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VEER NARMAD SOUTH GUJARAT UNIVERSITY

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વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી

યુનિવર્સિટી કેમ્પસ, ઉધના-મગદલા રોડ, સુરત - ૩૯૫ ૦૦૭, ગુજરાત, ભારત.

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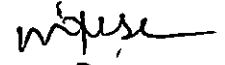
-:પરિપત્ર:-

યુનિવર્સિટીના વિજ્ઞાન વિદ્યાશાખા હેઠળના તમામ શૈક્ષણિક વિભાગોના વડાશ્રીઓ અને યુનિવર્સિટી સંલગ્ન વિજ્ઞાન વિદ્યાશાખા હેઠળની તમામ કોલેજોનાં આચાર્યશ્રીઓને જણાવવાનું કે, શૈક્ષણિક વર્ષ ૨૦૨૬-૨૭ થી અમલમાં આવનાર ઔદ્યોગિક પોલિસી ૨૦૨૬ અન્વયે ભૌતિકશાસ્ત્ર વિષયની અભ્યાસ સમિતિની તા.૦૩/૦૭/૨૦૨૬ની સભા ના ઠરાવ ક્રમાંક:૦૨ થી નિયુક્ત પેટાસમિતિ દ્વારા તૈયાર કરેલ PG લેવલ 2 Credit Certificate Course (1) Semi-conductor Materials and Electronic Devices and (2) Non-Districtive Testing (NDT) ના અભ્યાસક્રમો વિજ્ઞાન વિદ્યાશાખાના અધ્યક્ષશ્રીએ વિદ્યાશાખાવતી મંજૂર કરી એકેડેમિક કાઉન્સિલને કરેલ ભલામણ એકેડેમિક કાઉન્સિલની તા.૧૩/૦૭/૨૦૨૬ની સભાનાં ઠરાવ ક્રમાંક:૬૧ થી મંજૂર કરેલ છે. જેની આથી જાણ કરવામાં આવે છે.

(બિડાણ:ઉપર મુજબ)

ક્રમાંક:ઓથો./પરિપત્ર/૧૬૮૪૨/૨૦૨૬

તા.૨૧/૦૭/૨૦૨૬


કુલસચિવ (વ)

પ્રતિ,

- (૧) યુનિવર્સિટીના વિજ્ઞાન વિદ્યાશાખા હેઠળના તમામ શૈક્ષણિક વિભાગોના વડાશ્રીઓ.
- (૨) યુનિવર્સિટી સંલગ્ન વિજ્ઞાન વિદ્યાશાખા હેઠળની તમામ કોલેજોનાં આચાર્યશ્રીઓ.
- (૩) અધ્યક્ષશ્રી, વિજ્ઞાન વિદ્યાશાખા.
- (૪) પરીક્ષા નિયામકશ્રી, પરીક્ષા વિભાગ, વીર નર્મદ દ. ગુ. યુનિવર્સિટી, સુરત.

.....તરફ જાણ સારું.

**VEER NARMAD SOUTH GUJARAT
UNIVERSITY, SURAT.**



**A
Proposed Syllabus
For
2-Credit: 30 Hrs. Certificate Course**

Course No. : 1

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT	
PROGRAM TITLE	
Name of Program	Certificate Course
Program Abbreviation	SEMICONDUCTOR MATERIALS AND ELECTRONIC DEVICES
Duration	30 Hrs.
Credit	2
Eligibility Criteria	Any Science Graduate
Pre-requisite	Aptitude for Sciences.
Medium of Instruction	English
Marks	Internal Marks :25 ; External Marks :25 ;Total marks :50
Course Fee	Rs. 3200.00
Objective of Program	1. To understand theoretical concepts of semiconductor materials and physics behaviour with particular emphasis on their preparation and growth properties 2. To understand the basic concept of carrier transport phenomena in semiconductor and measurement electrical properties of semiconductor 3. To understand basic device PN junction including properties like generation-recombination current, heterojunction and metal-semiconductor junction 4. To understand special semiconductor devices with includes optoelectronics devices introduce so that student interest is boost by applying their already accumulated knowledge to modern, real life field.

