गुरू घासीदास विश्वविद्यालय (केनीय विश्वतिवालय अधिनेयन 2008 क. 25 के अंतर्गत स्वापित केन्द्रेय विश्ववेवालय) कोनी, बिलासपुर - 495009 (छ.ग.)



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1.2.1

List of New Courses Introduced with Course Contents

	Colour Codes	
Employability Contents	Green	
Entrepreneurship Contents	Light Blue	
Skill Development Contents	Pink	
NameoftheSubjects/Related to allthreeComponents(Employability/Entrepreneurship/ SkillDevelopment)	Yellow	

गुरु घासीदास विश्वविद्यालय (हेन्द्रेर विवविद्यालय अधिम 2009 इ. 25 हे संपंत सामित हेन्द्रेर विवविद्याल) कोनी, बिलासपुर - 495009 (छ.ग.)



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List of New Course(s) Introduced

Depar	rtment	: Pure and applied physics					
Progr	Programme Name : <i>B.Sc. Electronics</i>						
	Academic Year : <mark>2020-21</mark>						
List of	f New Course(s) I	Introduced					
Sr. No.	Course Code	Name of the Course					
01.	PS/ELEC/C- 402P	Signals and Systems Lab					
02.	PS/ELEC/C- 403P	Electronics Instrumentations Lab					
03.	PS/ELEC/C- 501P	Microprocessors and Microcontrollers Lab					
04.	PS/ELEC/C- 502P	Electromagnetics Lab					
05.	PS/ELEC/C- 601P	Communication Electronics Lab					
06.	PS/ELEC/C- 602P	Photonics Lab					
07	PS/ELEC/DSE- 603L	Semiconductor Fabrication and Characterization					
08	PS/ELEC/DSE- 603P	Semiconductor Fabrication & Characterization Lab					

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विभागाध्यक्षं/H.O.D. शुद्ध एवं अनुप्रयुक्त भौतिकी विभाग Dept. of Pure & Applied Physics गुरु घासीदास विश्वविद्यालय Guru Ghasidas Vishwavidyalaya बिलासपुर (छ.ग.)/Bilaspur (C.G.) गुरू घासीदास विश्वविद्यालय (भेदेश रिसमेवल अभिम 2009 ह. 25 के अंग्रेंग सामित केंद्रेय रिस्वेचलन) कोनी, बिलासपुर - 495009 (छ.ग.)



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& Seal of HoD

शुद्ध एवं अनुप्रयुक्तं भौतिकी विभाग Dept. of Pure & Applied Physics नुरु घासीदास विश्वविद्यालय Guru Ghasidas Vishwavidyalaya बिलासपुर (छ.ग.)/Bilaspur (C.G.)

Minutes of Meetings (MoM) of Board of Studies (BoS)

Academic Year : 2020-21

School: School of Physical SciencesDepartment: Pure and Applied PhysicsDate and Time : July 13, 2020- 11:30 AM; July 18, 2020 - 5:00 PMVenue: Smart Class Room

The scheduled meetings of member of Board of Studies (BoS) of Department of Pure and Applied Physics, School o Studies of Physical Sciences, Guru Ghasidas Vishwavidyalaya, Bilaspur, were held to design and discuss the B. Sc (Physics) Second year (III and IV Semesters), scheme and syllabi.

The following members were present in the meeting:

- 1. Prof. P K. Bajpai
- 2. Dr. H. S. Tewari
- 3. Prof. S. B. Kondawar (External Member)
- 4. Dr. M. N. Tripathi
- 5. Dr. P. Thakur
- 6. Dr. R. K. Pandey
- 7. Dr. T. G. Reddy
- 8. Dr. R. P. Prajapati
- 9. Dr. A. K. Gupta
- 10. Dr. M. P. Sharma
- 11. Dr. P. Das
- 12. Dr. T. Trivedi
- 13. Dr. S. P. Patel
- 14. Prof. R. Dhar (External member)

The committee discussed and approved the scheme and syllabi. The following Skill Enhancement courses were added in the B. Sc. (Physics) Second year (V and VI Semesters)

