Study & Evaluation Scheme

of

Bachelor of Science (Hons.)
(Physics)
[Applicable for Academic Session 2017-18]
[Approved by Hon’ble VC dated August 08, 2017]

TEERTHANKER MAHAVEER UNIVERSITY
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Website: www.tmu.ac.in
TEERHANKER MAHAVEER UNIVERSITY

(Established under Govt. of U. P. Act No. 30, 2008)

Delhi Road, Bagarpur, Moradabad (U.P)

Study & Evaluation Scheme
Bachelor of Science (Hons.)

SUMMARY

Programme: B.Sc. (Hons.) – Physics
Duration: Three-year full time (Six Semesters)
Medium: English
Minimum Required Attendance: 75%
Credit: 145
Maximum Credit: 133

(Minimum one non-core paper can be audit per year of program)

Assessment

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Internal Evaluation
(Theory Papers):

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Duration of Examination:

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(To qualify the course a student is required to secure a minimum of 45% marks in aggregate in each course including the semester-end examination and the teacher’s continuous evaluation shall be essential for passing the course and earning its assigned credits. A candidate, who secures less than 45% marks in a course, shall be deemed to have failed in that course.)

Question Paper Structure

1. The question paper shall consist of six questions. All six are compulsory. First question shall be of short answer type (not exceeding 50 words). Question No. 1 shall contain 8 parts representing all units of the syllabus and students shall have to answer any five (weightage 2 marks each).
2. Remaining five questions will be one from each unit with internal choice. The student has to answer one of the two in each question. The weightage of Question No. 2 to 6 shall be 10 marks each.
3. Usually each question in the examination should be designed to have a numerical component, where part of syllabus.
Note 1:

Evaluation Scheme for MOOC, Short Term Courses:

University allows students to undertake additional subjects/course(s) (In-house offered by the university through collaborative efforts or courses in the open domain by various internationally recognized universities) and to earn additional credits on successful completion of the same. Each course will be approved in advance by the University following the standard procedure of approval and will be granted credits as per the approval.

Keeping this in mind the Academic Council in its 10th meeting on February 13, 2016, approved the University proposal and allowed a maximum of two credits to be allocated for MOOC courses. In the pilot phase it is proposed that a student undertaking and successfully completing a MOOC course through edX, Coursera, IIRS and NPTEL could be given a maximum credit of two with 1 credit for credit with 30-60 contact hours and 2 credits for courses having more than 60 contact hours.

For smooth functioning and monitoring of the scheme the following shall be the guidelines for MOOC courses, Add-on courses carried out by the College from time to time.

1. There shall be a MOOC co-ordination committee in the College with a faculty at the level of Professor heading the committee and all Heads of the Department being members of the Committee.

2. The Committee will list out courses to be offered during the semester, which could be requested by the department or the students and after deliberating on all courses finalise a list of courses to be offered with credits defined for each course and the mode of credit consideration of the student. The complete process including the approval of the Vice Chancellor shall be obtained by the College before end of June and end of December for Odd and Even semester respectively of the year in which the course is being offered. In case of MOOC course the approval will be valid only for the semester on offer.

3. A student can opt for a maximum of two MOOC courses for credit during the complete duration of the course other than offered under SWAYAM.

4. College can offer upto 20% credit through courses offered by SWAYAM. However, if the college is offering courses on other MOOC platforms, the total credit offered under MOOC will not exceed 20% including those offered under SWAYAM.

5. Students will register for the course and the details of the students enrolling under the course along with the approval of the Vice Chancellor will be forwarded to the Examination department within fifteen days of start of the semester by the Co-ordinator MOOC through the Principal of the College.
6. Where the MOOC course or Add-on on courses are only offering certificate of successful completion, and credit has been assigned to the course, the University examination division will conduct a MCQ examination for the course with 50 MCQ with 100 marks to facilitate inclusion of the courses in CPI computation.

7. College will define whether the credits are regular credits or to be considered only in case a student fails to secure minimum required credits then the additional subject(s) shall be counted for calculating the minimum credits required for the award of degree.

8. In case the College wants the additional course to be shown in the mark sheet as additional course completed by the students the same shall also be mentioned by the College and the student will opt for the same at the time of taking admission to the course.
# Study & Evaluation Scheme

## Semester I

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Total
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Semester-I
Mathematical Physics-I

Course Code: BAS119

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Objective:

- The emphasis of course is on applications in solving problems of interest to physicists.
- The students are to be examined entirely on the basis of problems, seen and unseen.

Course Outcomes:

- To show how Trigonometry can be used to evaluate Calculus.
- To explain probability and Dirac Delta function and its properties.
- To solve all problems related to Vector differentiation and integration which is useful in each and every area of physics.
- Learn to solve double and triple integral which are used in quantum statistical mechanics etc.

Course Contents:

Unit I (08 Lectures)


Unit II (08 Lectures)


Unit III (08 Lectures)


Unit IV (08 Lectures)


Unit V (08 Lectures)

Orthogonal Curvilinear Coordinates: Orthogonal Curvilinear Coordinates. Derivation of Gradient, Divergence, Curl and Laplacian in Cartesian, spherical and cylindrical coordinates. Green’s Theorems and Stokes Theorems, Gauss’ divergence theorem, and their applications (no rigorous proofs).
Text & Reference Books:

5. Mathematical Physics, Goswami, Cengage Learning.
7. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley India.
8. Essential Mathematical Methods, K. F. Riley & M. P. Hobson, Cambridge Univ. Press

*Latest editions of all the suggested books are recommended
Semester I
Mechanics

Course Code: BAS114/BAS213
L T P C
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Objective: To understand the fundamentals of physics like Linear Momentum, Rotational Dynamics, Motion under Central Forces, Properties of Matter etc.

Course Outcomes: The student will be able:
• To compute basic quantities in linear and rotational mechanics
• To formulate, analyze and solve a multi level problem in mechanics.
• To apply mathematical tools to mechanics.

Course Contents:

Unit I (08 Lectures)

Rotational Dynamics:

Unit II (08 Lectures)

Fluid Motion:

Unit III (08 Lectures)

Elasticity:
Relation between Elastic constants. Twisting torque on a Cylinder or Wire.

Unit IV (08 Lectures)

Unit V (08 Lectures)


**Text & Reference Books:**

   Physics, Resnick, Halliday and Walker, Wiley.

*Latest editions of all the suggested books are recommended*
Semester I
Fundamentals of Inorganic Chemistry

Course Code: BAS 120

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Objective: To expose with different type of physical phenomenon and instruments in Fundamentals of inorganic chemistry like study of atomic structure, periodicity of elements, chemical bonding and basics of inorganic chemistry.

Course Outcomes: After completion of the course, student will be able to understand

- The Schrödinger equation which provide explanation about the origin of Quantum number, shape of atomic orbital.
- Student will learn the periodicity of elements in which they understand the effective nuclear charge, enthalpy, electronegativity required to understand trend in periodic table and predicting their chemical behavior.
- The course also provides a detail understanding of covalent, ionic bond.
- A basic understanding of metallic bond hydrogen bond.

Course Contents:

UNIT – I (08 Lectures)
Atomic Structure:

UNIT – II (08 Lectures)
Periodicity of Elements:
Effective nuclear charge, shielding or screening effect, Atomic & ionic radii, Ionization enthalpy, Successive ionization enthalpies and factors affecting ionization energy. Applications of ionization enthalpy, Electron gain enthalpy, Electronegativity, trends in periodic table and applications in predicting and explaining the chemical behavior.

