, 2<sup>nd</sup> edition, Prentice Hall, Englewood Cliffs, N.J., 1984.
5. Jasprit Singh; Semiconductor Devices: Basic Principles, John Wiley, New York, 2001.
6. Donald A. Neamen; Semiconductor Physics and Devices: Basic Principles, 3<sup>rd</sup> edition, Tata McGraw-Hill, New Delhi, 2002.

*Nya. Tatyasaheb Athalye Arts, Ved. S. R. Sapre Commerce and Vid. Dadasaheb Pitre Science College, Devrukh (An Autonomous College Affiliated with University of Mumbai)*

7. M. Shur; Physics of Semiconductor Devices, Prentice Hall of India, New Delhi, 1995.
8. Pallab Bhattacharya; Semiconductor Optoelectronic Devices, Prentice Hall of India, New Delhi, 1995.
9. S.M. Sze; Physics of Semiconductor Devices, 2<sup>nd</sup> edition, Wiley Eastern Ltd., New Delhi, 1985.

#### **Access to the Course**

The course is available for all the students admitted for Master of Science in Physics.

#### **Methods of Assessment**

The assessment pattern would be 60:40, 60% for Semester End Examination (SEE) and 40% for Continuous Internal Assessment (CIA). The structure of the SEE and CIA would be as recommended by the Board of Studies and approved by the Board of Examination and the Academic Council of the college.

#### **Pattern of Evaluation**

The Examination/Evaluation pattern shall be framed by the Board of Examination with its final approval from the Academic Council of the College.