Board of Studies in Physics

FACULTY OF SCIENCE

GONDWANA UNIVERSITY, GADCHIROLI

Syllabus of

B.Sc. Third Year (Semester Pattern)

SUBJECT - PHYSICS

Semester V Semester

GONDWANA UNIVERSITY, GADCHIROLI

SUBJECT - PHYSICS

(A) Teaching workload and Semester Examination Scheme for B.Sc.

Class	Semester	paper	Teaching workload per week			Examination Scheme								Total marks	Total Credits
						Theory Paper			Internal assessment			Practical			
			Theory	Total	Practical	marks		Credits	marks		Credits	marks	credits		
B.Sc.I	I	I	3	6+ 1T*	6	50	100	**12**	10	20	**2**	30	**6**	150	**20**
		II	3			50			10						
	II	I	3	6+ 1T*	6	50	100	**12**	10	20	**2**	30	**6**	150	**20**
		II	3			50			10						
B.Sc.II	III	I	3	6+ 2T*	6	50	100	**12**	10	20	**2**	30	**6**	150	**20**
		II	3			50			10						
	IV	I	3	6+ 2T*	6	50	100	**12**	10	20	**2**	30	**6**	150	**20**
		II	3			50			10						
B.Sc.III	V	I	3	6+ 2T*	6	50	100	**12**	10	20	**2**	30	**6**	150	**20**
		II	3			50			10						
	VI	I	3	6+ 2T*	6	50	100	**12**	10	20	**2**	30	**6**	150	**20**
		II	**3**			50			10						
B.Sc.	**Total marks : 900**								**Total Credits : 120**						

T* Periods for Tutorials per batch.

(B) B.Sc.Semester Pattern Examination Scheme

1. There shall be total **six** semesters.
2. Each semester shall comprise of **90** (Ninety) actual teaching days.
3. Each Semester I to VI shall be of **150** marks.

4. Every subject in each semester will comprise of two theory papers of **50** marks each. Practical/ laboratory work will be of **30** marks and Internal assessment of **10** marks for each theory paper.

i.	Paper I Theory	----	50 marks
	Internal Assessment	----	10 marks
ii.	Paper II Theory	----	50 marks
	Internal Assessment	----	10 marks
iii.	Practical	----	30 marks
Total marks		**----**	**150 marks**

5. All theory papers shall be divided into four units. Each unit shall be cover in 15 periods of 45 minutes.

6. The scope and limitations of the subject of all semester opted by the students shall be indicated in the syllabi from time to time. The medium of instruction and examination shall be English.

7. The theory question paper will be **intraunit** choice and equal weightage to all questions. Duration of each theory paper shall be **three** hours. There will be five questions each of **10** marks. All questions are compulsory. Fifth question will be on all four units with three sub-questions from each unit.

8. **Pattern of question paper: Subject - Physics**

Time: 3 Hours **Maximum marks :50**

Question No.		**Marks Allotted**
Qu. 1 Either		
(A)From Unit - I		10
Or		
(B)From Unit – II / III / IV		10
Qu. 2		
If **Qu. 1 (B)** From Unit – II	Then	
Either (A) From Unit – III **Or**	(B)From Unit - IV	10
If **Qu. 1 (B)** From Unit – III	Then	
Either (A) From Unit – II **Or**	(B)From Unit - IV	10
If **Qu. 1 (B)** From Unit – IV	Then	
Either (A) From Unit – II **Or**	(B)From Unit - III	10
Qu. 3 Either		
a) From Unit - I		2.5
b) From Unit - II		2.5
c) From Unit - III		2.5
d) From Unit - IV		2.5
Or		
e) From Unit - I		2.5
f) From Unit - II		2.5
g) From Unit - III		2.5
h) From Unit - IV		2.5
Qu. 4 Either		
a) From Unit - I	2.5	
b) From Unit - II	2.5	
c) From Unit - III	2.5	
d) From Unit - IV	2.5	
Or		
e) From Unit - I	2.5	
f) From Unit - II	2.5	
g) From Unit - III	2.5	
h) From Unit - IV	2.5	
Qu. 5 Attempt any 10 questions from the following.		
(a) Unit - I	1	
(b) Unit - I	1	
(c) Unit - I	1	

(d)	Unit - II	1
(e)	Unit - II	1
(f)	Unit – II	1
(g)	Unit – III	1
(h)	Unit – III	1
(i)	Unit – III	1
(j)	Unit – IV	1
(k)	Unit – IV	1
(l)	Unit – IV	1

8. A student will have to perform at least five (**05**) experiments from each group.

9. Practical examination for all semesters shall be conducted **twice** in a year, at the end of each semester. Practical examination in odd semesters shall be conducted by **Internal examiner**, whereas practical examination in even semester shall be conducted by **Internal as well as external examiner**. Duration of practical examinations shall be of **6** hours. At the time of Practical examination every student has to perform **two** experiments **one** experiment from each group.