UNIT – III (08 Lectures)
Chemical Bonding – I:
Z6Covalent bond: Valence Bond theory & its limitations. Hybridization & shapes of simple inorganic molecules & ions, Valence shell electron pair repulsion theory (VSEPR), shapes of simple molecules and ions containing lone pairs and bond pairs of electrons. Resonance and resonance energy, Molecular orbital theory & MO diagrams of Homo & heteronuclear (CO, NO) diatomic molecules.
UNIT – IV  
Chemical Bonding – II:  
Ionic Solids: Covalent character in ionic compounds, polarizing power and polarizability. Fajan’s rules and consequences of polarization. Ionic character in covalent compounds: Bond moment and dipole moment. Percentage ionic character from dipole moment and electronegativity difference Ionic structures, radius ratio effect and coordination number, limitation of radius ratio rule, lattice energy and Born-Haber cycle, salvation energy and solubility of ionic solid.

UNIT – V  
Chemical bonding III:  
Metallic bond-free electron, Semiconductors & insulators, valence bond and band theories. Weak Chemical Forces: van der Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interactions, Instantaneous dipole-induced dipole interactions. Repulsive forces, Hydrogen bonding, Effects of chemical force, melting and boiling points, solubility & energetics of dissolution process.  
Oxidation-Reduction: Redox equations, Standard Electrode Potential and its application to inorganic reactions.

Text & Reference Books:  
1. Lee, J.D. Concise Inorganic Chemistry ELBS.  

* Latest editions of all the suggested books are recommended
Semester I
Computer System & Programming in C++

Course Code: BCS111 /ECS212/MCS111

Objective: To learn the basics of computers & C++ programming language.

Course Outcomes:
1. Be exposed to basic hardware and software concepts
2. Be familiar with issues related to software design
3. Be familiar with using C++ functions and the concepts related to good modular design.
4. Be familiar with using C++ structures.
5. Be familiar with using pointers and reference parameters.
6. Be familiar with using text file input/output

Course Contents:

Unit I
(Lectures 08)
Statements for problem solving: if, switch, while, for, do, break, continue, go to statements.

Unit II
(Lectures 08)

Unit III
(Lectures 08)
Concepts in Operating System: Purpose, Services, Types, Functions.
Data Communication & Networks: Types, Topology, IP address classes.
C++ Basics: Data types, Variables, Constants, Keywords, Identifiers, Types of Operators, Memory Allocation operators, Expressions, Pre-processor directives, Introduction to Array, Pointers, Structures and Strings.

Unit IV
(Lectures 08)
Functions: Scope of variables; Parameter passing; Default arguments; Inline functions; Recursive functions; Pointers to functions.
C++ Classes and Data Abstraction: Class Structure, Objects; this pointer; Friend function; Static class members; Constructors and Destructors; Data abstraction.
Inheritance: Types, Access to the base class members; Virtual base class.

Unit V
(Lectures 08)
Polymorphism: Function overloading; Operator overloading; Static Binding and Dynamic bindings; Virtual function: Definition, Call mechanism, Pure virtual functions; Virtual destructors; Abstract Classes.
C++ I/O: Stream classes hierarchy; Stream I/O; File streams; Overloading << and >> operators; File Modes, Reading and Writing to a file; Formatted I/O.
Text Books-

2. Object-Oriented Programming with C++, Balagurusamy, TMH
3. C++ The Complete Reference, Schildt, TMH
4. Programming in C++, Shah & Thaker, ISTE/EXCEL

Reference Books-

2. Programming with C++, Radhaganesan, Scitech
3. Projects using C++, Varalaxmi, Scitech
4. Object Oriented modelling & Design, RumBaugh, PHI

*Latest editions of all the suggested books are recommended.*
Semester I

English Communication and Soft Skills – I

Course Code: BHM199/EHM199

Objectives:
1. To remove the phobia of conversing in English.
2. To make the learners enable to express themselves among peers & teachers.
3. To enable learners, improve their vocabulary.
4. To introduce them with basic communicative skills in real life situations

Course Outcomes: At the end of the semester, the learner will be able to
1. Remove fear of speaking in English among peers & teachers.
2. Develop the ability to speak in English (even if grammatically not perfect).
3. Use vocabulary taught for speaking and writing simple sentence for day to day conversation.
4. Use taught vocabulary for writing applications on common issues.

Course Contents:

Unit – I Fear of Failure, Reasons of Fear of Failure & How to overcome it (12 hours)
- Self-Introduction
- Identifying strengths and weakness
- Fear of Failure: Signs of Fear of Failure, Reasons of Fear of Failure, Strategies to overcome Fear of Failure
- Positive Attitude
- Motivation
- Building Self Confidence

Unit – II Confidence, Presentability, Etiquettes & Manners (10 hours)
- Body Language: Facial Expression, Eye Contact, Gesture, Posture, Tips to have appropriate body language
- Grooming & Dressing Sense
- Etiquette & Manners: Social Etiquettes, Telephonic Etiquettes, Dining Etiquettes, Etiquettes to handle cultural differences, Etiquettes of Effective Conversation.
- Problem Sounds (s-sh,j-z,v-b)

Unit – III Conversation Practice, commonly made mistake & Initiating a conversation (10 hours)
- Vocabulary of commonly used words (50 Words)
- Conversation Practice: At College, At Bank, At Ticket Counter (Railway Station & Movie Theatre)
- How to initiate a conversation
- Commonly made mistakes in conversation
- Basic of Communication: 7Cs of Communication

Unit – IV Application writing (08 hours)
- Format & Style of Application Writing
- Practice of Application writing on common issues.
Reference Books:
- Harris, Thomas. A. “I am ok, You are ok” New York: Harper and Row.

Methodology:
1. Language Lab software.
2. The content will be conveyed through Real life situations, Pair Conversation, Group Talk and Class Discussion.
3. Conversational Practice will be effectively carried out by Face to Face & Via Media (Telephone, Audio-Video Clips)
4. Modern Teaching tools (PPT Presentation, Tongue-Twisters & Motivational videos with subtitles) will be utilized.

Note:
- 2 words per class will be taught with meaning, usage & correct pronunciation to ensure progressive learning.
- Class (above 30 students) will be divided in to two groups for effective teaching. 
- For effective conversation practice, groups will be changed weekly.

**Evaluation Scheme**

<table>
<thead>
<tr>
<th>Internal Evaluation</th>
<th>External Evaluation</th>
<th>Total Marks</th>
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<tbody>
<tr>
<td>50 Marks</td>
<td>50 Marks</td>
<td>100</td>
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<tr>
<td>40 Marks (Progressive Evaluation)</td>
<td>25 Marks Midway external assessment (Viva)*</td>
<td>25 Marks (External Viva) **</td>
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<tr>
<td>After each unit-completion: Assignments / oral Presentation</td>
<td>10 Marks (Attendance)</td>
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*Parameters of Midway external assessment (Viva)*

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<tr>
<th>Content</th>
<th>Dressing sense &amp; Grooming</th>
<th>Confidence</th>
<th>Pronunciation</th>
<th>Question responsiveness</th>
<th>TOTAL</th>
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<td>05 Marks</td>
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Note: Midway external assessment of 25 marks will be submitted and considered with external evaluation with a total of 50 marks.

Note: To take corrective actions, midway assessment will be conducted by 2-member committee of Director’s nominee (not by the faculty teaching English courses) and average of the two would be the 25 marks obtained by the students after two units are completed.
**Parameters of External Viva**

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<tr>
<th>Content</th>
<th>Dressing sense &amp; Grooming</th>
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<th>Pronunciation</th>
<th>Question responsiveness</th>
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<td>25 Marks</td>
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*Note: External Viva will be conducted by 3-member committee comprising*

- **a)** Faculty teaching the class
- **b)** English faculty from other college of the University (As approved by VC).
- **c)** T&P officer of other colleges of the University (As approved by VC).

*Each member will evaluate on a scale of 25 marks and the average of three would be the 25 marks obtained by the students.*
Semester-I
Mechanics (Lab)

Course Code: BAS166/BAS267

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List of Experiments:

Note: Select any ten experiments from the following list.

1. Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope.
2. To study the random error in observations.
3. To determine the height of a building using a Sextant.
4. To study the Motion of Spring and calculate (a) Spring constant, (b) \( g \) and (c) Modulus of rigidity.
5. To determine the Moment of Inertia of a Flywheel.
6. To determine \( g \) and velocity for a freely falling body using Digital Timing Technique
8. To determine the Young's Modulus of a Wire by Optical Lever Method.
9. To determine the Modulus of Rigidity of a Wire by Maxwell’s needle.
10. To determine the elastic Constants of a wire by Searle’s method.
11. To determine the value of \( g \) using Bar Pendulum.
12. To determine the value of \( g \) using Kater’s Pendulum.

Text & Reference Books:

1. Advanced Practical Physics for students, B. L. Flint and H.T. Worsnop, Asia Publishing House
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, Heinemann Educational Publishers
3. A Text Book of Practical Physics, I. Prakash & Ramakrishna, Kitab Mahal.
4. Engineering Practical Physics, S. Panigrahi & B. Mallick, Cengage Learning India Pvt. Ltd.

* Latest editions of all the suggested books are recommended

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:
PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS) | ON THE DAY OF EXAM (15 MARKS) | TOTAL INTERNAL (50 MARKS)
---|---|---
EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.
Semester-I
Fundamentals of Inorganic Chemistry (Lab)

Course Code: BAS168

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Objective: To learn about practical knowledge of the alum, estimation of ions, titration and qualitative organic analysis in given samples.

Course Outcomes: After completion of the course, student will be able

- To prepare alums and estimation of ions using titration.
- To formulate, analyze and qualitative organic analysis.

List of Experiments:

1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.
2. Estimation of oxalic acid by titrating it with KMnO4.
3. Estimation of water of crystallization in Mohr’s salt by titrating with KMnO4.
4. Estimation of Fe (II) ions by titrating it with K2Cr2O7 using internal indicator.
6. Estimate the amount of nickel present in a given solution as bis (dimethylglyoximato) nickel(II) or aluminium as oximate in a given solution gravimetrically.
7. Estimation of (i) Mg2+ or (ii) Zn2+ by complexometric titrations using EDTA.
8. Estimation of total hardness of a given sample of water by complexometric titration.

Text & Reference Books:

1. Svehla, G. Vogel’s Qualitative Inorganic Analysis, Pearson Education.

* Latest editions of all the suggested books are recommended

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:
### PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)

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<th>VIVA (10 MARKS)</th>
<th>ATTENDANCE (10 MARKS)</th>
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<th>VIVA (10 MARKS)</th>
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### ON THE DAY OF EXAM (15 MARKS)

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### TOTAL INTERNAL (50 MARKS)

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<th>EXPERIMENT (5 MARKS)</th>
<th>FILE WORK (10 MARKS)</th>
<th>VIVA (10 MARKS)</th>
<th>TOTAL EXTERNAL (50 MARKS)</th>
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### External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.
Semester I
Computer System & Programming in C++ (Lab)

Course Code: BCS161/ECS262/MCS161

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List of Experiments:
Note: Minimum 15 experiments should be performed from the following:

1. Write a Program (WAP) to calculate Sum & average of N numbers.
2. WAP to convert integer arithmetic to a given number of day and month.
3. WAP to find maximum and minimum out of 3 numbers a, b & c.
4. WAP to find factorial of positive integer.
5. WAP to find sum of series up to n number, 2+5+8+…………………+n.
6. WAP to print all the number between 1 to 100 which are dividing by 7.
7. WAP to generate Fibonacci series up to n.
8. WAP to calculate area of circle using Functions.
9. WAP to calculate factorial of given number using Recursion function.
10. WAP to find whether number is prime or not.
11. WAP to find that the enter character is a letter or digit.
12. WAP to find addition of two matrix of n*n order.
13. WAP to find multiplication of two matrix of n*n order.
14. WAP to find even or odd up to a given limit n.
15. WAP to find whether a given no is palindrome or not.
16. WAP to Swap two numbers using third Variable and without using third variable.
17. WAP to Swap two numbers using call by value and call by reference.
18. WAP illustrating overloading of various operators.
19. WAP illustrating use of Friend.
20. WAP illustrating use of Inline Function.
21. WAP illustrating use of destructor and various types of constructor.
22. WAP illustrating various forms of Inheritance.
23. WAP illustrating use of virtual functions, virtual Base Class.

Evaluation Scheme of Practical Examination:
Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

<table>
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<tr>
<th>PRACTICAL PERFORMANCE &amp; VIVA DURING THE SEMESTER (35 MARKS)</th>
<th>ON THE DAY OF EXAM (15 MARKS)</th>
<th>TOTAL INTERNAL (50 MARKS)</th>
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<tr>
<td>EXPERIMENT (5 MARKS)</td>
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<tr>
<td>FILE WORK (10 MARKS)</td>
<td>VIVA (10 MARKS)</td>
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<td>ATTENDANCE (10 MARKS)</td>
<td>VIVA (10 MARKS)</td>
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External Evaluation (50 marks)
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

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<th>EXPERIMENT (20 MARKS)</th>
<th>FILE WORK (10 MARKS)</th>
<th>VIVA (20 MARKS)</th>
<th>TOTAL EXTERNAL (50 MARKS)</th>
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</table>
Semester I
DISCIPLINE & GENERAL PROFICIENCY

Course Code: BGP111

There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.
2. Participation in Conferences /Workshops / Seminars.
3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.
4. Participation in community projects including NSS.
5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.
6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.
7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.
8. General behavior

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IIInd & IIIrd CT in semester:

<table>
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<tr>
<th>S No</th>
<th>Enroll No.</th>
<th>Student Name</th>
<th>Dress code</th>
<th>Participation in Conferences /Workshops / Seminars</th>
<th>Participation in guest lectures, invited talks and special technical sessions</th>
<th>Participation in community Services</th>
<th>Participation in Culture &amp; extra curriculum activities, Department Club Activities</th>
<th>General Behavior</th>
<th>Any Extra Achievement</th>
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<tr>
<th>Responsible for marks</th>
<th>Mentor</th>
<th>Head</th>
<th>Head</th>
<th>Mentor</th>
<th>Cultural Events Coordinator &amp; Department Club Coordinator</th>
<th>Sports Coordinator</th>
<th>Mentor</th>
<th>Director or Principal</th>
</tr>
</thead>
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Semester-II
Electricity and Magnetism

Course Code: BAS218

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**Objective:** To provide a detailed and thorough knowledge of the basic concept of electricity and magnetism.

**Course Outcomes:** After completion of the course, students will be able to understand
- The basic concept of electric field and potential and the method of their calculation using Gauss Law.
- Basics of dielectric polarization of matter, capacitor.
- The applications of magnetic field, ampere law etc.

**Course Contents:**

**Unit I**

(08 Lectures)

**Electric Field and Electric Potential:**

**Electric field:** Electric field lines, Electric flux, Gauss’ Law with applications to charge distributions with spherical, cylindrical and planar symmetry. Electrostatic Potential. Laplace’s and Poisson equations (Only statement). The Uniqueness Theorem. Potential and Electric Field of a dipole. Force and Torque on a dipole.

**Unit II**

(08 Lectures)


**Series & Parallel LCR Circuit:** (1) Resonance, (2) Power Dissipation and (3) Quality Factor, and (4) Band Width.

**Unit III**

(08 Lectures)

**Dielectric Properties of Matter:**

Electric Field in matter. Polarization, Polarization Charges. Electrical Susceptibility and Dielectric Constant. Capacitor (parallel plate, spherical, cylindrical) filled with dielectric. Displacement vector \( \mathbf{D} \). Relations between \( \mathbf{E} \), \( \mathbf{P} \) and \( \mathbf{D} \). Gauss’ Law in dielectrics. **Network Theorems:** Thevenin theorem, Norton theorem, Superposition theorem.

