

# Bachelor of Science Physics (Honors)

## Syllabus - Second Semester

### OPTICS

Course Code: PHY2202

Credit Units:03

**Course Objective:** This course aims at exposing the students to basic laws of optics and its applications in real world.

#### Course Contents:

##### Module I: Geometric Optics and its applications:

Ray optics, Plane and spherical Mirrors, Lens, image formation, Lens formula. Microscope and Telescope.

##### Module II: Interference

Young's experiment, coherent sources, phase and path differences, Theory of interference fringes, Fresnel's biprism, sheet thickness determination, interference in thin films due to reflected and transmitted lights, Maxima and minima in intensities, Colours of thin films, Newton's rings and its various aspects, Non-reflecting films.

##### Module III: Diffraction

Introduction, rectilinear propagation, Fresnel and Fraunhofer diffraction, Diffraction at circular aperture and straight edge and their discussion. Fraunhofer diffraction at a single slit and a double slit. Fraunhofer diffraction at N slits and its discussion. Plane diffraction grating and its theory, Dispersive power of grating, Resolving power of optical instruments, Rayleigh criterion, Resolving power telescope, microscope, prism and diffraction grating. Phase contrast microscope.

##### Module IV: Polarization:

Introduction, Polarization by reflection, Brewster's law, Polarization by refraction, Malus's law, Double refraction, Nicol Prism and its use, elliptically and Circularly polarized light, quarter and half-wave plates, production and detection of plane, circularly and elliptically polarized light, optical activity, specific rotation, Half-shade polarimeter.

#### Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

#### Text & References:

- A Textbook of Optics: N. Subrahmanyam and B. Lal (S. Chand & Co., N. Delhi, 1987).
- Physical Optics: B. K. Mathur and T. P. Pandya.
- Geometrical and Physical Optics: Longhurst.
- Introduction to Modern Optics: G. R. Fowles.
- Optics: P. K. Srivastav.

# Syllabus - Third Semester

## ANALOG ELECTRONICS

Course Code: PHY2303

Credit Units:03

### Course Objective:

This course aims at exposing the students to Semiconductors, Circuits and Transistors and its applications.

### Course Contents:

#### Module I: Junction Diodes and their Applications

Formation of PN junction, Depletion region, Junction capacitance (Transition and diffusion capacitance, Energy level diagrams and built in potential, diffusion and drift velocity of carriers, Diode equation, V-I characteristics, temperature dependence,

Applications Half-wave Rectifiers & Full-wave Rectifiers, Calculation of Ripple Factor and Rectification Efficiency. Low pass filter and High pass filter, Qualitative idea of C, L and  $\pi$  - Filters. Zener Diode and Voltage Regulation. Photo Diode, Tunnel Diode, LED, Varactor Diode, Tunnel diodes. AC and DC Power Supplies

#### Module II: Circuit Analysis

Kirchhoff's Laws (KCL and KVL), Mesh and Node analysis of dc and ac Circuits, Superposition theorem, Thevenin's and Norton's theorem, reciprocity theorem, Linear resistive 2- ports and interconnections, Z, Y, L, S,T, H' and H'' representations/Parameters, Wheatstone Bridge and its Applications to Wein Bridge and Anderson Bridge

#### Module III: Transistors

PNP and NPN junction transistors, transistor current components, CB, CC and CE Configurations, transfer characteristics, Transistor as switch and applications, Transistor biasing, fixed bias, emitter-stabilised biasing, Voltage-divider biasing, FET and BJT Junction Field Effect Transistor (JFET), JFET V-I Characteristics, Application of FET as voltage variable resistor. Advantages of FET over BJT. MOSFET: construction, working & Application

### Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

### Text & References:

- Semiconductor Electronics by A. K. Sharma, New Age International Publisher(1996)
- Semiconductor Device- Physics and Technology by S. M. Sze, Wiley(1985)
- Introduction to Semiconductor Devices by M. S.Tyagi
- Integrated Electronics : J. Millman and C.C.Halkias (Tata McgrawHill)
- Linear and Non-linear Circuits: Chua, Desoer andKuh.
- Electronic Devices and Circuits : A. Mottershead (Prentice Hall)



## PHYSICS LAB-III

Course Code: PHY2304

Credit Units:02

### Course Contents:

1. To determine a Low Resistance by Carey Foster's Bridge.
2. To determine a Low Resistance by a Potentiometer.
3. To determine High Resistance by Leakage of a Capacitor.
4. To investigate the Motion of Coupled Oscillators.
4. To study the response curve of a Series LCR circuit and determine its (a) Resonant Frequency, (b) Impedance at Resonance and (c) Quality Factor Q, and (d) Band Width.
5. To study the response curve of a Parallel LCR circuit and determine its (a) Anti-Resonant Frequency and (b) Quality Factor Q.
6. To study (a) Half-wave Rectifier and (b) Full-wave Bridge Rectifier.
7. To study the Forward and Reverse characteristics of a Zener Diode and to study its use as a Voltage Regulator.
8. To study the CE Characteristics of a PNP Transistor.
9. To study the characteristics curves of PN junction diode in forward and reverse bias.
10. To study the Frequency Response of Voltage Gain of a RC-Coupled Amplifier.
- 11.
- 12.

*Any other experiment carried out in the class.*

### Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva

# COMPUTER PROGRAMMING IN C/MAT LAB

CourseCode:PHY2306

Credit Units:03

## Course Objective:

The objective of this course module is to acquaint the students with the basics of computers system, its components, data representation inside computer and to get them familiar with various important features of procedure oriented programming language i.e.C.

## Course Contents:

### Module I: Introduction

Introduction to computer, history, von-Neumann architecture, memory system (hierarchy, characteristics and types), H/W concepts (I/O Devices), S/W concepts (System S/W & Application S/W, utilities). Data Representation: Number systems, character representation codes, Binary, octal, hexadecimal and their interconversions. Binary arithmetic, floating point arithmetic, signed and unsigned numbers, Memory storage unit.

### Module II: Programming in C

History of C, Introduction of C, Basic structure of C program, Concept of variables, constants and data types in C, Operators and expressions: Introduction, arithmetic, relational, Logical, Assignment, Increment and decrement operator, Conditional, bitwise operators, Expressions, Operator precedence and associativity. Managing Input and output Operation, formatting I/O.

### Module III: Fundamental Features in C

C Statements, conditional executing using if, else, nesting of if, switch and break Concepts of loops, example of loops in C using for, while and do-while, continue and break. Storage types (automatic, register etc.), predefined processor, Command Line Argument.

### Module IV: Arrays and Functions

One dimensional arrays and example of iterative programs using arrays, 2-D arrays Use in matrix computations .Concept of Sub-programming, functions Example of user defined functions. Function prototype, Return values and their types, calling function, function argument, function with variable number of argument, recursion.

### Module V: Advanced features in C

Pointers, relationship between arrays and pointers Argument passing using pointers, Array of pointers. Passing arrays as arguments. Strings and C string library. Structure and Union. Defining C structures, Giving values to members, Array of structure, Nested structure, passing strings as arguments. File Handling.

## Examination Scheme:

Components	A	CT	C	H	EE
Weightage (%)	5	15	5	5	70

## References:

- “ANSI C” by EBalagurusamy
- YashwantKanetkar, “Let us C”, BPB Publications, 2<sup>nd</sup> Edition, 2001.
- Herbert Schildt, “C: The complete reference”, Osbourne Mcgraw Hill, 4<sup>th</sup> Edition, 2002.
- V. Raja Raman, “Computer Programming in C”, Prentice Hall of India, 1995.
- Kernighan & Ritchie, “C Programming Language”, The (Ansi C Version), PHI, 2<sup>nd</sup> Edition.
- J.BDixit, “Fundamentals of Computers and Programming in C”.
- P.K. Sinha and Priti Sinha, “Computer Fundamentals”, BPB publication.

# TERM PAPER

CourseCode:PHY2331

Credit Units:02

A term (or research) paper is primarily a record of intelligent reading in several sources on a particular subject.

The students will choose the topic at the beginning of the session in consultation with the faculty assigned. The progress of the paper will be monitored regularly by the faculty. At the end of the semester the detailed paper on the topic will be submitted to the faculty assigned. The evaluation will be done by Board of examiners comprising of the faculties.