10. The distribution of marks for practical examination is as follows.

Record Book	----	6 marks
Viva-voce	----	6 marks
Each Experiment	(9 marks) ----	18 marks
TOTAL	----	**30 MARKS**

11. Evaluation of the student during the semester for internal assessment:

The University approved teacher will have to conduct a test on each unit. The test is to be carried out with the interest to make the student aware of the basics of the theory and the experiments as well. This will enhance the viva-voce competence and subject interest of the student. The record of these tests is to be maintained in the department duly signed by the teacher in-charge and head of the department. The record is to be maintained in the following format. Each unit test should be of **10** marks. Find the average and assign it to the student.

Record of marks scored in the unit tests during the semester.

Date										Average marks obtained
S.No.	Name of the Student	Paper I				Paper II				
		Test1	Test 2	Test 3	Test 4	Test1	Test 2	Test 3	Test 4	
1	ABC									
2	DEF									
3	GHI									
4	JKL									
5	MNO									
6	PQR									
7	STU									
8	VWX									
9	YZ									

Signature of teacher in-charge Head of Department

12. The internal assessment shall be done by respective college and the marks shall be

sent to the university one month prior to the final examination of each semester.

13. Minimum marks for passing will be **35%** of the total marks. A candidate has to pass individuality in theory / internal assessment / practical separately. The minimum passing marks for theory **35** marks, for internal assessment **7** marks and that for practical **11** marks.

C) Grade Point Average (GPA) and Course Grade Point Average (CGPA)

In the Credit and Grade Point System, the assessment of individual Courses in the concerned examinations will be on the basis of marks only, but the marks shall later be converted into Grades wherein the overall performance of the Learners can be reflected after considering the Credit Point. The overall evaluation shall be designated in terms of Grade.

(Table No.1): Performance Grading Scale

Marks Obtained %	Grade	Grade Points
75 & above	O	6
65 to 74.99	A	5
55 to 64.99	B	4
50 to 54.99	C	3
45 to 49.99	D	2
40 to 44.99	E	1
00 to 39.99	F	0

(Table No. 2): Final Grade Points

Final Grade Points	Final grade
5.0 to 6.0	O
4.50 to 4.99	A
3.50 to 4.49	B
2.50 to 3.49	C
1.50 to 2.49	D
0.50 to 1.49	E
0.00 to 0.49	F

O: Outstanding, **A**: Very Good, **B**: Good, **C**: Average, **D**: Satisfactory, **E**: Pass, **F**: Fail

Semester Grade point average (SGPA)

SGPA: Semester Grade Point Average shall be calculated for individual semesters. It is also designated as GPA.

$$SGPA = \frac{\sum CG}{\sum C}$$

Where, $\sum CG$: Sum of Product of Credits & Grade points and $\sum C$: Sum of Credit points.

Cumulative Grade Point Average (CGPA)

CGPA: Cumulative Grade Point Average shall be calculated for the entire Program by considering all the semesters taken together. The CGPA of a student will be Average of the SGPA's of that student. A student will be allotted a cumulative Grade Point Average (**CGPA**) after clearing all the four semesters. The CGPA of a student will be Average of the four SGPA's of that student.

After calculating the SGPA for an individual semester and the CGPA for entire program, the value can be matched with the grade in the Final Grade Point table No. 2 as per the Seven (07) Points Grading System and expressed as a single designated GRADE such as O, A, B, C, D,

Syllabus for B.Sc. III Subject – Physics

The syllabus of Physics as per semester system for the B.Sc. III will be implemented from the Academic year **2014-2015**.

Name of Programme : **B.Sc. III**
Duration: **Two semesters**

Semester V: Paper I (5S-PHY 501): Statistical Physics and Relativity
Paper II (5S-PHY 502): X-rays and Solid State Physics,
Practical (5S- PHY 503)

Semester VI: Paper I (6S-PHY 601): Nuclear Physics, Nanotechnology and Biophysics
Paper II (6S-PHY 602): Fibre Optics, Communication and Digital Electronics
Practical (6S- PHY 603)

Paper I: 5S-PHY 501: (Statistical Physics and Relativity)

Unit I

***S*tatistical Basis of Thermodynamics:** Probability and thermodynamic probability, principle of equal a *priori* probabilities, mu space, Macro-states and Microstates, Constraints, accessible

and inaccessible states, Equilibrium between two systems in thermal contact, Bridge with macroscopic physics. *Numericals.*

Unit II

M-B Statistics: Fundamental postulates of statistical mechanics, M-B statistics applicable to ideal gas, Maxwell-Boltzmann energy distribution law, Maxwellian distribution of speeds in an ideal gas, distinction between mean, r.m.s. and most probable speed values. *Numericals.*

Unit-III

***Quantum* Statistics:** Bose-Einstein statistics, 'h' as a natural constant and its implications, B-E energy distribution law, Fermi-Dirac statistics, F-D energy distribution law, Distribution of energy among electrons, Fermi level and Fermi energy, Comparison of M-B, B-E, and F-D statistics. *Numericals.*

Unit-IV:

Theory of Relativity: Reference systems, inertial frames, Postulates for the special theory of relativity, Lorentz transformations, Length contraction, time dilation, velocity addition theorem, variation of mass with velocity, mass-energy equivalence. *Numericals.*