- Signals and Systems Lab
- Electronics Instrumentations Lab
- Microprocessors and Microcontrollers Lab
- Electromagnetics Lab
- Communication Electronics Lab
- Photonics Lab
- Semiconductor Fabrication and Characterization
- Semiconductor Fabrication & Characterization LabPhysics Workshop Skills (SEC-1)
- Electrical Circuits and Network Skills (SEC-2)





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Course Structure & Syllabus of B.Sc. Electronics Session -2019

	School of Physical Sciences: B.Sc. Hon's (Electronics)				
Semester	Course Opted	Course Code	Name of the course	Credit	Hour
	Core-1	PS/ELEC./C-1011	Basic Circuit Theory and Network Analysis	- 14	4
	Core +1 Practical	PS/ELEC./C-101P	Basic Circuit Theory and Network Analysis Lab	2	4
	Core -2	PS/ ELEC./C-102L	Mathematics Foundation for Electronics	- 4	4
	Core -2 Practical	PS/ELEC/C-P-102P	Mathematics Foundation for Electronics Lab	2	4
1	Generic Elective -I (GE-1A)	PS/ELEC/GE-101	To be opted from the pool*	4	4
	Generic Elective - Practical	PS/ELEC./GE-P-101	GE-101 practical as opted	2	4
	Ability Enhancement Compulsory Coarse (AECC)	PS/ELEC./AE- 101/EC	English Communication / MIL (Hindi Communication)	4*	4
	ECA	Open elective (Optional)	ECA-Extracurricular activity/ Tour, Field visit/ Industrial training/ NSS/ Swachhta/ vocational Training/ Sports/ others	2	(2)
			TOTAL	24	28
	Core-3	PS/ELEC/C-203L	Semiconductor Devices	4	4
	Core -3 Practical	PS/ ELEC /CP-203P	Semiconductor Devices Lab	2	4
	Core -4	PS/ ELEC /C-204L	Applied Physics	:4	4
	Core -4 Practical	PS/ ELEC /CP-204P	Applied Physics Lab	2	4
	Generic Elective -2 (GE-IB)	PS/ ELEC /GE-202/	GE-102 (second course of the same subject as opted in GE-101	4	4
Ш	Generic Elective - Practical	PS/ ELEC /GE-P-202/	GE-202 practical as opted	2	4
	Ability Enhancement Compulsory Course (AECC)	PS/ ELEC /AE- 201/ES	Environmental Science	42	- 4
	ECA	Optional elective	ECA-Extracurricular activity/ Tour, Field visit/ Industrial training/ NSS/ Swachhta/ vocational Training/ Sports/ others	2	(2)
			Total	24	28