**Unit IV**

(08 Lectures)

**Magnetic Field:** Magnetic force between current elements and definition of Magnetic Field \( \mathbf{B} \). Biot-Savart’s Law and its simple applications: straight wire and circular loop. Ampere’s Circuital Law and its application to (1) Solenoid and (2) Toroid (3) Infinite long wire. Magnetic Force on (1) point charge (2) current carrying wire (3) between current elements.
Unit V

(08 Lectures)


Text & Reference Books:

2. Electricity and Magnetism, Edward M. Purcell, McGraw-Hill Education.
3. Introduction to Electrodynamics, D.J. Griffiths, Benjamin Cummings.

* Latest editions of all the suggested books are recommended
Semester-II
Waves & optics

Course Code: BAS220

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Objective: To understand the fundamentals of physics like geometrical optics & wave motion, electromagnetic theory, wave optics: diffraction, interferometer and holography etc.

Course Outcomes: After completion of the course, student will be able to -
1. get the idea of geometrical optics including the wave motion
2. provide basic and advanced concept of holography, interference and diffraction.

Course Contents:

Unit-I (8 Lectures)
Geometrical optics: Fermat’s principle, reflection and refraction at plane interface, Application to thick lenses, Ramsden and Huygens eyepiece.

Unit-II (8 Lectures)
Superposition of two perpendicular Harmonic Oscillations: Graphical and Analytical methods. Lissajous Figures (1:1 and 1:2) and their uses. Superposition of N harmonic waves.

Unit-III (8 Lectures)

Unit-IV (8 Lectures)

Unit-V (8 Lectures)
Fresnel Diffraction: Fresnel’s Assumptions. Fresnel’s Half-Period Zones for Plane Wave, Explanation of Rectilinear Propagation of Light. Theory of a Zone Plate: Multiple Foci of a Zone Plate. Fresnel’s Integral, Fresnel diffraction pattern of a straight edge, a slit and a wire.
### Text & Reference Books:


*Latest editions of all the suggested books are recommended*
Objective: The objective of this course to introduce the basic principles and methodologies of Physical chemistry, Clarity of concepts concerning Gaseous state, Phase rule, First law of thermodynamics etc. This course also provides the students an overview of the fundamental theories and application of Physical materials.

Course Outcomes: On successful completion of course students will have

- A broad knowledge of principle and concepts of fundamental of Physical Chemistry.
- Able to learn the laws and theories acting behind Gaseous state, Phase rule, Ist law of thermodynamics, photochemical reactions etc.
- Student are able to understand the underlying physical and chemical phenomena behind the liquid and solid state.
- A detail knowledge of ionic equilibria.

Unit – I

Gaseous state:
Postulates and derivation of the kinetic gas equation; collision frequency; collision diameter; mean free path, including their temperature and pressure dependence. Behavior of real gases: Deviations from ideal gas behavior, compressibility factor, Z, Causes of deviation from ideal behavior. Van der Waals equation of state, its derivation and application in explaining real gas behavior, virial equation of state; van der Waals equation expressed in virial form and calculation of Boyle temperature.

Unit – II

Liquid state
Qualitative treatment of the structure of the liquid state; Radial distribution function; physical properties of liquids; vapor pressure, surface tension and coefficient of viscosity, and their determination. Effect of addition of various solutes on surface tension and viscosity. Explanation of cleansing action of detergents. Temperature variation of viscosity of liquids and comparison with that of gases.

Unit – III

Solid state
Nature of the solid state, law of constancy of interfacial angles, law of rational indices, Miller indices, elementary ideas of symmetry, symmetry elements and symmetry operations, qualititative idea of point and space groups, seven crystal systems and fourteen Bravais lattices; Bragg’s law, Analysis of powder diffraction patterns of NaCl, CsCl and KCl. Defects in crystals.
Unit – IV

Ionic equilibria I

Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect; dissociation constants of mono-, di- and triprotic acids (exact treatment).

Unit – V

Ionic equilibria II

Salt hydrolysis—calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions; derivation of Henderson equation and its applications; buffer capacity, buffer range, buffer action and applications of buffers. Solubility and solubility product of sparingly soluble salts – applications of solubility product principle, Theory of acid–base indicators; selection of indicators and their limitations.

Text & Reference Books:

2. Castellan, G. W. Physical Chemistry Narosa.

* Latest editions of all the suggested books are recommended
Semester II
Environmental Studies

Course Code: BAS214/EAS115/BAS328/BAS428
L T P C 1 2 0 2

Objective: To create awareness among students about environment protection.

Course Outcomes:
Based on this course, the Engineering graduate will understand / evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development.

Course Content:
Unit I (Lectures 08)
Definition and Scope of environmental studies, multidisciplinary nature of environmental studies, Concept of sustainability & sustainable development.

Unit II (Lectures 08)
Natural Resources: Renewable & Non-Renewable resources; Land resources and landuse change; Land degradation, Soil erosion & desertification. Deforestation: Causes & impacts due to mining, Dam building on forest biodiversity & tribal population. Energy Resources: Renewable & Non-Renewable resources, Energy scenario & use of alternate energy sources, Case studies.
Biodiversity: Hot Spots of Biodiversity in India and World, Conservation, Importance and Factors Responsible for Loss of Biodiversity, Biogeographical Classification of India

Unit III (Lectures 08)
Environmental Pollutions: Types, Causes, Effects & control; Air, Water, soil & noise pollution, Nuclear hazards & human health risks, Solid waste Management: Control measures of urban & industrial wastes, pollution case studies

Unit IV (Lectures 08)

Unit V (Lectures 08)
Human Communities & Environment:
Human population growth; impacts on environment, human health & welfare, Resettlement & rehabilitation of projects affected person: A case study, Disaster Management; Earthquake, Floods & Droughts, Cyclones & Landslides, Environmental Movements; Chipko, Silent Valley, Vishnoi’s of Rajasthan, Environmental Ethics; Role of Indian & other regions & culture in environmental conservation, Environmental communication & public awareness; Case study
Field Work:
1. Visit to an area to document environmental assets; river/forest/flora-fauna etc.
2. Visit to a local polluted site: urban/ rural/industrial/agricultural.
3. Study of common plants, insects, birds & basic principles of identification.
4. Study of simple ecosystem; pond, river etc.

Text Books:

Reference Books:
1. “Biodiversity and Conservation”, Bryant, P. J., Hypertext Book

*Latest editions of all the suggested books are recommended.*
Semester II  
English Communication and Soft Skills-II

Course Code: BHM249/EHM249

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Objectives:
1. To enhance the vocabulary of learners to address competitive exams like PGT & TGT.
2. To develop ability of sentence construction.
3. To enhance learner’s writing ability.
4. To make the learner effective in presenting himself/herself.

Course Outcomes: At the end of the semester, the learner will be able to
1. Learn additional 100 words apart from 50 words learnt in preceding semester (3 words/lecture)
2. Write letters effectively.
3. Acquire competence in constructing short sentences dealing day to day activities with grammatical accuracy.
4. Express themselves before class / in a group and attain proficiency in deliverance.
5. Acquire adequate knowledge of grammar to address competitive exams like PGT & TGT.

Course Contents:

Unit – I Vocabulary & Grammar (14 hours)
- Homophones, Homonyms, Synonyms, Antonyms and one-word substitution.
- Parts of Speech, Modals, Tenses and Simple sentence construction.

Unit – II Listening Skills (05 hours)
- Difference between listening & hearing, Types of Listening, Process
- Importance and Barriers to listening

Unit – III Writing Skills (08 hours)
- Letters and Email writing
- Story Narration

Unit – IV Strategies & Structure of Presentation and Problem Sounds (13 hours)
- Managing Time, Audience & Locale, Structure and Organization of Content and 5 W’s
- Problem Sounds: S-Sh, J-Z and V-B*

Reference Books:
Methodologies:
1. Words and exercises, usage in sentences.
2. Sentence construction on daily activities and conversations.
3. Format and layout to be taught with the help of samples and preparing letters on different subjects.
4. JAM sessions and Picture presentation.
5. Tongue twisters, Newspaper reading and short movies.