## GUIDELINES FOR TERM PAPER

The procedure for writing a term paper may consists of the following steps:

1. Choosing a subject
2. Finding sources of materials
3. Collecting the notes
4. Outlining the paper
5. Writing the first draft
6. Editing & preparing the final paper

### 1. Choosing a Subject

The subject chosen should not be too general.

#### 2. Finding Sources of materials

- a) The material sources should be not more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view.
- b) Begin by making a list of subject-headings under which you might expect the subject to be listed.
- c) The sources could be books and magazines articles, news stories, periodicals, scientific journals etc.

#### 3. Collecting the notes

Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes.

- a) Get facts, not just opinions. Compare the facts with author's conclusion.
- b) In research studies, notice the methods and procedures, results & conclusions.
- c) Check crossreferences.

#### 4. Outlining the paper

- a) Review notes to find main sub-divisions of the subject.
- b) Sort the collected material again under each main division to find sub-sections for outline so that it begins to look more coherent and takes on a definite structure. If it does not, try going back and sorting again for main divisions, to see if another general pattern is possible.

#### 5. Writing the first draft

Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is. You may follow the following:

- a) statement of purpose
- b) main body of the paper
- c) statement of summary and conclusion

Avoid short, bumpy sentences and long straggling sentences with more than one main ideas.

#### 6. Editing & Preparing the final Paper

- a) Before writing a term paper, you should ensure you have a question which you attempt to answer in your paper. This question should be kept in mind throughout the paper. Include only information/ details/ analyses of relevance to the question at hand. Sometimes, the relevance of a particular section may be clear to you but not to your readers. To avoid this, ensure you briefly explain the relevance of every section.
- b) Read the paper to ensure that the language is not awkward, and that it "flows" properly.
- c) Check for proper spelling, phrasing and sentence construction.

- d) Check for proper form on footnotes, quotes, and punctuation.
- e) Check to see that quotations serve one of the following purposes:
- f) Show evidence of what an author has said.
- g) Avoid misrepresentation through restatement.
- h) Save unnecessary writing when ideas have been well expressed by the original author.
- i) Check for proper form on tables and graphs. Be certain that any table or graph is self-explanatory.

Term papers should be composed of the following sections:

1. Titlepage
2. Table of contents
3. Introduction
4. Review
5. Discussion & Conclusion
6. References
7. Appendix

Generally, the introduction, discussion, conclusion and bibliography part should account for a third of the paper and the review part should be two thirds of the paper.

### **Discussion**

The discussion section either follows the results or may alternatively be integrated in the results section. The section should consist of a discussion of the results of the study focusing on the question posed in the research paper.

### **Conclusion**

The conclusion is often thought of as the easiest part of the paper but should by no means be disregarded. There are a number of key components which should not be omitted. These include:

- a) summary of question posed
- b) summary of findings
- c) summary of main limitations of the study at hand
- d) details of possibilities for related future research

### **References**

From the very beginning of a research project, you should be careful to note all details of articles gathered.

The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography.

The key to a good bibliography is consistency. Choose a particular convention and stick to this.

### **Conventions**

Monographs

Crystal, D. (2001), *Language and the internet*. Cambridge: Cambridge University Press.

### **Edited Volumes**

Gass, S./Neu, J. (eds.) (1996), *Speech acts across cultures. Challenges to communication in a second language*. Berlin/ NY: Mouton de Gruyter.

[(eds.) is used when there is more than one editor; and (ed.) where there is only one editor. In German the abbreviation used is (Hrsg.) for Herausgeber].

### **Edited Articles**

Schmidt, R./Shimura, A./Wang, Z./Jeong, H. (1996), *Suggestions to buy: Television commercials from the U.S., Japan, China, and Korea*. In: Gass, S./Neu, J. (eds.) (1996), *Speech acts across cultures. Challenges to communication in a second language*. Berlin/ NY: Mouton de Gruyter: 285-316.

### **Journal Articles**

McQuarrie, E.F./Mick, D.G. (1992), On resonance: A critical pluralistic inquiry into advertising rhetoric. *Journal of consumer research* 19, 180-197.

### **Electronic Book**

Chandler, D. (1994), *Semiotics for beginners* [HTML document]. Retrieved [5.10.'01] from the World Wide Web, <http://www.aber.ac.uk/media/Documents/S4B/>.

### **Electronic Journal Articles**

Watts, S. (2000) Teaching talk: Should students learn 'real German'? [HTML document]. *German as a Foreign Language Journal* [online] 1. Retrieved [12.09.'00] from the World Wide Web, <http://www.gfl-journal.com/>.

### **Other Websites**

Verterhus, S.A. (n.y.), Anglicisms in German car advertising. The problem of gender assignment [HTML document]. Retrieved [13.10.'01] from the World Wide Web, <http://olaf.hiof.no/~sverrev/eng.html>.

### **Unpublished Papers**

Takahashi, S./DuFon, M.A. (1989), Cross-linguistic influence in indirectness: The case of English directives performed by native Japanese speakers. Unpublished paper, Department of English as a Second Language, University of Hawai'i at Manoa, Honolulu.

### **Unpublished Theses/ Dissertations**

Möhl, S. (1996), *AlltagssituationeniminterkulturellenVergleich: Realisierung von Kritik und AblehnungimDeutschen und Englischen*. Unpublished MA thesis, University of Hamburg.

Walsh, R. (1995), *Language development and the year abroad: A study of oral grammatical accuracy amongst adult learners of German as a foreign language*. Unpublished PhD dissertation, University College Dublin.

### **Appendix**

The appendix should be used for data collected (e.g. questionnaires, transcripts) and for tables and graphs not included in the main text due to their subsidiary nature or to space constraints in the main text.

### **Examination Scheme:**

<b>Organisation and relevance of content</b>	<b>Literature Review</b>	<b>Bibliography</b>	<b>Total</b>
40	40	20	100



# PROJECT

CourseCode:PHY2332

Credit Units:03

## Objectives:

The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

## Chapter Scheme and distribution of marks:

Chapter 1: Introduction – 10 marks

Chapter 2: Conceptual Framework/ National/International Scenario – 25 marks

Chapter 3: Presentation, Analysis & Findings -- 25 marks

Chapter 4: Conclusion & Recommendations -- 10 marks

Chapter 5: Bibliography -- 05 marks

Project Report	Power Point Presentation & Viva
75 marks	25 marks

## Components of a Project Report

The outcome of Project Work is the Project Report. A project report should have the following components:

- 1) Cover Page:** This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.
  - 2) Acknowledgement:** Various organizations and individuals whom might have provided assistance / co-operation during the process of carrying out the study.
  - 3) Table of Content:** Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.
  - 4) Body of the Report:** The body of the report should have these four logical divisions
    - a) Introduction:** This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.
    - b) Conceptual Framework / National and International Scenario:** (relating to the topic of the Project).
    - c) Presentation of Data, Analysis and Findings:** (using the tools and techniques mentioned in the methodology).
    - d) Conclusion and Recommendations:** In this section, the concluding observations based on the main findings and suggestions are to be provided.
  - 5) Bibliography or References:** This section will include the list of books and articles which have been used in the project work, and in writing a project report.
  - 6) Annexures:** Questionnaires (if any), relevant reports, etc.
- (The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

## The Steps of a Project Report

**Step I :** Selection of the topic for the project by taking following points into consideration:

- Suitability of the topic.
- Relevance of the topic
- Time available at the disposal.
- Feasibility of data collection within the given time limit.
- Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses, etc.)

**Step II** :Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.

**Step III** : Collection of information and data relating to the topic and analysis of the same.

**Step IV** : Writing the report dividing it into suitable chapters, viz.,

Chapter 1:Introduction,

Chapter 2: Conceptual Framework / National & International Scenario, Chapter

3: Analysis & Findings

Chapter 4: Conclusion and Recommendations.

**Step V** : The following documents are to be attached with the Final Project Report.

1) Approval letter from the supervisor(Annexure-IA)

2) Student's declaration(Annexure-IB)

3) Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation /Institution.

**Guidelines for Evaluation:**

- Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines statedbelow.
- Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hardbound.
- Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per UniversityRules).
- No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her ProjectReport.
- Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to thecandidate.