References and Text books –

1. Physics for degree students B.Sc. Second Year – C.L. Arora, Dr P.S. Hemne
   Publisher: S. Chand & Publication, New Delhi.
2. Statistical Mechanics, by- Kamal Singh
3. Quantum Mechanics ,Statistical Mechanics and Solid state physics, by- Chattopadhyay and P. C. Rakshit
4. Heat, thermodynamics and statistical physics, by- Brijlal, Subramayam and Dr. P.S. Hemne, Publisher: S. Chand & Company Ltd. New Delhi.
5. Introduction to special theory of Relativity, by- Shrivastava
6. Elements of special theory of Relativity, by- S. P. Singh and M. K. Bagde.
7. Introduction to theory of Relativity, by- P. G. Bergmann

Paper II: 5S-PHY 502: X-Rays and Solid State Physics

Unit I

X-rays-Introduction, discrete and continuous X-ray spectra, Main feature of continuous X-ray spectra, Characteristics X-ray spectra, Duane-Hunt law, X- ray emission spectra, Moseley law its importance and applications, Auger effect, X-ray absorption spectra, applications of X-rays in various fields.

Numericals.

Unit II

Crystal Structure: Crystal structure, periodicity, lattices and bases, fundamental translation vectors, unit cell, Wigner-Seitz allowed rotations, lattice types, lattice planes, common crystal structures, Bragg's law, Laue patterns.
Numericals.

Unit III

Bonding: Potential between a pair of atoms, Lennard-Jones potential, concept of cohesive energy, ionic solids, covalent solids, metallic solids, Van der Walls bond and molecular crystals, Hydrogen bond.
Magnetic Properties: Atomic magnetic moment, magnetic susceptibility, Langevin's theory of Dimagnetism.
Numericals.

Unit IV

Free Electron Theory: Drude-Lorentz model, Wiedemann Franz law (Derivation), Density of states.
Band Theory of Solids: Bloch theorem (statement only), Kroning Penny model, Concept of hole, Hall effect (without proof), distinction between metal, semiconductor and insulator.
Numericals.

References and Text books –

1. Physics for degree students B.Sc. Third Year – C.L. Arora, Dr P.S. Hemne
   Publisher: S. Chand & Publication, New Delhi.
2. Solid State Physics, by- S. U. Pillai.
3. Solid State Physics, by- Gupta Kumar.
4. Introduction to Solid State Physics, by- C. Kettel.
5. Modern Physics, by- R. Mugadesham
6. Modern Physics, by- J. B. Rajam
7. Modern Physics, by- Kumar , Krishane, Nandeem
8. A Text Book of Modern Physics, by- K. C. Lal, S. T. Ahmad.
9. Modern Physics, by- Aurther Biser.

5S-PHY 503 :(Practical)

1. Every student will have to perform at least **Five (05)** experiments from each group.
2. Every student will have to perform **two** experiments one from each group in 6 hours during university practical examination.
3. The distribution of practical/laboratory work of 30 marks is-

Two experiments (9 Marks each)	- 18 Marks
Record book	- 06 Marks
Viva Voce	- 06 Marks

Total	30 Marks

List of the experiments-

Group A

1. To show that deviation of probability from theoretical value decrease with increase in number of events.
2. Study of statistical distribution from the given data and to find most probable, average and rms values.
3. Plotting of distribution curve from the given data and calculation of (a) Most probable (b) Average and
   (c) RMS values.
4. Study of probability dependence on number of events (With one coin)
5. Comparison of experimental and theoretical values of probability with two and three coins.
6. To verify the maximum power transfer theorem.
7. To determine the capacitance of a capacitor by Scherring bridge.
8. Study of Owen's bridge.
9. To determine the capacitance or to compare two capacitances by Wien's bridge.
10. Study of dielectric constant.

Group B

1. Determination of activation energy of material of the thermistor.
2. To determine the lattice parameter 'a' of the unit cell of a cubic crystal using X ray diffraction film.
3. To determine the energy band gap of a semiconductor using a junction diode (Si/Ge).
4. Identification of unknown element from a line emission spectra.
5. To determine the energy band gap of a semiconductor (Germanium) using four probe method.
6. To determine Hall coefficient and mobility of charge carriers in a semiconductor.
7. To study the characteristics of a Silicon Controlled Rectifier (SCR).
8. To verify the Stefan's law of radiation by using an incandescent lamp.

9. Study of OPAMP as inverting and non-inverting amplifier.
10. Study of OPAMP as adder and subtractor.

References books -

1. B.Sc. Practical Physics - – Dr P.S. Hemne, Harnam Singh,
   Publisher: S. Chand & Company Ltd. New Delhi.
2. Practical Physics For B. Sc. II –Kale, Soman, Gawande & Gokhale
   Publisher: Kitab Mahal, Nagpur
3. Practical Physics For B. Sc. III –Kale, Bahekar & Gokhale
   Publisher: Kitab Mahal, Nagpur