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IER Internship: 15 days	Optional elective	Swayam Swachhta / NSS / Industrial/ others	2	100
Core-5	PS/ ELEC /C-301L	Electronic Circuits	4	4
Core -5 Practical	PS/ ELEC /C-301P	Electronic Circuits Lab	2	4
Core -6	PS/ELEC /C-302L	Digital Electronics and VHDL	- 4	4
Core -6 Practical	PS/ELEC /C-302P	Digital Electronics and VHDL Lab	2	4
Core - 7	PS/ELEC/C-303L	C Programming and Data Structures	4	4
Core - 7 Practical	PS/ELEC/C-303P	C Programming and Data Structures Lab	2	4
Generic Elective -3 (GEII-A)		To be opted from the pool of GE	4	-4
Generic Elective - Practical		I SCOOL STRUCTURE AND	2	4
Skill Enhancement Course (SEC + 1)		To be opted from the pool of SE courses**	4*	2 (4)
No. of the second se		Total	28	34
Carel	DSUELEC /C.4011	Ourselford Amplifiers and Applieding		4
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	P. OT BERIEFE THE TREAT		14	4
		rook open nom me poer or Generie courses		4
Skill Enhancement Course		To be opted from the pool of SE courses	4*	2 (4)
A1970-01-000		TOTAL	28	34
ER Internship: 15 days	Optional elective	Swayam Swachhta / NSS / Industrial/ others	2	100
Consti	Descert for an abit	Missource and Missourcellure	14	4
the second se				i i
Core -12	PS/ ELEC /C-502L	Electromagnetics	4	4
Core -12 Practical	PS/ ELEC /C-502P	Electromagnetics Lab	-	1
	Core-5 Core -5 Practical Core -6 Core -6 Practical Core -7 Core - 7 Practical Generic Elective -3 (GEII-A) Generic Elective -3 (GEII-A) Core-8 Core-8 Core -8 Core -8 Core -8 Core -9 Core -9 Core -9 Core -9 Core -9 Core -10 Core -11 Core -1 Core -1 Core -1 Core -1 Core -1 Core -1 Co	Core-5 PS/ ELEC /C-301L Core -5 Practical PS/ ELEC /C-301L Core -6 PS/ ELEC /C-302L Core -7 PS/ ELEC /C-303L Generic Elective - Practical PS/ ELEC /C-303P Generic Elective - Oractical Skill Enhancement Course (SEC + 1) Core -8 PS/ ELEC /C-401L Core -9 PS/ ELEC /C-402L Core -9 PS/ ELEC /C-403L Core -10 PS/ ELEC /C-403L Core -10 Practical PS/ ELEC /C-403L Core -10 Practical PS/ ELEC /C-403L Generic Elective - Practical Skill Enhancement Course (SEC -2) ER Internship: 15 days Optional elective Core-11 PS/ ELEC /C-501L PS/ ELEC /C-501L PS/ ELEC /C-501L	Core-5 PS/ ELEC /C-301L Electronic Circuits Electronic Circuits Core -5 PS/ ELEC /C-301P Electronic Circuits Electronic Circuits Lab Core -6 PS/ ELEC /C-302L Digital Electronics and VHDL Lab Core -7 PS/ ELEC /C-303L C Programming and Data Structures PS/ ELEC /C-303H Generic Elective - 7 Ps/ ELEC /C-303P C Programming and Data Structures Lab To be opted from the pool of GE Generic Elective - Practical PS/ ELEC /C-403H To be opted from the pool of SE courses** Total Core -8 PS/ ELEC /C-401H Operational Amplifiers and Applications Core -8 Core -8 PS/ ELEC /C-401H Operational Amplifiers and Applications Lab Core -8 PS/ ELEC /C-401H Operational Amplifiers and Applications Lab Core -9 PS/ ELEC /C-401H Operational Amplifiers and Applications Lab Core -9 PS/ ELEC /C-401H Operational Amplifiers and Applications Lab Core -10 PS/ ELEC /C-403H Electronic Instrumentation Lab Core -10 PS/ ELEC /C-403H Electronic Instrumentation<	Core-5 PS/ ELEC /C-301L Electronic Circuits 4 Core -5 Practical PS/ ELEC /C-301P Electronic Circuits Lab 2 Core -6 PS ELEC /C-302L Digital Electronics and VHDL 4 Core -6 PS ELEC /C-302P Digital Electronics and VHDL 4 Core -7 PS ELEC /C-303L C Programming and Data Structures 4 Core -7 PS/ ELEC /C-303P C Programming and Data Structures Lab 2 Generic Elective -3 (GEII-A) To be opted from the pool of GE 4 Generic Elective - Practical PS/ ELEC /C-401L Operational Amplifiers and Applications Lah 2 Skill Enhancement Course Signals and Systems 4 2 Core -8 PS/ ELEC /C-401L Operational Amplifiers and Applications Lah 2 Core -9 PS/ ELEC /C-401P Operational Amplifiers and Applications Lah 2 Core -9 PS/ ELEC /C-401P Operational Amplifiers and Applications Lah 2 Core -9 PS/ ELEC /C-401P Operational Amplifiers and Applications Lah 2 Core -10 PS/ ELEC /C-403L Electronic Instrume