# WORKSHOP

CourseCode:PHY2333

Credit Units:01

## Objectives

A workshop is primarily an activity based academic event that is organized to provide the students a one to one and hands on experience on any aspect of their learning. The communication in a workshop has to be necessarily two ways. The trainer has to make sure that the aspect covered is practically practiced by the participants. The student will choose the option of workshop from amongst their concentration electives. The evaluation will be done by Board of examiners comprising of the faculties.

## Major Themes for Workshop

The workshop may be conducted on any of the following major themes:

- Nanotechnology
- RenewableEnergy
- DataAnalytics
- Spintronics
- Superconductivity
- Bio-fuels
- Biophysics
- QuantumComputation
- PlasmaPhysics
- Cryogenics
- CleanEnergy

These themes are merely indicative and other recent and relevant topics of study may be included.

## Guidelines for Workshop

1. The procedure for earning credits from workshop consists of the following steps:
2. Relevant study material and references will be provided by the trainer in advance.
3. The participants are expected to explore the topic in advance and take active part in the discussions held
4. Attending and Participating in all activities of the workshop
5. Group Activities have to be undertaken by students as guided by the trainer.
6. Evaluation of workshop activities would be done through test and quiz at the end of the workshop.
7. Submitting a write up of at least 500 words about the learning outcome from the workshop.

## Methodology

The methodology followed at the workshop could be based on any one or more of the following methods:

Course Study

Oral Presentation/Seminar

Assignment

Group Discussion

Write up

## Evaluation Scheme:

Attendance	Active Participation	Seminar	Assignment/ Write up	Total
10	30	30	30	100

# Syllabus - Fourth Semester

## DIGITAL ELECTRONICS

CourseCode:PHY2411

Credit Units:03

### Course Objective:

This course aims at exposing the students to Digital Electronics and Communication.

### Course Contents:

#### Module I: Digital Circuits & Combinational Logic

Difference Between Analog and Digital Circuits. Binary Numbers. Octal and Hexadecimal Numbers, Conversion of Decimal to Binary and other numbers and Vice Versa, Logic systems, Circuits for OR, AND, NOT gates, transistor switching times, Exclusive OR gate, Verification and design of AND, OR, NOT and XOR gates using NAND gates & NOR gates, Boolean algebra: De Morgan's Theorems. Simplification of Logic Circuit using Boolean Algebra. Conversion of a Truth Table into an Equivalent Logic Circuit by (1) Sum of Products Method and (2) Karnaugh Map. Arithmetic Circuits: Binary Addition. Binary Subtraction using 2's Complement Method, Half Adders, Full Adders and Subtractors

#### Module II: Flip-Flops, Counters, Shift Registers and Converters:

TTL ICs (binary decoder, 7segment decoder, Schmitt trigger), 7-segment display driver. Memories: RAM and ROM Sequential Circuits: RS, D, and JK Flip-Flops. Level Clocked and Edge Triggered Flip-Flops. Preset and Clear Operations. Race-around Conditions in JK Flip-Flops. Master-Slave JK Flip-Flop Shift registers: Serial and parallel shifting of data, A/D converter, D/A converter.

#### Module III: Analog Circuits

Integrated Circuits (Qualitative Treatment only) Active and Passive components. Advantages and Drawbacks of ICs. Scale of integration: SSI, MSI, LSI and VLSI (Basic Idea and Definitions Only). Examples of Linear and Digital ICs. Operational Amplifiers (Use Black Box approach): Revision of basic characteristics of Op-Amps. Characteristics of an Ideal Op-Amp. Feedback in Amplifiers. Open-loop and Closed-loop Gain. Frequency Response. CMRR. Virtual ground and its Application

#### Module IV: Communication

Modulation: Need for modulation- Types of modulation- Amplitude, Frequency, Phase and Pulse code modulation. Radio wave propagation, Ionosphere, Effect of Ionosphere on Radio waves, Skip distance and Maximum Usable Frequency, Radio transmitter and receiver, TV receiver, Satellite communication, Modem, Demodulation. Introduction to Microprocessor.

### Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

### Text & References:

- Pulse, Digital and Switching Waveforms : J. Millman and H. Taub ( Tata McgrawHill)

- Electronic Devices and Circuits: A. Mottershead (PrenticeHall).
- Digital principles and applications By Donald P. Leach & Albert Paul Malvino, (Glencoe)
- Digital Fundamentals, 3rd Edition by Thomas L. Floyd (Universal Book Stall, India).
- Op-Amps and Linear Integrated Circuits by R. A. Gayakwad (Pearson Education Asia)
- Electronics Fundamental and Application: D. Chattopadhyay and P.C.Rakshit.



## PHYSICS LAB-IV

CourseCode:PHY2404

Credit Units:02

### Course Contents:

1. To investigate the use of an op-amp as an Integrator.
2. To investigate the use of an op-amp as a Differentiator.
3. To study Amplitude Modulation using Transistor.
4. To study Pulse Width / Pulse Position and Pulse Amplitude Modulation using ICs.
5. To verify the basic logic gates using logic gate trainer kit.
6. To design and verify the following digital circuits using basic gates:  
i) S-R flip-flops , ii) J-K flip-flops.
7. To execute half adders and full adders with basic gates and hence to verify addition of binary numbers.
8. To determine the value of  $e/m$  by Thomson's method.

*Any other experiment carried out in the class.*

### Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

# LASER PHYSICS

Course Code: PHY2406

Credit Units:03

## Course Objective:

This course aims at students to give them basic understanding of Laser and its applications.

## Course Contents:

### Module I: Introduction

Introduction, mono chromaticity, temporal and spatial coherence, Einstein's coefficients, momentum transfer, possibility of light amplification, kinetics of optical absorption, shape and width of spectral lines, line broadening mechanism, natural, collision and Doppler broadening.

### Module II: Laser Pumping and Resonators

Resonators, modes of a resonator, number of modes per unit volume, open resonators, confocal resonator (qualitative), quality factor, losses inside the cavity, threshold condition, Quantum yield.

### Module III: Dynamics of the Laser Processes

Rate equations for two, three and four level systems, production of a giant pulse – Q switching, giant pulse dynamics, laser amplifiers, mode-locking, hole burning, distributed feedback lasers.

### Module IV: Types of Lasers

He-Ne laser, Nitrogen Laser, CO<sub>2</sub> laser, Ruby laser, features of semiconductor lasers, intrinsic semiconductor lasers, doped semiconductors, condition for laser action, Advances in semiconductor lasers, injection lasers, dye lasers.

### Module V: Applications

Holography, non-linear optics: harmonic generation, second harmonic generation, phase matching and optical mixing, brief qualitative description of some experiments of fundamental importance.

## Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;  
A: Attendance

## Text & References:

- Lasers and Non-linear Optics: B.B. Laud. (WileyEastern).
- Principles of Lasers: O. Svelto (PlenumPress).
- An Introduction to Lasers and their applications: D.C.O'Shea, W.Russell and W.T.Rhodes (Addition–Wesley).
- Laser Theory and Applications :Thyagarajan and A. Ghatak(MacMillan)



# TERM PAPER

CourseCode:PHY2431

Credit Units:02

A term (or research) paper is primarily a record of intelligent reading in several sources on a particular subject.

The students will choose the topic at the beginning of the session in consultation with the faculty assigned. The progress of the paper will be monitored regularly by the faculty. At the end of the semester the detailed paper on the topic will be submitted to the faculty assigned. The evaluation will be done by Board of examiners comprising of the faculties.

## GUIDELINES FOR TERM PAPER

The procedure for writing a term paper may consists of the following steps:

- Choosing a subject
- Finding sources of materials
- Collecting the notes
- Outlining the paper
- Writing the first draft
- Editing & preparing the final paper

### Choosing a Subject

The subject chosen should not be too general.

#### *Finding Sources of materials*

- The material sources should be not more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view.
- Begin by making a list of subject-headings under which you might expect the subject to be listed.
- The sources could be books and magazines articles, news stories, periodicals, scientific journals etc.

#### *Collecting the notes*

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- Get facts, not just opinions. Compare the facts with author's conclusion.
- In research studies, notice the methods and procedures, results & conclusions.
- Check crossreferences.

#### *Outlining the paper*

- Review notes to find main sub-divisions of the subject.
- Sort the collected material again under each main division to find sub-sections for outline so that it begins to look more coherent and takes on a definite structure. If it does not, try going back and sorting again for main divisions, to see if another general pattern is possible.