Note:
- 3 words per class will be taught with meaning, usage & correct pronunciation to ensure progressive learning.
- Class (above 30 students) will be divided into two groups for effective teaching.
- For effective conversation practice, groups will be changed weekly.
- Repeated practice of sound.

Evaluation Scheme

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<th>Internal Evaluation</th>
<th>External Evaluation</th>
<th>Total Marks</th>
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<td>30 Marks (Progressive Evaluation)</td>
<td>20 Marks Midway external assessment (Oral Presentation) *</td>
<td>40 Marks (Written Examination)</td>
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<td>After each unit-completion: Assignments / oral Presentation</td>
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* Parameters of Midway external assessment Oral Presentation

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<th>Content</th>
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<th>Question responsiveness</th>
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Note:
Midway Assessment: To take corrective actions, midway assessment will be conducted by 2-member committee of Director’s nominee (not by the faculty teaching English courses) and average of the two would be the 20 marks obtained by the students after two units are completed. The marks in sealed envelope will be sent to Examination Department.

Written Examination: There would be four questions with internal choice one from each unit of 10 marks.
Semester-II
Electricity and Magnetism (Lab)

Course Code: BAS268

L  T  P  C
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Objective: To learn practically the various types of circuits, determination of low resistance and measurement of physical properties.

Course Outcomes: After completion of the lab course, student will be able to understand
- Series and parallel LCR circuits with their applications and various properties
- The network theorems like, Thevenin theorem and Norton theorem
- The self-inductance of a coil by Rayleigh’s method and measurement of low resistance

List of Experiments:

Note: Select any ten experiments from the following list.

1. Use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, (d) Capacitances, and (e) Checking electrical fuses.
2. To study the characteristics of a series RC Circuit.
3. To determine an unknown Low Resistance using Potentiometer.
4. To determine an unknown Low Resistance using Carey Foster’s Bridge.
5. To compare capacitances using De’Sauty’s bridge.
7. To verify the Thevenin theorem.
8. To verify Norton theorem.
9. To determine self-inductance of a coil by Anderson’s bridge.
10. To study response curve of a Series LCR circuit and determine its (a) Resonant frequency, & Impedance at resonance,
11. To study response curve of a Series LCR circuit and determine its (a) Quality factor Q, & (b) Band width.
12. To study the response curve of a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q.
14. To determine self-inductance of a coil by Rayleigh’s method.

Reference Books
1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, Asia Publishing House
2. A Text Book of Practical Physics, I.Prakash & Ramakrishna, 11th Ed., Kitab Mahal
3. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, Heinemann Educational Publishers
5. A Laboratory Manual of Physics for undergraduate classes, D.P. Khandelwal, Vani Pub

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

<table>
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<tr>
<th></th>
<th>PRACTICAL PERFORMANCE &amp; VIVA DURING THE SEMESTER (35 MARKS)</th>
<th>ON THE DAY OF EXAM (15 MARKS)</th>
<th>TOTAL INTERNAL (50 MARKS)</th>
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<td>EXPERIMENT (5 MARKS)</td>
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External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

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Objective: To compute practically the various types of optical properties, study of various interference pattern, determination of refractive index and measurement of dispersive power of grating.

Course Outcomes: After completion of the lab course, student will be able to understand
1. The optical properties with their use
2. Schuster`s focusing
3. The various interference patterns

List of Experiments:
Note: Select any ten experiments from the following list.

1. To determine the frequency of an electric tuning fork by Melde`s experiment and verify $\lambda^2 - T$ law.
2. To investigate the motion of coupled oscillators.
3. To study Lissajous Figures.
4. Familiarization with: Schuster`s focusing; determination of angle of prism.
5. To determine refractive index of the Material of a prism using sodium source.
6. To determine the dispersive power and Cauchy constants of the material of a prism using mercury source.
7. To determine the wavelength of sodium source using Michelson`s interferometer.
8. To determine wavelength of sodium light using Fresnel Bi-prism.
10. To determine the thickness of a thin paper by measuring the width of the interference fringes produced by a wedge-shaped Film.
11. To determine wavelength of (1) Na source or (2) spectral lines of Hg source using plane diffraction grating.
12. To determine dispersive power and resolving power of a plane diffraction grating.

Reference Books
1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, Asia Publishing House
2. A Text Book of Practical Physics, I. Prakash & Ramakrishna, Kitab Mahal.
3. Advanced level Physics Practical, Michael Nelson and Jon M. Ogborne, Heinemann Educational Publishers

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

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B.Sc. (Hons.) Physics Syllabus Applicable w.e.f. Academic Session 2017-18
Semester-II
Fundamentals of Physical Chemistry (Lab)

Course Code: BAS269

Objective: To learn the various types of reactions via practically, chemical kinetics properties and determination of heat capacity, enthalpy and surface tension.

Course Outcomes: After completion of the lab course, student will be able to understand
1. The procedure of experiment with their calculation
2. The enthalpy, chemical kinetics, viscosity and surface tension etc.

List of experiments

1. Determination of heat capacity of calorimeter for different volumes.
2. Determination of enthalpy of neutralization of hydrochloric acid with sodium hydroxide.
3. Determination of enthalpy of ionization of acetic acid.
4. Determination of integral enthalpy of solution of salts (KNO₃, NH₄Cl).
5. Determination of enthalpy of hydration of copper sulphate.
6. Determination of the surface tension of a liquid or a dilute solution using a stalgmometer.
7. Determination of the relative and absolute viscosity of a liquid or dilute solution using an Ostwald’s viscometer.
8. Chemical Kinetics Study the kinetics of the following reactions.
   a). Initial rate method: Iodide-persulphate reaction
   b). Integrated rate method:
9. Acid hydrolysis of methyl acetate with hydrochloric acid.

Text & Reference Books


Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.
Evaluation scheme:

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Semester II
DISCIPLINE & GENERAL PROFICIENCY

Course Code: BGP211

There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.
2. Participation in Conferences /Workshops / Seminars.
3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.
4. Participation in community projects including NSS.
5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.
6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.
7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.
8. General behavior

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IIInd & IIIrd CT in semester:

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<th>Participation in guest lectures, invited talks and special technical sessions</th>
<th>Participation in Community Services</th>
<th>Participation in Culture &amp; Extra curriculum activities, Department Club Activities</th>
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Semester-III
Elements of Modern Physics

Course Code: BAS314

Course Content: 4 0 0 4

Objective: To learn basics of modern Physics, Planck’s quantum and fundamental of quantum relations.

Course Outcomes: After completion of the course, student will be able to understand
1. The basic laws of quantum and their relations etc.
2. the Fission and fusion- Lasers
3. The law of decay and stability of the nucleus, electron-positron pair creation etc.

Course Contents:

Unit-I (08 Lectures)
Planck’s quantum-I: Planck’s constant and light as a collection of photons; Blackbody Radiation: Quantum theory of Light; Photo-electric effect and Compton scattering. De Broglie wavelength and matter waves. Two-Slit experiment with electrons.

Unit-II (08 Lectures)
Planck’s quantum-II: Two slit interference experiment with photons, atoms and particles; linear superposition principle as a consequence; Matter waves and wave amplitude; Schrodinger equation for non-relativistic particles

Unit-III (08 Lectures)
Schrodinger Equations: Schrodinger equations, Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an electron being in the nucleus as a consequence of the uncertainty principle. Nature of nuclear force

Unit-IV (08 Lectures)
Fission and fusion: Mass deficit, relativity and generation of energy; Fission - nature of fragments and emission of neutrons. Fusion and thermonuclear reactions driving stellar energy.

Unit-V (08 Lectures)
Radioactivity: stability of the nucleus; Law of radioactive decay; Mean life and half-life; Alpha decay; Beta decay- energy released, spectrum and Pauli’s prediction of neutrino; Gamma ray emission, energy-momentum conservation: electron-positron pair creation by gamma photons in the vicinity of a nucleus.