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	Discipline Specific Elective (DSE-1)	PS/ELEC/DSE-5011.	DSE-I	4	4
	DSE-1 - Practical	PS/ELEC/DSE-501P	DSE-I Lab	2	4
	Discipline Specific Elective - (DSE-2)	PS/ELEC/DSE-502L	DSE-2 .	4	4
	DSE-2 - Practical	PS/ELEC/DSE-502P	DSE-2 Lab	2	4
_			TOTAL	24	32
	Core-13	PS/'ELEC /C-601L	Communication Electronics	4	4
	Core -13 Practical	PS/ ELEC /C-601P	Communication Electronics Lab	2	4
	Core -14	PS/ ELEC /C-602L	Photonics	4	4
	Core -14 Practical	PS/ ELEC /C-602P	Photonics Lab	2	4
VI	Discipline Specific Elective (DSE-3)	PS/ELEC/DSE-503L	DSE-3	4	4
	DSE-3 - Practical	PS/ELEC/DSE-503P	DSE-3 Lab	2	4
	Discipline Specific Elective (DSE-4) + DSE-4 - Practical Or Dissertation/ Project work followed by seminar	PS/ELEC/PD		4+2=6 Or 5+1=6	8
			TOTAL	24	32
			TOTAL CREDITS	152 +	4 (SI)
departm two GE	nents. The No. of GE course is four. On courses (from one subject) in first two	e GE course is compulsory semesters after which stu	er GE and SEC courses offered by any departmen in first 4 semesters each. In present scheme it is dent shall change two GE for another subject in I approval by the competent authority).	proposed to have m	inimum , so that





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General electives to be offered by Electronics (for Physics/Maths /Electronics/ Comp. Sc. students) GE/101/ELEC Basic Circuit Theory and Network Analysis GE/102/ ELSC: Mathematics Foundation for Electronics '> GE/201/ ELEC: Semiconductor Devices 🛠 GE/202/ ELEC: Applied Physics List of General elective for Electronics Honors: (Ist SEM) GE/201/Maths GE/202/Maths GE/201/PHY GE/202/PHY GE/201/COMP. Sc. GE/202/COMP. Sc. Skill Enhancement Courses (02 to 04 papers) (Credit: 02 each)- SEC1 to SEC4 1. Design and Fabrication of Printed Circuit Boards (4) 2. Electronics Workshop Skills 3. Electrical circuit network Skills Basic Instrumentation Skills
 Renewable Energy and Energy harvesting abont tours by the 6. Radiation Safety

गुरू घासीदास विश्वविद्यालय (हेरे किसिबाल अधिल 2009 व. 25 हे कंतर्फ लागिर हेन्द्रेर किरीबाल) कोनी, बिलासपुर - 495009 (छ.ग.)



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Electromagnetics Lab (using Scilab/ any other similar freeware)

- 1. Understanding and Plotting Vectors.
- 2. Transformation of vectors into various coordinate systems.
- 3. 2D and 3D Graphical plotting with change of view and rotation.
- 4. Representation of the Gradient of a scalar field, Divergence and Curl of Vector Fields.
- 5. Plots of Electric field and Electric Potential due to charge distributions.
- 6. Plots of Magnetic Flux Density due to current carrying wire.
- 7. Solutions of Poisson and Laplace Equations contour plots of charge and potential distributions

8. Introduction to Computational Electromagnetics: Simple Boundary Value Problems by Finite

Difference/Finite Element Methods.

गुरू घासीदास विश्वविद्यालय (हेरीर विसरिवास अधिम 2009 हु 25 हे आंग सारित हेरीर विश्ववास) कोनी, बिलासपुर - 495009 (छ.ग.)



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Sc.(Honours) Electronics VIth Semester -2020-2021

Sub: Communication Electronics Lab (Hardware and Circuit Simulation Software) Subject code: PS/ELEC/C- 601P

Credit-02

- 1. Study of Amplitude Modulation
- 2. Study of Amplitude Demodulation
- 3. Study of Frequency Modulation
- 4. Study of Frequency Demodulation
- 5. Study of Pulse Amplitude Modulation
- 6. AM Transmitter/Receiver
- 7. FM Transmitter/Receiver
- 8. Study of TDM, FDM
- 9. Study of Pulse Width Modulation
- 10. Study of Pulse Position Modulation
- 11. Study of Pulse Code Modulation
- 12. Study of Amplitude Shift Keying
- 13. Study of Phase Shift Keying,
- 14. Study of Frequency Shift Keying.