#### *Writing the first draft*

Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is. You may follow the following:

- statement of purpose
- main body of the paper
- statement of summary and conclusion

Avoid short, bumpy sentences and long straggling sentences with more than one main ideas.

#### *Editing & Preparing the final Paper*

- Before writing a term paper, you should ensure you have a question which you attempt to answer in your paper. This question should be kept in mind throughout the paper. Include only information/ details/ analyses of relevance to the question at hand. Sometimes, the relevance of a particular section may be clear to you but not to your readers. To avoid this, ensure you briefly explain the relevance of every section.
- Read the paper to ensure that the language is not awkward, and that it "flows" properly.
- Check for proper spelling, phrasing and sentence construction.

- Check for proper form on footnotes, quotes, and punctuation.
- Check to see that quotations serve one of the following purposes:
- Show evidence of what an author has said.
- Avoid misrepresentation through restatement.
- Save unnecessary writing when ideas have been well expressed by the original author.
- Check for proper form on tables and graphs. Be certain that any table or graph is self-explanatory.

Term papers should be composed of the following sections:

- Title page
- Table of contents
- Introduction
- Review
- Discussion & Conclusion
- References
- Appendix

Generally, the introduction, discussion, conclusion and bibliography part should account for a third of the paper and the review part should be two thirds of the paper.

### **Discussion**

The discussion section either follows the results or may alternatively be integrated in the results section. The section should consist of a discussion of the results of the study focusing on the question posed in the research paper.

### **Conclusion**

The conclusion is often thought of as the easiest part of the paper but should by no means be disregarded. There are a number of key components which should not be omitted. These include:

- summary of question posed
- summary of findings
- summary of main limitations of the study at hand
- details of possibilities for related future research

### **References**

From the very beginning of a research project, you should be careful to note all details of articles gathered.

The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography.

The key to a good bibliography is consistency. Choose a particular convention and stick to this.

### **Conventions**

Monographs

Crystal, D. (2001), *Language and the internet*. Cambridge: Cambridge University Press.

### **Edited Volumes**

Gass, S./Neu, J. (eds.) (1996), *Speech acts across cultures. Challenges to communication in a second language*. Berlin/ NY: Mouton de Gruyter.

[(eds.) is used when there is more than one editor; and (ed.) where there is only one editor. In German the abbreviation used is (Hrsg.) for Herausgeber].

### **Edited Articles**

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### **Journal Articles**

McQuarrie, E.F./Mick, D.G. (1992), On resonance: A critical pluralistic inquiry into advertising rhetoric. *Journal of consumer research* 19, 180-197.

### **Electronic Book**

Chandler, D. (1994), *Semiotics for beginners* [HTML document]. Retrieved [5.10.'01] from the World Wide Web, <http://www.aber.ac.uk/media/Documents/S4B/>.

### **Electronic Journal Articles**

Watts, S. (2000) Teaching talk: Should students learn 'real German'? [HTML document]. *German as a Foreign Language Journal* [online] 1. Retrieved [12.09.'00] from the World Wide Web, <http://www.gfl-journal.com/>.

### **Other Websites**

Verterhus, S.A. (n.y.), Anglicisms in German car advertising. The problem of gender assignment [HTML document]. Retrieved [13.10.'01] from the World Wide Web, <http://olaf.hiof.no/~sverrev/eng.html>.

### **Unpublished Papers**

Takahashi, S./DuFon, M.A. (1989), Cross-linguistic influence in indirectness: The case of English directives performed by native Japanese speakers. Unpublished paper, Department of English as a Second Language, University of Hawai'i at Manoa, Honolulu.

### **Unpublished Theses/ Dissertations**

Möhl, S. (1996), *AlltagssituationeniminterkulturellenVergleich: Realisierung von Kritik und AblehnungimDeutschen und Englischen*. Unpublished MA thesis, University of Hamburg.

Walsh, R. (1995), *Language development and the year abroad: A study of oral grammatical accuracy amongst adult learners of German as a foreign language*. Unpublished PhD dissertation, University College Dublin.

### **Appendix**

The appendix should be used for data collected (e.g. questionnaires, transcripts) and for tables and graphs not included in the main text due to their subsidiary nature or to space constraints in the main text.

### **Examination Scheme:**

<b>Organisation and relevance of content</b>	<b>Literature Review</b>	<b>Bibliography</b>	<b>Total</b>
40	40	20	100

# PROJECT

CourseCode:PHY2432

Credit Units:03

## Objectives:

The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

## Chapter Scheme and distribution of marks:

Chapter 1: Introduction – 10 marks

Chapter 2: Conceptual Framework/ National/International Scenario – 25 marks

Chapter 3: Presentation, Analysis & Findings -- 25 marks

Chapter 4: Conclusion & Recommendations -- 10 marks

Chapter 5: Bibliography -- 05 marks

Project Report	Power Point Presentation & Viva
75 marks	25 marks

## Components of a Project Report

The outcome of Project Work is the Project Report. A project report should have the following components:

**Cover Page:** This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.

**Acknowledgement:** Various organizations and individuals whom might have provided assistance / co-operation during the process of carrying out the study.

**Table of Content:** Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.

**Body of the Report:** The body of the report should have these four logical divisions

a) **Introduction:** This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.

b) **Conceptual Framework / National and International Scenario:** (relating to the topic of the Project).

c) **Presentation of Data, Analysis and Findings:** (using the tools and techniques mentioned in the methodology).

d) **Conclusion and Recommendations:** In this section, the concluding observations based on the main findings and suggestions are to be provided.

**Bibliography or References:** This section will include the list of books and articles which have been used in the project work, and in writing a project report.

**Annexures:** Questionnaires (if any), relevant reports, etc.

(The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

## The Steps of a Project Report

**Step I :** Selection of the topic for the project by taking following points into consideration:

- Suitability of the topic.
- Relevance of the topic
- Time available at the disposal.
- Feasibility of data collection within the given time limit.
- Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses, etc.)

**Step II** :Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.

**Step III** : Collection of information and data relating to the topic and analysis of the same.

**Step IV** : Writing the report dividing it into suitable chapters, viz.,

Chapter 1:Introduction,

Chapter 2: Conceptual Framework / National & International Scenario, Chapter

3: Analysis & Findings

Chapter 4: Conclusion and Recommendations.

**Step V** : The following documents are to be attached with the Final Project Report.

- Approval letter from the supervisor(Annexure-IA)
- Student's declaration(Annexure-IB)
- Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation /Institution.

**Guidelines for Evaluation:**

- Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines statedbelow.
- Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hardbound.
- Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per UniversityRules).
- No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her ProjectReport.
- Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to thecandidate.

# WORKSHOP

Course Code: PHY2433

Credit Units: 01

## Objectives

A workshop is primarily an activity based academic event that is organized to provide the students a one to one and hands on experience on any aspect of their learning. The communication in a workshop has to be necessarily two ways. The trainer has to make sure that the aspect covered is practically practiced by the participants. The student will choose the option of workshop from amongst their concentration electives. The evaluation will be done by Board of examiners comprising of the faculties.

## Major Themes for Workshop

The workshop may be conducted on any of the following major themes:

- Nanotechnology
- Renewable Energy
- Data Analytics
- Spintronics
- Superconductivity
- Bio-fuels
- Biophysics
- Quantum Computation
- Plasma Physics
- Cryogenics
- Clean Energy

These themes are merely indicative and other recent and relevant topics of study may be included.

## Guidelines for Workshop

1. The procedure for earning credits from workshop consists of the following steps:
2. Relevant study material and references will be provided by the trainer in advance.
3. The participants are expected to explore the topic in advance and take active part in the discussions held
4. Attending and Participating in all activities of the workshop
5. Group Activities have to be undertaken by students as guided by the trainer.
6. Evaluation of workshop activities would be done through test and quiz at the end of the workshop.
7. Submitting a write up of at least 500 words about the learning outcome from the workshop.

## Methodology

The methodology followed at the workshop could be based on any one or more of the following methods:

Course Study

Oral Presentation/Seminar

Assignment

Group Discussion

Write up

## Evaluation Scheme:

Attendance	Active Participation	Seminar	Assignment/ Write up	Total
10	30	30	30	100

# Syllabus - Fifth Semester

## NUCLEAR & PARTICLE PHYSICS

CourseCode:PHY2503

Credit Units:03

**Course Objective:** The course aims to introduce students to the fundamental concepts of nuclear and sub-nuclear physics and introduction to the physics behind particle detectors.