Unit	Description	Weight-age
I	<u>1.Semiconductors and Their Preparation for Engineering use:</u> 1.1 Semiconductors Materials 1.2 Purification of Semiconductors Materials, 1.3 Growth of Semiconductors Materials (Growth from melts, Epitaxial growth and Single crystal formation) 1.4 Crystal Structure and Valance Model of a Pure and Doped Semiconductor 1.5 Statistics of Donors and Acceptors state 1.6 Position of Fermi level	25%
	<u>2.Carrier transport phenomena:</u> 2.1 Carrier transport phenomena: Mobility, Resistivity and Scattering Mechanisms and Average Drift Velocity Hall Effect 2.2 Recombination process, Career Diffusion Current Density and Total Current Density 2.3 Phonon spectra, optical thermal and high field properties of semiconductor, 2.4 Basic equation for semiconductor device operation 2.5 Four Probe Method and Hall Effect Phenomena	25%
II	<u>3.The PN Junction:</u> 3.1 Method of making Junction, Abrupt and linearly graded junctions 3.2 Depletion region in Equilibrium and under forward and reverse Bias 3.3 Current-Voltage characteristics, Ideal case- Shockley equation 3.4 Generation and Recombination 3.5 Diffusion Capacitance and Depletion Capacitance 3.6 Junction breakdown, Thermal instability, Tunneling effect, Avalanche multiplication,	25%

3.7 Metal-Semiconductor contact: Ohmic and Schottky effect	
3.8 Heterojunctions	
<u>4. Optoelectronics:</u>	25%
4.1 Light-Semiconductor Interaction	
4.2 Light Detection the Photoconductive Device	
4.3 The PIN Photodetector	
4.4 The Photovoltaic Effect	
4.5 Optical to Electrical Energy Conversion, the Solar Cell	
4.6 Luminescent Materials	
4.7 Light emitting Diodes (LED) Optic Couplers	
4.8 Liquid Crystal Display (LCD)	
4.9 The Semiconductor Injection Lasers	

SEMICONDUCTOR MATERIALS AND ELECTRONIC DEVICES CHARACTERIZATION RELATED PRACTICALS

1. Vacuum Techniques (Rotary and Diffusion Pump, Pirani and Ionization Gauge)
2. Single Crystal Growth Technique
3. Thin Film Technology (Physical Vapor Deposition and Spinning Coating)
4. Fabrication of Electronic Device
5. Electrical and Optical Characterization (Current Source Meter, Four Probe, Hall Effect, Ultra Violet Spectroscopy, Photo Response Characterization.
6. Energy Dispersive X-Ray Analysis
7. Thermo Gravimetric Analysis
8. X-Ray Diffraction
9. Scanning Electron Microscopy (SEM)
10. High Resolution TEM
11. X-Ray Photo Electron Spectroscopy

Reference Books	
1.	Semiconductor Physics and devices: D.A. Neamen, Tata McGraw-Hill Publishing Company Limited, 2002.
2.	Physics of semiconductor devices: S.M. Sze, Wiley-Interscience, 1981.
3.	Solid State Electronic Devices: B.G. Streetman,(3 rd Ed.), Prentice-Hall of India Private Limited,1994.
4.	Semiconductor Devices: Jasprit Singh, McGraw-Hill Publishing Company Limited, 1994.

Proposed Theory Question Paper for External Exam: Total 25 marks

Q-1.	Compulsory : 5 marks	Weightage is given to entire two units of course content
	Attempt any two of the following	
Q-2.	(a) 5 marks	Equal Weightage is given to first unit Sec-1&2 of course content
	(b) 5 marks	
	(c) 5 marks	
	(d) 5 marks	
	Attempt any two of the following	
Q-3.	(a) 5 marks	Equal Weightage is given to second unit Sec-3 & 4 of course content
	(b) 5 marks	
	(c) 5 marks	
	(d) 5 marks	

Proposed Practical Internal Exam: Total 25 marks

- 15 Marks for Practical Exam
- 05 Marks for Journal
- 05 Marks for Attendant

Course No. : 2

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT	
PROGRAM TITLE	
Name of Program	Certificate Course
Program Abbreviation	Non-Destructive Testing (NDT)
Duration	30 Hrs.
Credit	2
Eligibility Criteria	Any Science Graduate
Pre-requisite	Aptitude for Sciences.
Medium of Instruction	English
Marks	Internal Marks :25 ; External Marks :25 ;Total marks :50
Course Fee	Rs. 3200.00

Course Description

This course introduces the principles, methods, and industrial applications of Non-Destructive Testing (NDT). Students will gain knowledge of various NDT techniques used to detect defects and evaluate the integrity of engineering materials and components without causing damage. The course emphasizes practical applications in manufacturing, aerospace, construction, power plants, oil & gas, and quality assurance. The syllabus aligns with common university and industry coverage of visual inspection, liquid penetrant, magnetic particle, ultrasonic, radiographic, and electromagnetic testing methods.