Note: Perform any ten experiments out of 14 experiments.



गुरू घासीदास विश्वविद्यालय (हेरी रिवरिवर अधिय 200 ह. 25 हे आंध सारित हेन्द्रीर विश्ववाल) कोनी, बिलासपुर - 495009 (छ.ग.)



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B.Sc. (Honours)Electronics VIth Semester -2020-2021

Sub: Photonic Devices and Power Electronics

Subject Code: PS/ELEC/C- 602L Credit-04 Theory Lectures (60)

UNIT-I

(17 Lectures)

Classification of photonic devices. Interaction of radiation and matter, Radiative transition and optical absorption. Light Emitting Diodes- Construction, materials and operation. Semiconductor Laser- Condition for amplification, laser cavity, hetero structure and quantum well devices. Charge carrier and photon confinement, line shape function. Threshold current.

Photodetectors: Photoconductor. Photodiodes (p-i-n) and Photo transistors, Photomultiplier tube, Solar Cell: Construction, working and characteristics.

UNIT-II

(17Lectures)

(12 Lectures)

LCD Displays: Types of liquid crystals, Principle of Liquid Crystal Displays, advantages over LED displays.

Introduction to Fiber Optics: Evolution of fiber optic system- Element of an Optical Fiber Transmission link, Optical Fiber Modes and Configurations - Mode theory of Circular Wave guides, Linearly Polarized Modes, Single Mode Fibers, Graded Index fiber structure.

UNIT-III

Introduction to family of thyristors. Silicon Controlled Rectifier (SCR)- structure, I-V characteristics, Turn-On and Turn-Off characteristics. Diac and Triac- Basic structure, working and V-I characteristics.

Insulated Gate Bipolar Transistors (IGBT): Basic structure, I-V Characteristics, switching characteristics, device limitations and safe operating area (SOA).

UNIT-IV

(12 Lectures)

New Course Introduced

Criteria – I (1.2.1)



Applications of SCR: Phase controlled rectification, AC voltage control using SCR and Triac as a switch. Power Invertors- Need for commutating circuits and their various types, dc link invertors, Parallel capacitor commutated invertors, Series Invertor.

Reference Books:

- 1. J. Wilson & J.F.B. Hawkes, Optoelectronics: An Introduction, Prentice Hall India (1996)
- 2. S.O. Kasap, Optoelectronics & Photonics, Pearson Education (2009)
- 3. AK Ghatak & K Thyagarajan, Introduction to fiber optics, Cambridge Univ. Press (1998)
- 4. Power Electronics, P.C. Sen, Tata McGraw Hill
- 5. Power Electronics, M.D. Singh & K.B. Khanchandani, Tata McGraw Hill
- 6. Power Electronics Circuits, Devices & Applications, 3rd Edn., M.H. Rashid, Pearson Education
- 7. Optoelectronic Devices and Systems, Gupta, 2nd edn., PHI learning.
- 8. Electronic Devices and Circuits, David A. Bell, 2015, Oxford University Press.



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B.Sc. (Honours) Electronics VIth Semester -2020-2021

Sub: Photonic Devices and Power Electronics Lab

Subject code: PS/ELEC/C- 602P Credit-02

- 1. Diffraction experiments using a laser.
- 2. To determine characteristics of (a) LEDs, (b) Photo voltaic cell and (c) Photo diode.
- 3. To study the Characteristics of LDR and Photodiode with (i) Variable Illumination intensity, and (ii) Linear Displacement of source.
- 4. To measure the numerical aperture of an optical fibre.
- 5. Output and transfer characteristics of a power MOSFET.
- 6. Study of I-V characteristics of SCR.
- 7. SCR as a half wave and full wave rectifiers with R and RL loads.