### Course Contents:

#### Module I: Nuclear Properties

Constituents of nucleus, Non-existence of electrons in nucleus, Nuclear mass and binding energy, features of binding energy versus mass number curve, nuclear radius, angular momentum and parity, qualitative discussion of two-body nuclear forces, nuclear moments, magnetic dipole moment and electric quadrupole moment,

#### Module II: Radioactive Decays

Modes of decay of radioactive nuclides and decay Laws, Beta decays:  $\beta^-$ ,  $\beta^+$  and electron capture decays, , Parity violation in  $\beta$ decay. Alpha decay: Stability of heavy nuclei against break up, Geiger-Nuttal law, barrier penetration as applied to alpha decay, Gamma transitions: Excited levels, Radio carbon dating, Nuclear Power generation ( Fission& Fusion Process ) & Nuclear Reactor ( if time permits)

#### Module III Nuclear Reactions and Nuclear Models

Types of nuclear reactions, reactions cross section, conservation laws, Kinematics of nuclear reaction, Q-value and its physical significance, compound nucleus. Liquid drop model, semi-empirical mass formula, condition of stability, evidence for nuclear magic numbers, Shell model, energy level scheme (Introductory).

#### Module IV: Elementary Particles, their Properties and reactions

Historical introduction, Cosmology, fermions and bosons, particles and antiparticles, Classification of elementary particles, types of interactions, electromagnetic, weak, strong interactions, gravitational interactions, Quantum numbers and conservation laws, isospin, charge conjugation, Yukawa theory, Introduction to quarks and qualitative discussion of the quark model and 3 generation of Quarks qualitatively).

### Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	15	5	5	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;  
A: Attendance

### Text & References:

- Basic ideas and Concepts in Nuclear Physics by K.Hyde
- Introduction to Nuclear Physics : H.A.Enge
- Nuclear Physics : I. Kaplan (AddisonWesley)
- Nuclei and Particles by E.Segre
- Introduction to High energy Physics by D.H.Perkins
- Elementary Particles by I.S.Hughe





## PHYSICS LAB-V

CourseCode:PHY2504

Credit Units:02

### Course Contents:

1. To measure the Resistivity of a Ge Crystal with Temperature by Four-Probe Method (from room temperature to 200<sup>0</sup> C) and to determine the Band Gap Eg for it.
2. To determine the Hall Coefficient a Semiconductor.
3. To study the Hysteresis loop (B-H) of ferromagnetic material.
4. To measure the Magnetic susceptibility of Solids and Liquids.
5. To determine the band gap energy of a given semiconductor by four-probe method.
6. To study the characteristics of Photovoltaic cell.
7. To measure the dielectric constant of a ferroelectric material as a function of temperature.
8. To measure magnetic susceptibility of a solution of a paramagnetic salt in water for 3 different concentrations by using Quincke's method.

*Any other experiment carried out in the class.*

### Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

# SUMMER PROJECT EVALUATION

CourseCode:PHY2535

Credit Units:03

## Objectives:

Practical training is based on the theoretical subjects studied by subjects. It can be arranged within the college or any in any related industrial unit. The students are to learn various industrial, technical and administrative processes followed in the industry. In case of on campus training the students will be given specific tasks of synthesizing / testing / analysis / characterization. On completion of the practical training the students are to present a report covering various aspects learnt by them and give a presentation of the same.

## Chapter Scheme and distribution of marks Report (Probable):

Chapter 1: Introduction –5 marks

Chapter 2: Conceptual Framework/ National/International Scenario – 10 marks

Chapter 3: Presentation, Analysis & Findings -- 15 marks

Chapter 4: Conclusion & Recommendations -- 5 marks Chapter

5: Bibliography -- 05 marks

## Evaluation Scheme:

Continuous Evaluation (Feedback from Industry/ Faculty in charge)	Report	Presentation and Viva	Total
25	40	35	100

## Components of a Project Report

The outcome of Project Work is the Project Report. A project report should have the following components:

- 1) Cover Page:** This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.
  - 2) Acknowledgement:** Various organizations and individuals whom might have provided assistance /co-operation during the process of carrying out the study.
  - 3) Table of Content:** Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.
  - 4) Body of the Report:** The body of the report should have these four logical divisions
    - a) Introduction:** This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.
    - b) Conceptual Framework / National and International Scenario:** (relating to the topic of the Project).
    - c) Presentation of Data, Analysis and Findings:** (using the tools and techniques mentioned in the methodology).
    - d) Conclusion and Recommendations:** In this section, the concluding observations based on the main findings and suggestions are to be provided.
  - 5) Bibliography or References:** This section will include the list of books and articles which have been used in the project work, and in writing a project report.
  - 6) Annexures:** Questionnaires (if any), relevant reports, etc.
- (The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

## The Steps of a Project Report

**Step I :** Selection of the topic for the project by taking following points into consideration:

- Suitability of the topic.
- Relevance of the topic

- Time available at the disposal.
- Feasibility of data collection within the given time limit.
- Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses, etc.)

**Step II :** Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.

**Step III :** Collection of information and data relating to the topic and analysis of the same.

**Step IV :** Writing the report dividing it into suitable chapters, viz.,

Chapter 1: Introduction,

Chapter 2: Conceptual Framework / National & International Scenario, Chapter

3: Analysis & Findings

Chapter 4: Conclusion and Recommendations.

**Step V:** The following documents are to be attached with the Final Project Report.

- 1) Approval letter from the supervisor (Annexure-IA)
- 2) Student's declaration (Annexure-IB)
- 3) Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation / Institution.

**Guidelines for Evaluation:**

- Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines stated below.
- Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hardbound.
- Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per University Rules).
- No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.
- Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate.

# SPECTROSCOPY

Course Code: PHY2505

Credit Units:03

## Course Objective:

This course aims at students to get acquainted with Spectra of Hydrogen, Alkali, Raman and Electronic Spectra which will give them clear understanding of Spectroscopy.

## Course Contents:

### Module I: Hydrogen and Hydrogen-like ions

Series in hydrogen, circular motion, nuclear mass effect, elliptical orbits, energy levels. Fine structure: basic facts and Sommerfeld theory, electron spin and spin-orbit coupling, relativistic correction and Lamb shift (qualitative).

### Module II: Alkali-like Spectra and Complex Spectra

General features, doublet structure, Larmor's theorem and magnetic levels, elementary theory of weak and strong magnetic fields, Zeeman Effect in doublet spectra: anomalous Zeeman effect and the anomalous g-value. L-S Coupling and J-J Coupling scheme, normal triplets, basic assumptions of the theory, identification of terms, selection rules. Pauli's principle and shell structure: Systems with several electrons and spin functions.

### Module III: Infrared and Raman Spectra

Rigid rotator, energy levels, spectrum (no derivation of selection rules), Harmonic oscillator: energy levels, eigen-functions, spectrum, comparison with observed spectrum, Raman Effect, Quantum theory of Raman effect, Rotational and Vibrational Raman spectrum. Anharmonic oscillator: energy levels, Infrared and Raman Spectrum, Vibrational frequency and force constants. Non-rigid rotator: energy levels, spectrum, Vibrating-rotator energy levels, Infrared and Raman spectrum (no derivation of Dunham coefficients), Symmetry properties of rotational levels, influence of nuclear spin.

### Module IV: Electronic Spectra

Electronic energy and potential curves, resolution of total energy, Vibrational Structure of Electronic transitions. General formulae, Deslandre's table, absorption sequences (qualitative) and Vibrational analysis, Rotational Structure of Electronic bands: General relations, branches of a band, band-head formation, Intensity distribution in a vibrational band system. Franck-Condon Principle and its wave mechanical formulation. Classification of electronic states: Orbital angular momentum, Spin, total angular momentum of electrons, Symmetry properties of electronic eigen-functions.

## Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

## Text & References:

- Atomic Spectra: H. Kuhn (Academic Press)
- Molecular Spectra and Molecular Structure I: G. Herzberg (Van-Nostrand Reinhold, 1950)
- Atomic Spectra: H.E. White (McGrawHill).
- Fundamentals of Molecular spectroscopy: Banwell and McCash (Tata McGrawHill)
- Molecular Spectroscopy: S. Chandra (Narosa, 2009)

# TERM PAPER

CourseCode:PHY2531

Credit Units:02

A term (or research) paper is primarily a record of intelligent reading in several sources on a particular subject.

The students will choose the topic at the beginning of the session in consultation with the faculty assigned. The progress of the paper will be monitored regularly by the faculty. At the end of the semester the detailed paper on the topic will be submitted to the faculty assigned. The evaluation will be done by Board of examiners comprising of the faculties.

## GUIDELINES FOR TERM PAPER

The procedure for writing a term paper may consists of the following steps:

- Choosing a subject
- Finding sources of materials
- Collecting the notes
- Outlining the paper
- Writing the first draft
- Editing & preparing the final paper

### Choosing a Subject

The subject chosen should not be too general.

#### *Finding Sources of materials*

- The material sources should be not more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view.
- Begin by making a list of subject-headings under which you might expect the subject to be listed.
- The sources could be books and magazines articles, news stories, periodicals, scientific journals etc.

#### *Collecting the notes*

Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes.

- Get facts, not just opinions. Compare the facts with author's conclusion.
- In research studies, notice the methods and procedures, results & conclusions.
- Check crossreferences.

#### *Outlining the paper*

- Review notes to find main sub-divisions of the subject.
- Sort the collected material again under each main division to find sub-sections for outline so that it begins to look more coherent and takes on a definite structure. If it does not, try going back and sorting again for main divisions, to see if another general pattern is possible.

#### *Writing the first draft*

Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is. You may follow the following:

- statement of purpose
- main body of the paper
- statement of summary and conclusion

Avoid short, bumpy sentences and long straggling sentences with more than one main ideas.

#### *Editing & Preparing the final Paper*

- Before writing a term paper, you should ensure you have a question which you attempt to answer in your paper. This question should be kept in mind throughout the paper. Include only information/ details/ analyses of relevance to the question at hand. Sometimes, the relevance of a particular section may be clear to you but not to your readers. To avoid this, ensure you briefly explain the relevance of every section.
- Read the paper to ensure that the language is not awkward, and that it "flows" properly.
- Check for proper spelling, phrasing and sentence construction.

- Check for proper form on footnotes, quotes, and punctuation.
- Check to see that quotations serve one of the following purposes:
- Show evidence of what an author has said.
- Avoid misrepresentation through restatement.
- Save unnecessary writing when ideas have been well expressed by the original author.
- Check for proper form on tables and graphs. Be certain that any table or graph is self-explanatory.

Term papers should be composed of the following sections:

- Title page
- Table of contents
- Introduction
- Review
- Discussion & Conclusion
- References
- Appendix

Generally, the introduction, discussion, conclusion and bibliography part should account for a third of the paper and the review part should be two thirds of the paper.

### **Discussion**

The discussion section either follows the results or may alternatively be integrated in the results section. The section should consist of a discussion of the results of the study focusing on the question posed in the research paper.

### **Conclusion**

The conclusion is often thought of as the easiest part of the paper but should by no means be disregarded. There are a number of key components which should not be omitted. These include:

- summary of question posed
- summary of findings
- summary of main limitations of the study at hand
- details of possibilities for related future research

### **References**

From the very beginning of a research project, you should be careful to note all details of articles gathered.

The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography.

The key to a good bibliography is consistency. Choose a particular convention and stick to this.

### **Conventions**

Monographs

Crystal, D. (2001), *Language and the internet*. Cambridge: Cambridge University Press.

### **Edited Volumes**

Gass, S./Neu, J. (eds.) (1996), *Speech acts across cultures. Challenges to communication in a second language*. Berlin/ NY: Mouton de Gruyter.

[(eds.) is used when there is more than one editor; and (ed.) where there is only one editor. In German the abbreviation used is (Hrsg.) for Herausgeber].

### **Edited Articles**

Schmidt, R./Shimura, A./Wang, Z./Jeong, H. (1996), *Suggestions to buy: Television commercials from the U.S., Japan, China, and Korea*. In: Gass, S./Neu, J. (eds.) (1996), *Speech acts across cultures. Challenges to communication in a second language*. Berlin/ NY: Mouton de Gruyter: 285-316.

### **Journal Articles**

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### **Electronic Book**

Chandler, D. (1994), *Semiotics for beginners* [HTML document]. Retrieved [5.10.'01] from the World Wide Web, <http://www.aber.ac.uk/media/Documents/S4B/>.

### **Electronic Journal Articles**

Watts, S. (2000) Teaching talk: Should students learn 'real German'? [HTML document]. *German as a Foreign Language Journal* [online] 1. Retrieved [12.09.'00] from the World Wide Web, <http://www.gfl-journal.com/>.

### **Other Websites**

Verterhus, S.A. (n.y.), Anglicisms in German car advertising. The problem of gender assignment [HTML document]. Retrieved [13.10.'01] from the World Wide Web, <http://olaf.hiof.no/~sverrev/eng.html>.

### **Unpublished Papers**

Takahashi, S./DuFon, M.A. (1989), Cross-linguistic influence in indirectness: The case of English directives performed by native Japanese speakers. Unpublished paper, Department of English as a Second Language, University of Hawai'i at Manoa, Honolulu.

### **Unpublished Theses/ Dissertations**

Möhl, S. (1996), *AlltagssituationeniminterkulturellenVergleich: Realisierung von Kritik und AblehnungimDeutschen und Englischen*. Unpublished MA thesis, University of Hamburg.

Walsh, R. (1995), *Language development and the year abroad: A study of oral grammatical accuracy amongst adult learners of German as a foreign language*. Unpublished PhD dissertation, University College Dublin.

### **Appendix**

The appendix should be used for data collected (e.g. questionnaires, transcripts) and for tables and graphs not included in the main text due to their subsidiary nature or to space constraints in the main text.

### **Examination Scheme:**

<b>Organisation and relevance of content</b>	<b>Literature Review</b>	<b>Bibliography</b>	<b>Total</b>
40	40	20	100

# WORKSHOP

CourseCode:PHY2533

Credit Units:01

## Objectives

A workshop is primarily an activity based academic event that is organized to provide the students a one to one and hands on experience on any aspect of their learning. The communication in a workshop has to be necessarily two ways. The trainer has to make sure that the aspect covered is practically practiced by the participants. The student will choose the option of workshop from amongst their concentration electives. The evaluation will be done by Board of examiners comprising of the faculties.

## Major Themes for Workshop

The workshop may be conducted on any of the following major themes:

- Nanotechnology
- RenewableEnergy
- DataAnalytics
- Spintronics
- Superconductivity
- Bio-fuels
- Biophysics
- QuantumComputation
- PlasmaPhysics
- Cryogenics
- CleanEnergy

These themes are merely indicative and other recent and relevant topics of study may be included.

## Guidelines for Workshop

- The procedure for earning credits from workshop consists of the following steps:
- Relevant study material and references will be provided by the trainer in advance.
- The participants are expected to explore the topic in advance and take active part in the discussions held
- Attending and Participating in all activities of the workshop
- Group Activities have to be undertaken by students as guided by the trainer.
- Evaluation of workshop activities would be done through test and quiz at the end of the workshop.
- Submitting a write up of atleast 500 words about the learning outcome from the workshop.

## Methodology

The methodology followed at the workshop could be based on any one or more of the following methods:

Course Study

Oral Presentation/Seminar

Assignment

Group Discussion

Write up

## Examination Scheme:

Attendance	Active Participation	Seminar	Assignment/ Write up	Total
10	30	30	30	100



# Syllabus - Sixth Semester

## DISSERTATION / FINAL PROJECT

CourseCode:PHY2637

Credit Units:03

### Aims:

The educational aims of the BSc dissertation are to:

- enable students to explore in depth a topic of personal interest in the physical sciences.
- enhance information search and selection skills specific to a particular project.
- develop such transferable skills as scientific report writing and oral presentation.
- facilitate self-reliance and the application of project management skills (i.e. time management, use of resources) to the successful completion of the project.