Course Objectives (COs)

After completing the course, students will be able to:

1. Understand the importance and principles of Non-Destructive Testing.
2. Explain various NDT methods and their working principles.
3. Select appropriate NDT techniques for different engineering applications.
4. Interpret basic inspection results and identify common defects.
5. Appreciate industrial safety and quality standards in NDT.

Course Outcomes (COs)

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

- **CO1:** Explain the fundamentals and importance of NDT.
- **CO2:** Describe major NDT techniques and their applications.
- **CO3:** Identify defects using suitable inspection methods.
- **CO4:** Recommend appropriate NDT techniques for industrial components.
- **CO5:** Understand safety precautions and quality assurance practices.

Course Contents:

Unit I: Introduction to Non-Destructive Testing (6 Hours)

- Introduction to NDT
- Destructive vs Non-Destructive Testing
- Importance of NDT in quality control
- Types of material defects
- Industrial applications
- Advantages and limitations of NDT
- Introduction to inspection standards

Unit II: Surface Inspection Methods (8 Hours)

Visual Testing (VT)

- Principles
- Equipment
- Lighting and optical aids
- Applications

Liquid Penetrant Testing (PT)

- Principle
- Penetrants and developers
- Inspection procedure
- Advantages and limitations

Magnetic Particle Testing (MT)

- Principle
- Magnetization methods
- Magnetic particles
- Applications
- Limitations

Unit III: Volumetric Inspection Methods (8 Hours)

Ultrasonic Testing (UT)

- Basic principles
- Ultrasonic waves
- Pulse-echo method
- Thickness measurement
- Applications

Radiographic Testing (RT)

- X-rays and Gamma rays
- Imaging principles
- Radiographic equipment
- Industrial applications
- Radiation safety

Unit IV: Advanced NDT Methods and Industrial Applications (8 Hours)

- Eddy Current Testing (ECT)
- Acoustic Emission Testing (AET)
- Leak Testing (LT)
- Infrared Thermography (Introduction)
- Selection of suitable NDT techniques
- Case studies in aerospace, automotive, manufacturing, pipelines, and civil infrastructure
- Emerging trends in digital NDT and automation

Practical/Demonstration (Suggested)

Students should observe demonstrations or perform basic experiments on:

1. Visual inspection of engineering components
2. Liquid penetrant testing
3. Magnetic particle testing
4. Ultrasonic flaw detection
5. Radiographic image interpretation (demonstration/video)
6. Case study analysis of industrial failures

Teaching Methodology

- Lectures
- Multimedia presentations
- Laboratory demonstrations
- Industrial videos
- Case studies
- Group discussions
- Industry interaction (if available)

Suggested Textbooks

1. Barry Hull & Vernon John, **Non-Destructive Testing**, Macmillan.

2. Raj B., Jayakumar T., Thavasimuthu M., **Practical Non-Destructive Testing**, Narosa Publishing.
3. L. Cartz, **Non-Destructive Testing**, ASM International.
4. R. Halmshaw, **Introduction to the Non-Destructive Testing of Welded Joints**, Edward Arnold.

Reference Books

1. ASM Handbook, **Non-Destructive Evaluation and Quality Control**.
2. P. J. Shull, **Nondestructive Evaluation: Theory, Techniques and Applications**.
3. ASNT, **Nondestructive Testing Handbook**.
4. Relevant ISO, ASTM, and ASME codes and standards for NDT.

Suggested Learning Resources

- Industrial demonstrations and inspection videos
- ASNT learning materials
- ASTM and ISO standards on NDT methods
- Virtual simulation software for ultrasonic and radiographic testing

Proposed Theory Question Paper for External Exam: Total 25 marks

Q-1.	Compulsory : 5 marks	Weightage is given to entire two units of course content
	Attempt any two of the following	
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	(c) 5 marks	
	(d) 5 marks	
	Attempt any two of the following	
Q-3.	(a) 5 marks	Equal Weightage is given to second unit -3 & 4 of course content
	(b) 5 marks	
	(c) 5 marks	
	(d) 5 marks	

Proposed Practical Internal Exam: Total 25 marks

- 15 Marks for Practical Exam
- 05 Marks for Journal
- 05 Marks for Attendant