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B.Sc. (Honours) Electronics VIth Semester -2020-2021

Sub: DSE-3(Semiconductor Fabrication & Characterization)

Subject Code: PS/ELEC/DSE- 603L Credit-04 Theory Lectures (60)

Unit-I Crystal Growth

Introduction, Semiconductor Materials, Semiconductor Devices, Silicon Crystal Growth from the melt, Starting Material, The Czochralski Technique, Distribution of Dopant, Effective Segregation Coefficient, Silicon float Zone Process, GaAs Crystal Growth techniques, starting materials, Bridgman techniques for GaAs crystal growth, Wafer shaping, crystal defects

Unit-II Silicon Oxidation

Introduction, Thermal oxidation process, kinetics of growth, Thin oxide growth, Impurity redistribution during oxidation, Masking properties of silicon dioxide, oxide quality, oxide thickness characterization, concept of oxidation simulation

Unit-III Photolithography

Introduction, optical lithography, The clean room, exposure tools, masks, photoresist, pattern transfer, Resolution Enhancement Techniques, Electron beam lithography, Electron Resist, The Proximity Effect, Ion beam lithography

Unit-IV Etching, Diffusion, Ion Implantation and Metallization

Wet chemical etching: Silicon etching, Silicon dioxide etching, Dry etching: fundamentals of plasma, etch mechanism, Reactive ion etching

Diffusion, Basic Diffusion Process, Diffusion equation, measurement of resistivity using four point probes, introduction of Ion Implantation, Annealing process, Metallization and Introduction of Process Integration

Reference books:

New Course Introduced

गुरु घासीदास विश्वविद्यालय (न्द्रेश विस्तिवास अभिम 2009 व. 25 ने संगंत साथि नेन्द्रेश विश्वेवाम) कोनी, बिलासपुर - 495009 (छ.ग.)



Guru Ghasidas Vishwavidyalaya (A Central University Established by the Central Universities Ant 2009 No. 25 of 2009) Koni, Bilaspur – 495009 (C.G.)

- 1. Introduction to Microelectronic Fabrication, R.C. Jaeger, Modular Series on Solid State Devices, Volume V, Addison-Wesley, 1988
- 2. Principles of Semiconductor Devices, © Bart Van Zeghbroeck, 1997
- **3.** The science and Engineering of Microelectronic Fabrication, S. Campbell, Oxford University Press, 1996.
- 4. Semiconductor Devices Physics and Technology, S.M. Sze, Wiley and Sons, 1985.
- Semiconductor Intergrated Circuit Processing Technology, W.R. Runyan and K.E. Bean, Addison-Wesley, 1990.
- 6. Solid State Electronic Devices, Fourth edition, B.G. Streetman, Prentice Hall, 1995.
- 7. Modular series on solid state devices, Pierret and Neudeck, Addison Wesley, 1989.
- 8. Semiconductor Physics and Devices, Second edition, D. Neamen, Irwin, 1997.
- 9. Fundamentals of Semiconductor Fabrication Gary S.May and S.M. Sze, Wiley and Sons, 2012
- **10.** Ludmila Eckertova, Physics of Thin films, 2nd Edition, Plenum Press (1986). 3.



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B.Sc.(Hons) Electronics VIth Semester -2020-2021

Sub: DSE-3 lab (Semiconductor Fabrication & Characterization)

Subject Code: PS/ELEC/DSE- 603P Credit-02

- **1.** To measure the resistivity of semiconductor crystal with temperature by four –probe method.
- 2. To determine the nature of conductivity (type n or p) and mobility of semiconductor material using Hall effect.
- 3. To determine the Energy band gap (Eg) of semiconductor materials
- 4. Synthesis of thin films using Sol-gel Spin Coating System
- 5. Synthesis of thin films using Dip Coating and Spray pyrolysis System
- 6. Synthesis of thin film using Thermal Coating System
- 7. Synthesis of thin film using Chemical Vapour Deposition System
- 8. Determination of thickness of thin film using Ellipsometer /Thin Film profilomete
- 9. Determination of Optical Band gap through transmission / absorption spectra.
- 10. Determination of Refractive index of thin films using Ellipsometer / Thin Film profilomete
- **11.** Determination of Refractive index through transmission / absorption spectra.
- **12.** To study the Simulation of Oxidation process
- **13.** To study the Simulation of Diffusion Process
- **14.** To design a pattern using photolithographic process and its simulation
- **15.** To study the Simulation of Process integration

Note: Perform any ten experiments out of 14 experiments.