### Intended Learning Outcomes:

On completion successful students will be able to:

- apply knowledge of physical science to the planning and development of a research/technical project.
- use a range of primary source material including library and on-line resources.
- critically evaluate information and techniques when deciding upon research methodologies and analysis, using criteria that can be defended.
- manage time and resources to optimal effect to produce a dissertation to a given deadline.

### Format

The project takes place during the first or last six weeks of S5, or the first or last six weeks of S6. It must be completed and handed in at the end of this six week period. Students are assigned at the start of a project selected from their list of choices which is timed to take place when they are free from their experimental programme. The supervisor will outline possible approaches and offer guidance and advice during the course of the project.

The student will carry out an individual study of a current topic in physics, which should show evidence of original thinking and may take the form of a design element. **The focus of the project should be clearly on the physics, broadly construed;** students unsure whether their planned approach meets this criterion should discuss the issue with their supervisor. The student will write a report or essay along the lines of a scientific article. The length of the report should be between 4000 and 6000 words. At the end of the project you give a 10 minute presentation followed by a 15 minute question and answer session.

### Example project titles

Power for the 21st century - alternative concepts in magnetically confined fusion

Measuring the Temperature of the Troposphere by Radio-Acoustic Sounding

A Tuning Device for a Musical Instrument

The Physics of traffic jams

The carbon crunch: living for the future

A sunlight health policy

Airships: History and Future Potential

The potential impact of LED based solid state lighting

Ultra-fast dynamics of biological molecules

SETI: the search for extra-terrestrial intelligence

Quantum Computers

Accelerator Driven Sub-Critical Reactors

Deceleration and trapping of polar molecules

Negative index of refraction

Helioseismology: a look inside the Sun

Why is water essential for life?

Neutron scattering technology development and its application in bio-research

And many more current topics..

**Assessment Scheme:**

**Continuous Evaluation:** 40% (Based on punctuality, regularity of work, adherence to plan and methodology, refinements/ mid-course corrections etc. as reflected in the Project File.)

**Final Evaluation:** 60% (Based on the Documentation in the file, Final report layout, analysis and results, achievement of objectives, presentation/ viva)

**It is recommended that the Final evaluation should be carried out by a panel of evaluators.**

# LOW TEMPERATURE PHYSICS AND SUPERCONDUCTIVITY

CourseCode:PHY2605

Credit Units:03

## Course Objective:

The aim of this course is to get acquainted the students with physics of ultra low temperatures, physics of materials at zero resistance and their applications in our realworld.

## Course Contents:

### Module I: Superconductivity

Basic properties of superconductors, thermodynamics, superconductors in magnetic fields The London equations, electromagnetic properties, penetration depth, Ginzburg-Landau theory, coherence length, type I and type II superconductors, BCS theory, second quantization, Cooper- pairing, energy gap Tunneling, Josephson effects and SIS tunneling, High Tc superconductors, structure, d-wave symmetry, phase diagrams, Coexistence of superconductivity and Magnetism Overview of applications, squids, microwave devices, powerapplications.

### Module II: Superfluidity

Two – Fluid Model, Bose – Einstein Condensation, Macroscopic Quantum State, Properties of liquid helium-4, Phenomena near The Lambda Point, phase diagrams, Superfluidity, Superfluid phenomena, rollin film, fountain effect, second sound Excitations and vortices in superfluids, Properties of liquid helium-3, the phase diagram, Symmetry properties of superfluid helium-3, Macroscopic Quantum Interference – Josephson Effect, Normal Fluid Density – Quasiparticle Scattering , Collective Excitations, Sound Propagation.

### Module III: Cryogenics

Thermal and electrical properties for different materials at low temperature, Thermodynamic Properties, Liquefaction of gases. Regenerative principle Cooling methods above 1K, Joule-Thompson, Gifford-McMahon, evaporation cooling, Cooling methods below 1K, dilution & refrigeration, Methods of liquefaction of gases (Laser Cooling, Cascade process, Linde's process, and adiabatic demagnetization process) – Measurement of cryogenic temperatures.

## Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

## Text & References:

- Basic Superfluids by TonyGuenault
- Superfluidity and Superconductivity:David R. Tilley,John Tilley (Ph.D.)
- Amorphous solids: low-temperature properties:William AndrewPhillips
- An introduction to liquid helium:John Wilks,David SheridanBetts.

# SEMICONDUCTOR PHYSICS & DEVICES

CourseCode:PHY2610

Credit Units:03

**Course Objective:**This course illustrates the basics of semiconductor theory with emphasis on the formation of energy bands in semiconductors. Applications in terms of studying the device structure and working principle of LEDs, photodiodes and tunnel diodes. Also, the basic structure and working principle of MOS devices is given in addition to the energy band diagram in a metal-semiconductor contact.

## Course Content:

### Module I:Formation of Energy bands

Formation of Energy bands, Electron effective mass, concept of holes, Density of states function, Fermi-Dirac probability function and distribution, Equilibrium distribution of electrons and holes in intrinsic semiconductors, the  $n_0$  and  $p_0$  equations, intrinsic Fermi level position, dopant energy levels, Equilibrium distribution of electrons and holes in extrinsic semiconductors, Degenerated/Non-degenerated semiconductors.

### Module II: Semiconductor Physics

Drift current density, Mobility Effect, Conductivity, Diffusion Current Density, Total Current Density, the Einstein relation, The Hall Effect, Carrier Generation and Recombination, Continuity Equations, time dependent diffusion equation, Basics of ambipolar effect and its transport equation, Haynes-Shockley Experiment.

### Module III: Diodes

Visible and Infrared LEDs (Device structure and Working principle), photoconductor and photodiode (device structure and working principle), PN junction solar cells, Tunnel diodes, Impatt diodes and its static and dynamic characteristics, negative differential resistance, Transferred Electron devices (TED): TED device operation; Quantum effect devices (QED): Resonance tunnel diode.

### Module IV: Metal-semiconductor contact

MOSFET structure and principle of operation, current-voltage characteristics, MOS structure and its energy band diagram, Depletion layer thickness, work function differences, Flat band voltage - charge distribution, capacitance-voltage characteristics and frequency effects,.

## Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

## Reference Books:

- Semiconductor Physics and Devices (Third Edition) by Donald A. Neamen (the McGraw-Hill companies)
- Semiconductor devices Physics and Technology (2nd Edition) by S. M. Sze (Wiley Student Edition)
- Integrated Electronics: Analog and Digital Circuits and Systems, Jacob Millman and Christos C. Halkias, Tata McGraw-Hill.
- Hand Book of Electronics, Gupta & Kumar, PragatiPrakashan.

# TERM PAPER

CourseCode:PHY2631

Credit Units:02

A term (or research) paper is primarily a record of intelligent reading in several sources on a particular subject.

The students will choose the topic at the beginning of the session in consultation with the faculty assigned. The progress of the paper will be monitored regularly by the faculty. At the end of the semester the detailed paper on the topic will be submitted to the faculty assigned. The evaluation will be done by Board of examiners comprising of the faculties.

## GUIDELINES FOR TERM PAPER

The procedure for writing a term paper may consists of the following steps:

- Choosing a subject
- Finding sources of materials
- Collecting the notes
- Outlining the paper
- Writing the first draft
- Editing & preparing the final paper

### 1. Choosing a Subject

The subject chosen should not be too general.

#### 2. Finding Sources of materials

- The material sources should be not more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view.
- Begin by making a list of subject-headings under which you might expect the subject to be listed.
- The sources could be books and magazines articles, news stories, periodicals, scientific journals etc.

#### 3. Collecting the notes

Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes.

- Get facts, not just opinions. Compare the facts with author's conclusion.
- In research studies, notice the methods and procedures, results & conclusions.
- Check cross references.

#### 4. Outlining the paper

- Review notes to find main sub-divisions of the subject.
- Sort the collected material again under each main division to find sub-sections for outline so that it begins to look more coherent and takes on a definite structure. If it does not, try going back and sorting again for main divisions, to see if another general pattern is possible.

#### 5. Writing the first draft

Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is. You may follow the following:

- statement of purpose
- main body of the paper
- statement of summary and conclusion

Avoid short, bumpy sentences and long straggling sentences with more than one main ideas.