Reference Books:
2. Introduction to Quantum Mechanics, David J. Griffith, Pearson Education.
7. Six Ideas that Shaped Physics: Particle Behave like Waves, T. A. Moore, McGraw Hill.

* Latest editions of all the suggested books are recommended
Semester-III
Mathematical Physics- II

Course Code: BAS318

Objective: To learn Fourier series, Frobenius method, theory of errors and special functions.

Course Outcomes: After completion of the course, student will be able to understand
- The special functions with their use
- The problems with their solution in Physics
- The theory of errors

Course Content

Unit-I (08 Lectures)
Fourier Series:

Unit-II (08 Lectures)
Power series and Frobenius Method:

Unit-III (08 Lectures)
Special Functions:
Legendre, Bessel and Differential Equations. Properties of Legendre Polynomials: Rodrigues Formula, Generating Function, Orthogonality. Simple recurrence relations. Bessel Generating Function, simple recurrence relations. Zeros of Bessel Functions \( J_0(x) \) and \( J_1(x) \) and Orthogonality, Hermite Polynomials (without proof).

Unit-IV (08 Lectures)
Some Special Integral & Theory of Errors:

Unit-V (08 Lectures)
Partial Differential Equations:
Text & Reference Books:

4. Mathematical methods for Scientists & Engineers, D.A. McQuarrie, Viva Books

*Latest editions of all the suggested books are recommended
Semester-III
Thermal Physics

Course Code: BAS320

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**Objective:** To learn laws of thermodynamics, entropy, and Maxwell’s thermodynamic relations.

**Course Outcomes:** After completion of the course, student will be able to understand

1. laws of thermodynamics, entropy, and Maxwell’s thermodynamic relations etc.
2. the Kinetic theory of gases-distribution of velocities, molecular collisions in Physics
3. The basics of real gases

**Course Content**

**Unit-I**

(08 Lectures)

**Introduction to Thermodynamics:**

**Unit-II**

(08 Lectures)

**Entropy & Thermodynamic Potentials:**

**Unit-III**

(08 Lectures)

**Maxwell’s Thermodynamic Relations:**

**Unit-IV**

(08 Lectures)

**Kinetic Theory of Gases-Distribution of Velocities, Molecular Collisions:**
Unit-V (08 Lectures)

Real Gases:

Text & Reference Books:

* Latest editions of all the suggested books are recommended.
Semester-III
Fundamentals of Organic Chemistry

Course Code: BAS321

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Objective: To learn the various types of reactions, rearrangements and their synthetic utility and Concept of isomerism, Alcohols and Organometallic Compounds.

Course Outcomes:
- The syllabus provides an understanding of fundamentals of organic chemistry like hybridization electronic displacement hemolytic and heterolytic fission in organic molecules. The organic intermediate carbocations carbanions carbenes plays important role in chemical knowledge in various type of organic reaction.
- In modern day, organic chemistry stereochemistry plays an important role to know the rate of reactions in various stereoisomers.

Course Content:

Unit – I (08 Lectures)
Basics of Organic Chemistry I:
Electronic Displacements: Inductive, electrometric, resonance and mesomeric effects, hyperconjugation and their applications; Dipole moment; Organic acids and bases; their relative strength.

Unit – II (08 Lectures)
Basics of Organic Chemistry II:
Homolytic and Heterolytic fission. Curly arrow rules, formal charges; Electrophiles and Nucleophiles; Nucleophlicity and basicity; Types, shape and their relative stability of Carbocations, Carbanions, Free radicals and Carbenes.

Unit – III (08 Lectures)
Chemistry of Carbon-Carbon pi bonds:
Formation of alkenes and alkynes by elimination reactions, Mechanism of E1, E2, E1cb reactions. Saytzeff and Hofmann eliminations.
Reactions of alkenes: Electrophilic additions their mechanisms (Markownikoff/ Anti Markownikoff addition), hydroboration-oxidation, ozonolysis, reduction (catalytic and chemical). 1,2-and 1,4-addition reactions in conjugated dienes and, Diels-Alder reaction; Allylic bromination and mechanism, e.g. propene, 1-butene.
Reactions of alkynes: Acidity, Electrophilic and Nucleophilic additions. Hydration to form carbonyl compounds, Alkylation of terminal alkynes.
Unit – IV  \hspace{1cm} (08 Lectures )

**Stereochemistry:**
Fischer Projection, Newmann and Sawhorse Projection formulae and their interconversions;
Optical Isomerism: Optical Activity, Specific Rotation, Chirality/Asymmetry, Enantiomers,
Molecules with two or more chiral-centres, Distereoisomers, meso structures, Racemic mixture
and resolution. Relative and absolute configuration: D/L and R/S designations.

Unit – V  \hspace{1cm} (08 Lectures)

**Aromatic Hydrocarbons:**
Aromaticity: Hückel’s rule, aromatic character of arenes, cyclic carbocations/carbanions and
heterocyclic compounds with suitable examples. Electrophilic aromatic substitution:
halogenation, nitration, sulphonation and Friedel-Craft’s alkylation/acetylation with their
mechanism. Directing effects of the groups.

**Text & Reference Books:**


*Latest editions of all the suggested books are recommended*
Semester-III
English Communication and Soft Skills-III

Course Code: BHM349/EHM349/449

Objectives:

1. To enable the learners to upgrade their knowledge of grammar and vocabulary to address competitive exams like PGT & TGT.
2. To enable the learner to improve their listening.
3. To enable the learners to improvise their voice modulation in reading and speaking.
4. To enable the learners to enhance their writing and comprehensive skills in English
5. To enable the learners to proactively participate in activities in situational context.

Course Outcomes: At the end of the semester, the learners will be able to

1. Refine their usage of English grammar in day to day context.
2. Acquire adequate knowledge of grammar to address competitive exams like PGT & TGT.
3. Use advance English language by using variety of words i.e. idioms and phrase in variety of sentences in functional context.
4. Improve their listening to understand the basic content.
5. Improvise their voice modulation while reading and speaking something.
6. Enhance writing and comprehensive skills in English.
7. Present simple power point presentation (PPT).
8. Proactively participate in activities in situational context (like impromptu).

Course Contents:

Unit – I Grammar & Vocabulary (14 hours)

- Correction of Common Errors (with recap of English Grammar with its usage in practical context.)
- Synthesis of sentences: Simple, complex and compound Sentences
- Transformation of sentences
- Commonly used Idiom & Phrases (Progressive learning whole semester)

Unit – II Essence of Effective listening & speaking (12 hours)

- Listening short conversation/ recording (TED talks / Speeches by eminent personalities)
  Critical Review of these abovementioned
- Voice Modulation: Five P’s - Pace, Power, Pronunciation, Pause, and Pitch.
- Impromptu
- Power Point Presentation (PPT) Skills: Nuances of presenting PPTs

Unit – III Reading and Comprehension Skills (08 hours)

- Strategies of Reading comprehension: Four S’s
- How to solve a Comprehension (Short unseen passage: 150-200 words)
- Reading Newspaper (Progressive learning whole semester)

Unit – IV Writing Skills (06 hours)

- Essentials of a paragraph
- Paragraph writing (100-120 words)
Reference Books:

2. Joseph, Dr. C.J. & Myall E.G. “A Comprehensive Grammar of Current English” Inter
   University Press, Delhi.
   Delhi.
5. Chaudhary, Sarla “Basic Concept of Professional Communication” Dhanpat Rai Publication,
   New Delhi.

Note:

- For effective communication practice, groups will be changed weekly
- Class (above 30 students) will be divided in to two groups for effective teaching.

