



## 1.1.2

### List of Employability/ Entrepreneurship/ Skill Development Courses with Course Contents

Colour Codes		
Employability Contents	Green	
Entrepreneurship Contents	Light Blue	
Skill Development Contents	Pink	
Name of the Subjects/Related to all three Components (Employability/ Entrepreneurship/ Skill Development)	Yellow	



### List of New Course(s) Introduced

**Department** : *Pure and applied physics*

**Programme Name** : *B.Sc. Electronics*

**Academic Year** : *2020-21*

### List of New Course(s) 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

*Umbiparku*

विभागाध्यक्ष/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.)



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

**Academic Year : 2020-21**

**School : School of Physical Sciences**

**Department : Pure and Applied Physics**

**Date and Time : July 13, 2020- 11:30 AM; July 18, 2020 - 5:00 PM**

**Venue : Smart Class Room**

The scheduled meetings of member of Board of Studies (BoS) of Department of Pure and Applied Physics, School of 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 Lab Physics Workshop Skills (SEC-1)
- ❖ Electrical Circuits and Network Skills (SEC-2)

*M. N. Tripathi*  
Signature & Seal of HoD  
विभागाध्यक्ष / H.O.D.  
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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 / week
I	Core-1	PS/ELEC/C-101L	Basic Circuit Theory and Network Analysis	4	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
	Generic Elective -1 (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 Course (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
II	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-1B)	PS/ELEC/GE-202/	GE-102 (second course of the same subject as opted in GE-101)	4	4
	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	4*	4
	ECA	Optional elective *	ECA-Extracurricular activity/ Tour, Field visit/ Industrial training/ NSS/ Swachhta/ vocational Training/ Sports/ others	2	(2)
			Total	24	28

*Handwritten notes and signatures:*  
 10/11/19  
 Pradyumn Singh  
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SUMMER Internship: 15 days		Optional elective	Swayam Swachhta / NSS / Industrial/ others	2	100
III	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			2	4
	Skill Enhancement Course (SEC - 1)		To be opted from the pool of SE courses**	4*	2 (4)
			Total	28	34
IV	Core-8	PS/ ELEC /C-401L	Operational Amplifiers and Applications	4	4
	Core -8 Practical	PS/ ELEC /C-401P	Operational Amplifiers and Applications Lab	2	4
	Core -9	PS/ ELEC /C-402L	Signals and Systems	4	4
	Core -9 Practical	PS/ ELEC /C-402P	Signals and Systems Lab	2	4
	Core - 10	PS/ ELEC /C-403L	Electronic Instrumentation	4	4
	Core -10 Practical	PS/ ELEC /C-403P	Electronic Instrumentation Lab	2	4
	Generic Elective -4 (GEII-B)		To be opted from the pool of Generic courses	4	4
	Generic Elective - Practical			4	4
	Skill Enhancement Course (SEC -2)		To be opted from the pool of SE courses	4*	2 (4)
		TOTAL	28	34	
SUMMER Internship: 15 days		Optional elective	Swayam Swachhta / NSS / Industrial/ others	2	100
V	Core-11	PS/ ELEC /C-501L	Microprocessors and Microcontrollers	4	4
	Core -11 Practical	PS/ ELEC /C-501P	Microprocessors and Microcontrollers Lab	2	4
	Core -12	PS/ ELEC /C-502L	Electromagnetics	4	4
	Core -12 Practical	PS/ ELEC /C-502P	Electromagnetics Lab	2	4

*Handwritten notes:*  
 Prof. Dr. Praveen Kumar  
 10/11/2021  
 Prof. Dr. Praveen Kumar  
 10/11/2021



	Discipline Specific Elective (DSE-1)	PS/ELEC/DSE-501L	DSE-1	4	4	
	DSE-1 - Practical	PS/ELEC/DSE-501P	DSE-1 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	
VI	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	
	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	PS/ELEC/PD		4+2=6	8	
	Or Dissertation/ Project work followed by seminar			Or 5+1=6		
				TOTAL	24	32
				<b>TOTAL CREDITS</b>	<b>152 + 4 (SI)</b>	

As per UGC CBCS guidelines, University / departments have liberty to offer GE and SEC courses offered by any department to students of other departments. The No. of GE course is four. One GE course is compulsory in first 4 semesters each. In present scheme it is proposed to have minimum two GE courses (from one subject) in first two semesters after which student shall change two GE for another subject in III<sup>rd</sup> and IV<sup>th</sup> semester, so that all the student can have exposure of one additional subject. (Subject to approval by the competent authority).

*Handwritten notes:*  
 18/7/19  
 Approved for  
 Tuesday 18/7/19  
 Prince



General electives to be offered by Electronics (for Physics/Maths /Electronics/ Comp. Sc. students)

GE/101/ELEC: Basic Circuit Theory and Network Analysis ✓ *SK*

GE/102/ ELEC: Mathematics Foundation for Electronics ✗

GE/201/ ELEC: Semiconductor Devices ✗

GE/202/ ELEC: Applied Physics ✓ *SK*

List of General elective for Electronics Honors: (1st 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
4. Basic Instrumentation Skills
5. Renewable Energy and Energy harvesting
6. Radiation Safety

*SK* *SK*  
*SK* *SK* *SK*  
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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.

विभागध्यक्ष, पी.ओ.  
गुरु एवं अनुप्रयोग भौतिकी विभाग  
Dept. of Pure & Applied Physics  
गुरु घासीदास विश्वविद्यालय  
कोनी, बिलासपुर (छ.ग.)

30-4-2019  
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30/4/2019

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Haran  
Jain  
Sankar  
Usha





Sc.(Honours) Electronics VI<sup>th</sup> 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.**

विभागाध्यक्ष, पी.ओ.डी.  
विभाग पुरे व अप्लाइड फिजिक्स  
गुरु घासीदास विश्वविद्यालय  
कोनी (छ.ग.)/बिलासपुर 495009

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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

(17 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

(12 Lectures)

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)







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**B.Sc. (Honours) Electronics VI<sup>th</sup> 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:**



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.
5. 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.

विभागाध्यक्ष, पी.सी.डी.  
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गुरु घासीदास विश्वविद्यालय  
कोनी (छ.ग.), बिलासपुर

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**B.Sc.(Hons) Electronics VI<sup>th</sup> 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 ( $E_g$ ) 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.**

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गुरु एवं अनुसंधान विभाग  
Dept. of Pure & Applied Physics  
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बिलासपुर (छ.ग.)/बिलासपुर (छ.ग.)

30-4-2019  
28/4/2019

Shiv  
Tareddy  
Hemant  
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