#### 6. Editing & Preparing the final Paper

- Before writing a term paper, you should ensure you have a question which you attempt to answer in your paper. This question should be kept in mind throughout the paper. Include only information/ details/ analyses of relevance to the question at hand. Sometimes, the relevance of a particular section may be clear to you but not to your readers. To avoid this, ensure you briefly explain the relevance of every section.
- Read the paper to ensure that the language is not awkward, and that it "flows" properly.
- Check for proper spelling, phrasing and sentence construction.

- Check for proper form on footnotes, quotes, and punctuation.
- Check to see that quotations serve one of the following purposes:
- Show evidence of what an author has said.
- Avoid misrepresentation through restatement.
- Save unnecessary writing when ideas have been well expressed by the original author.
- Check for proper form on tables and graphs. Be certain that any table or graph is self-explanatory.

Term papers should be composed of the following sections:

- Title page
- Table of contents
- Introduction
- Review
- Discussion & Conclusion
- References
- Appendix

Generally, the introduction, discussion, conclusion and bibliography part should account for a third of the paper and the review part should be two thirds of the paper.

### **Discussion**

The discussion section either follows the results or may alternatively be integrated in the results section. The section should consist of a discussion of the results of the study focusing on the question posed in the research paper.

### **Conclusion**

The conclusion is often thought of as the easiest part of the paper but should by no means be disregarded. There are a number of key components which should not be omitted. These include:

- summary of question posed
- summary of findings
- summary of main limitations of the study at hand
- details of possibilities for related future research

### **References**

From the very beginning of a research project, you should be careful to note all details of articles gathered.

The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography.

The key to a good bibliography is consistency. Choose a particular convention and stick to this.

### **Conventions**

Monographs Crystal, D. (2001), *Language and the internet*. Cambridge: Cambridge University Press.

### **Edited Volumes**

Gass, S./Neu, J. (eds.) (1996), *Speech acts across cultures. Challenges to communication in a second language*. Berlin/ NY: Mouton de Gruyter.

[(eds.) is used when there is more than one editor; and (ed.) where there is only one editor. In German the abbreviation used is (Hrsg.) for Herausgeber].

### **Edited Articles**

Schmidt, R./Shimura, A./Wang, Z./Jeong, H. (1996), *Suggestions to buy: Television commercials from the U.S., Japan, China, and Korea*. In: Gass, S./Neu, J. (eds.) (1996), *Speech acts across cultures. Challenges to communication in a second language*. Berlin/ NY: Mouton de Gruyter: 285-316.

### **Journal Articles**

McQuarrie, E.F./Mick, D.G. (1992), On resonance: A critical pluralistic inquiry into advertising rhetoric. *Journal of consumer research* 19, 180-197.

### **Electronic Book**

Chandler, D. (1994), Semiotics for beginners [HTML document]. Retrieved [5.10.'01] from the World Wide Web, <http://www.aber.ac.uk/media/Documents/S4B/>.

### **Electronic Journal Articles**

Watts, S. (2000) Teaching talk: Should students learn 'real German'? [HTML document]. *German as a Foreign Language Journal* [online] 1. Retrieved [12.09.'00] from the World Wide Web, <http://www.gfl-journal.com/>.

### **Other Websites**

Verterhus, S.A. (n.y.), Anglicisms in German car advertising. The problem of gender assignment [HTML document]. Retrieved [13.10.'01] from the World Wide Web, <http://olaf.hiof.no/~sverrev/eng.html>.

### **Unpublished Papers**

Takahashi, S./DuFon, M.A. (1989), Cross-linguistic influence in indirectness: The case of English directives performed by native Japanese speakers. Unpublished paper, Department of English as a Second Language, University of Hawai'i at Manoa, Honolulu.

### **Unpublished Theses/ Dissertations**

Möhl, S. (1996), AlltagssituationeniminterkulturellenVergleich: Realisierung von Kritik und AblehnungimDeutschen und Englischen. Unpublished MA thesis, University of Hamburg.

Walsh, R. (1995), Language development and the year abroad: A study of oral grammatical accuracy amongst adult learners of German as a foreign language. Unpublished PhD dissertation, University College Dublin.

### **Appendix**

The appendix should be used for data collected (e.g. questionnaires, transcripts) and for tables and graphs not included in the main text due to their subsidiary nature or to space constraints in the main text.

### **Examination Scheme:**

<b>Organisation and relevance of content</b>	<b>Literature Review</b>	<b>Bibliography</b>	<b>Total</b>
40	40	20	100

# PROJECT

CourseCode:PHY2632

Credit Units:03

## Objectives:

The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

## Chapter Scheme and distribution of marks for Report :

Chapter 1: Introduction – 10 marks

Chapter 2: Conceptual Framework/ National/International Scenario – 25 marks

Chapter 3: Presentation, Analysis & Findings -- 25 marks

Chapter 4: Conclusion & Recommendations -- 10 marks

Chapter 5: Bibliography -- 05 marks

## Evaluation Scheme:

Continuous Evaluation (Feedback from Industry/ Faculty in charge)	Report	Presentation and Viva	Total
25	40	35	100

## Components of a Project Report

The outcome of Project Work is the Project Report. A project report should have the following components:

- 1) Cover Page:** This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.
  - 2) Acknowledgement:** Various organizations and individuals whom might have provided assistance /co-operation during the process of carrying out the study.
  - 3) Table of Content:** Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.
  - 4) Body of the Report:** The body of the report should have these four logical divisions
    - a) Introduction:** This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.
    - b) Conceptual Framework / National and International Scenario:** (relating to the topic of the Project).
    - c) Presentation of Data, Analysis and Findings:** (using the tools and techniques mentioned in the methodology).
    - d) Conclusion and Recommendations:** In this section, the concluding observations based on the main findings and suggestions are to be provided.
  - 5) Bibliography or References:** This section will include the list of books and articles which have been used in the project work, and in writing a project report.
  - 6) Annexures:** Questionnaires (if any), relevant reports, etc.
- (The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

## The Steps of a Project Report

**Step I :** Selection of the topic for the project by taking following points into consideration:

- Suitability of the topic.
- Relevance of the topic
- Time available at the disposal.



- Feasibility of data collection within the given timelimit.
- Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses,etc.)

**Step II** :Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.

**Step III** : Collection of information and data relating to the topic and analysis of the same.

**Step IV** : Writing the report dividing it into suitable chapters, viz.,

Chapter 1:Introduction,

Chapter 2: Conceptual Framework / National & International Scenario, Chapter

3: Analysis & Findings

Chapter 4: Conclusion and Recommendations.

**StepV**: The following documents are to be attached with the Final Project Report.

- 1) Approval letter from the supervisor(Annexure-IA)
- 2) Student's declaration(Annexure-IB)
- 3) Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation /Institution.

**Guidelines for Evaluation:**

- Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines statedbelow.
- Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hardbound.
- Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as “Absent” in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per UniversityRules).
- No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her ProjectReport.
- Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to thecandidate.

# WORKSHOP

CourseCode:PHY2633

Credit Units:01

## Objectives

A workshop is primarily an activity based academic event that is organized to provide the students a one to one and hands on experience on any aspect of their learning. The communication in a workshop has to be necessarily two ways. The trainer has to make sure that the aspect covered is practically practiced by the participants. The student will choose the option of workshop from amongst their concentration electives. The evaluation will be done by Board of examiners comprising of the faculties.

## Major Themes for Workshop

The workshop may be conducted on any of the following major themes:

- Nanotechnology
- RenewableEnergy
- DataAnalytics
- Spintronics
- Superconductivity
- Bio-fuels
- Biophysics
- QuantumComputation
- PlasmaPhysics
- Cryogenics
- CleanEnergy

These themes are merely indicative and other recent and relevant topics of study may be included.

## Guidelines for Workshop

- The procedure for earning credits from workshop consists of the following steps:
- Relevant study material and references will be provided by the trainer in advance.
- The participants are expected to explore the topic in advance and take active part in the discussions held
- Attending and Participating in all activities of the workshop
- Group Activities have to be undertaken by students as guided by the trainer.
- Evaluation of workshop activities would be done through test and quiz at the end of the workshop.
- Submitting a write up of atleast 500 words about the learning outcome from the workshop.

## Methodology

The methodology followed at the workshop could be based on any one or more of the following methods:

Course Study

Oral Presentation/Seminar

Assignment

Group Discussion

Write up

## Evaluation Scheme:

Attendance	Active Participation	Seminar	Assignment/ Write up	Total
10	30	30	30	100