Evaluation Scheme

<table>
<thead>
<tr>
<th>Internal Evaluation</th>
<th>External Evaluation</th>
<th>Total Marks</th>
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<tr>
<td>40 Marks</td>
<td>60 Marks</td>
<td>100</td>
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<tr>
<td>30 Marks (Progressive Evaluation)</td>
<td>20 Marks Midway external assessment (Oral Presentation) *</td>
<td>40 Marks (Written Examination)</td>
</tr>
<tr>
<td>(After each unit-completion: Assignments / oral Presentation)</td>
<td>* Parameters of Midway external assessment Oral Presentation</td>
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<tr>
<td>10 Marks (Attendance)</td>
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</table>

Note:

Midway Assessment: To take corrective actions, midway assessment will be conducted by 2-member
committee of Director’s nominee (not by the faculty teaching English courses) and average of the two
would be the 20 marks obtained by the students after two units are completed. The marks in sealed
envelope will be send to Examination Department.

Written Examination: There would be four questions with internal choice one from each unit of 10
marks.
Semester III

Database Management System

Course Code: BCS311/ECS611/411/511/MSC014 L T P C
3 1 0 4

Objective: Introducing the fundamental concepts necessary for designing, using, and implementing database systems and applications. The goal of this course is for students to become well-grounded in basic concepts necessary for understanding DB and their users, DBMS concepts, architecture, the concepts of the Entity Relationship(ER) model, the data abstraction and semantic modeling concepts leading to EER data model, describe the basic relational model, its integrity constraints and update operations, and the operation of relational algebra, describe relational schema design, and it covers the normalization and functional dependency algorithm.

Course Outcomes:
1. Be familiar with a commercial relational database system (Oracle) by writing SQL using the system.
2. Be familiar with the relational database theory, and be able to write relational algebra expressions for queries.
3. Be familiar with basic database storage structures and access techniques: file and page organizations, indexing methods including B-tree, and hashing.
4. Be familiar with the basic issues of transaction processing and concurrency control.

Course Contents:
Unit I: (Lectures 08)
Introduction: Scope and purpose of database system, view of data, relational databases, database architecture, transaction management, database system Vs filesystem, Database system concept and architecture, data definitions language, DML.

Data Models: The importance of data models, Basic building blocks, Business rules, The evolution of data models, Degrees of data abstraction

Unit II: (Lectures 08)
Database design and ER Model: overview, ER-Model, Constraints, ER-Diagrams, ERD Issues, weak entity etc, Codd’s rules, Relational Schemas, Introduction to UML, Relational database model: Logical view of data, keys, integrity rules.

Relational Database design: features of good relational database design, atomic domain and Normalization (1NF, 2NF, 3NF, BCNF)

Unit III: (Lectures 08)
Introduction on SQL: Characteristics of SQL, advantage of SQL. SQL data type and literals. Types of SQL commands. SQL operators and their procedure. Tables, views and indexes. Queries and sub queries. Aggregate functions. Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, and Procedures in SQL/PL SQL.

Unit IV: (Lectures 08)

Usage of Oracle:

1. Installing oracle
2. Creating Entity-Relationship Diagram using case tools.
3. Writing SQL statements Using ORACLE
4. MYSQL: a) Writing basic SQL SELECT statements.
   b) Restricting and sorting data.
   c) Displaying data from multiple tables.
   d) Aggregating data using group function.
   e) Manipulating data.
   f) Creating and managing tables.
5. Normalization in ORACLE.
6. Creating cursor in oracle.
7. Creating procedure and functions in oracle.
8. Creating packages and triggers in oracle.

Unit V: (Lectures 08)

Transaction management: ACID properties, serializability and concurrency control Lock based concurrency control (2PL, Deadlocks), Time stamping methods, optimistic methods, database recovery management.

Text Books:


*Latest editions of all the suggested books are recommended.*
Semester-III
Elements of Modern Physics (Lab)

Course Code: BAS364  

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</table>

Objective: To learn and understand the laws of modern Physics and fundamental of their relations practically.

Course Outcomes: After completion of the course, student will be able to understand

1. The Planck’s constant using black body radiation by various methods and measurement of work function of material etc.
2. The H-alpha emission line of Hydrogen atom and absorption lines in the rotational spectrum of Iodine vapour, etc.
3. The wavelength and measurement of it through single or double slit.

List of Experiments:

Note: Select any ten experiments from the following list.

1. Measurement of Planck’s constant using black body radiation and photo-detector
2. Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light.
3. To determine work function of material of filament of directly heated vacuum diode.
4. To determine the Planck’s constant using LEDs of at least 4 different colours.
5. To determine the wavelength of H-alpha emission line of Hydrogen atom.
6. To determine the ionization potential of mercury.
7. To determine the absorption lines in the rotational spectrum of Iodine vapour.
8. To determine the value of e/m by (a) Magnetic focusing or (b) Bar magnet.
9. To setup the Millikan oil drop apparatus and determine the charge of an electron.
10. To show the tunneling effect in tunnel diode using I-V characteristics.
11. To determine the wavelength of laser source using diffraction of single slit.
12. To determine the wavelength of laser source using diffraction of double slits.
13. To determine (1) wavelength and (2) angular spread of He-Ne laser using plane diffraction grating

Reference Books

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, Asia Publishing House
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, Heinemann Educational Publishers
3. A Text Book of Practical Physics, I.Prakash & Ramakrishna, Kitab Mahal.

* Latest editions of all the suggested books are recommended

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

<table>
<thead>
<tr>
<th>PRACTICAL PERFORMANCE &amp; VIVA DURING THE SEMESTER (35 MARKS)</th>
<th>ON THE DAY OF EXAM (15 MARKS)</th>
<th>TOTAL INTERNAL (50 MARKS)</th>
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<tr>
<td>EXPERIMENT (5 MARKS)</td>
<td>FILE WORK (10 MARKS)</td>
<td>VIVA (10 MARKS)</td>
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</table>

**External Evaluation (50 marks)**

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
Semester-III  
Thermal Physics (Lab)  

Course Code: BAS365  
L T P C  
0 0 3 2

Objective: To learn and understand the laws of thermal Physics and fundamental of their relations practically.

Course Outcomes: After completion of the course, student will be able to understand

1. The mechanical equivalent of heat and measurement of coefficient of thermal conductivity by various methods.
2. The temperature coefficient of resistance
3. The thermocouple to measure temperature, etc.

List of Experiments:

1. To determine Mechanical Equivalent of Heat, J, by Callender and Barne’s constant flow method.
2. To determine the Coefficient of Thermal Conductivity of Cu by Searle’s Apparatus.
3. To determine the Coefficient of Thermal Conductivity of Cu by Angstrom’s Method.
4. To determine the Coefficient of Thermal Conductivity of a bad conductor by Lee and Charlton’s disc method.
5. To determine the Temperature Coefficient of Resistance by Platinum Resistance Thermometer (PRT).
6. To study the variation of Thermo-Emf of a Thermocouple with Difference of Temperature of its Two Junctions.
7. To calibrate a thermocouple to measure temperature in a specified Range using (1) Null Method, (2) Direct measurement using Op-Amp difference amplifier and to determine Neutral Temperature.

Text & Reference Books

1. Advanced Practical Physics for students, B. L. Flint and H.T. Worsnop, 1971, Asia Publishing House

* Latest editions of all the suggested books are recommended

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

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<td>FILE WORK (10 MARKS)</td>
<td>ATTENDANCE (10 MARKS)</td>
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</table>

**External Evaluation (50 marks)**

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.
Semester-III
Fundamentals of Organic Chemistry (Lab)

Course Code: BAS366

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<td>Objective:</td>
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</table>

Objective: To learn the practical knowledge of various types of reactions, rearrangements and their synthetic utility.

Course Outcomes: Characterization of organic compound includes a number of steps-
(i) Preparation of organic compound and its purification
(ii) Detection of elements and functional group present in it
(iii) Detection of MP

All steps needed for the purpose will be learned in this laboratory.

List of Experiments
1. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing upto two extra elements)
2. Systematic Qualitative Organic Analysis of Organic Compounds possessing monofunctional groups (-COOH, phenolic, aldehydic, ketonic, amide, nitro, amines) and preparation of one derivative.
3. Preparations: Mechanism of various reactions involved to be discussed. Recrystallisation, determination of melting point and calculation of quantitative yields to be done.
   (a) Bromination of Phenol/Aniline
   (b) Benzoylation of amines/phenols
   (c) Oxime and 2,4-dinitrophenylhydrazone of aldehyde/ketone

Text & Reference Books:

1. Svehla, G. Vogel’s Qualitative Inorganic Analysis, Pearson Education.

* Latest editions of all the suggested books are recommended

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:
PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)  | ON THE DAY OF EXAM (15 MARKS)  | TOTAL INTERNAL (50 MARKS)
---|---|---
EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS) | ---

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) | ---
---|---|---|---|---

Semester III
DISCIPLINE & GENERAL PROFICIENCY

Course Code: BGP311

There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.
2. Participation in Conferences /Workshops / Seminars.
3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.
4. Participation in community projects including NSS.
5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.
6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.
7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.
8. General behavior

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IIInd & IIIrd CT in semester:

<table>
<thead>
<tr>
<th>S No</th>
<th>Enroll No.</th>
<th>Student Name</th>
<th>Dress code</th>
<th>Participation in Conferences /Workshops / Seminars</th>
<th>Participation in guest lectures, invited talks and special technical sessions</th>
<th>Participation in community Services</th>
<th>Participation in Culture &amp; extra curriculum activities, Department Club Activities</th>
<th>Participation in sports/ co-curricular activities</th>
<th>General Behavior</th>
<th>Any Extra Achievement</th>
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Semester-IV
Mathematical Physics-III

Course Code: BAS420  
L   T   P   C  
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Objective: The emphasis of the course is on applications in solving problems of interest to physicists. Students are to be examined on the basis of problems, seen and unseen.

Course Outcomes: After completion of the course, student will be able to understand
- Complex analysis and integration of a function etc.
- Integral transform and its use to solve various physical problems, etc.
- The Laplace transform with their use in Physics.

Course Content

Unit-I  (08 Lectures)

Unit-II  (08 Lectures)

Unit-III  (08 Lectures)

Unit-IV  (08 Lectures)
Laplace Transforms: Laplace Transform (LT) of Elementary functions. Properties of LTs: Change of Scale Theorem, Shifting Theorem. LTs of 1st and 2nd order Derivatives and Integrals of Functions, Derivatives and Integrals of LTs. LT of Unit Step function, Dirac Delta function, Periodic Functions.

Unit-V  (08 Lectures)

Text & Reference Books:

* Latest editions of all the suggested books are recommended
Semester-IV
Semiconductor Physics

Course Code: BAS421

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Objective: The aim of the course is to develop physics and engineering strategies of semiconductor materials and to discuss their functionalities in modern electronic and optoelectronic devices.

Course Outcomes: After completion of the course, student will be able to understand
- Solid state materials and k-space representation etc.
- Fermi distribution, DOS and carrier transport, etc.
- The processing of semiconductor devices like 1D, 2D & 3D photonic crystals.

Course Content:

UNIT-I (08 Lectures)

Introduction to solid state materials:
Crystal structure - Reciprocal lattice - Brillouin zone and rules for band (k - space) representation. Dynamics of electrons in periodic potential: Kronig - penny and nearly free electron models - Real methods for band structure calculations; Bandgaps in semiconductors - Holes and effective mass concept - Properties of conduction and valance bands.

UNIT-II (08 Lectures)


UNIT-III (08 Lectures)

Scattering Mechanism: electron - electron and electron - phonon scattering. Macroscopic transport: Carrier transport by Diffusion - Carrier transport by Drift: Low field, High field and very high field (Impact ionization) - Einstein relation.

UNIT-IV (08 Lectures)

Electron - hole pair generation and recombination: band to band (direct and indirect band gap transitions) and intra band (impurity related) transitions, free - carrier & phonon transitions. Excitons: Origin, electronic levels and properties Radiative and non-radiative recombination (Shockley - Read - Hall and Auger) processes. Carrier transport - continuity equations.

UNIT-V (08 Lectures)

Text & Reference Books:

2. "Fundamentals of Semiconductors" by Peter Y Yu and Manuel Cardona, Spriger.
3. "Introduction to Solid State Physics" by Charles Kittel, Willey.

* Latest editions of all the suggested books are recommended
Semester-IV
Atomic & Molecular Physics

Course Code: BAS422

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**Objective**
To provide a framework of understanding physics of atom and molecules, origin of X-Rays, Spectroscopic notation, rotational and vibrational spectra, Basics knowledge of Raman Spectra etc.

**Course Outcomes:** After completion of the course, student will be able to understand
- Be familiar with some of the early models of the atom.
- Understand Bohr’s model of the hydrogen atom and its relation to de Broglie waves.
- Know the basics mechanisms for production of X-rays, laser light etc.
- Be able to understand the Pauli Exclusion Principle, space quantization and Zeeman Effect.

**Course Contents:**

**Unit-I (Lectures 08)**

**Unit-II (Lectures 08)**

**Unit-III (Lectures 08)**

**Unit-IV (Lectures 08)**

**Unit V (Lectures 08)**
Text Books:

Reference Books:
1. Physics of Atoms and Molecules, Bransden and Joachein.
3. Optoelectronics by Ghatak and Thyagarajan
4. Principles of Lasers by Svelto

* Latest editions of all the suggested books are recommended
Semester-IV
Material Science

Course Code: BAS423

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**Objective:** To provide knowledge of internal structure of material, various defects that present in the structure of materials, microscopes and preparation of samples, phase diagram and Equilibrium diagram, phenomenon of transformations, different elastic properties visco-elastic behavior of polymers.

**Course Outcomes:**
- An ability to study important of materials, review of modern & atomic concepts in Physics and chemistry, analyzed Atomic packing factor and density, learn Miller indices, microscopes and preparation of sample, determination of grain structure, Crystallography and Imperfections
- An ability to learn Phase rule, Lever rule, non-crystalline and crystalline phases. Non-equilibrium in phase diagrams phase diagram and Equilibrium diagram Iron carbon diagram.
- Ceramic Systems and Other applications of phase diagrams. Time scale for phase changes, Nucleation kinetics, Growth of nuclei and solidification of alloys.
- Transformations in steel, Precipitation processes, Glass Transition; Recovery-crystallization and grain growth. Elastic behavior and its atomic model, Rubber like elasticity, inelastic behavior,
- An ability to study Visco-elastic behavior, and spring dash pot model, Plastic deformation.

**Course Contents:**

**Unit-I**

**Unit-II**
*Crystal Imperfections:* Point, line, surface and volume imperfections, dislocations and their geometry, Disorder in polymers and non-crystalline materials.

**Unit-III**
*Phase Diagrams:* Phase rule, Single component systems, Binary phase diagrams, Lever rule, phases in polymers, non-crystalline and crystalline phases. Non-equilibrium in phase diagrams, Cu-Zn system, Fe-C alloys, Ceramic Systems, Other applications of phase diagrams.

**Unit-IV**
*Phase Transformations:* Time scale for phase changes, Nucleation kinetics, Growth of nuclei and solidification of alloys, Transformations in steel, Precipitation processes, Glass Transition; Recovery, re-crystallization and grain growth.
Unit-V (Lectures 08)

**Elastic Properties:** Elastic behavior and its atomic model, Rubber like elasticity, inelastic behavior, Relaxation processes, Visco-elastic behavior, and spring dash pot model, Plastic deformation.

**Text Books:**
1. Introduction to Solid State Physics: C. Kittel, wiley.

**Reference Books:**

*Latest editions of all the suggested books are recommended*
Semester IV  
English Communication and Soft Skills – IV

Course Code: BHM499/EHM599/699  
L  T  P  C  
1  1  2  2

Objectives:
1. To enable the learners to inculcate the skills of technical writing.
2. To enable the learners to proactively participate in Job Oriented activities.
3. To enable the learners to be aware of corporate Skills.

Course Outcomes: At the end of the semester, the learners will be able to
1. Formulate their CVs along with cover letter in Job oriented perspective.
2. Communicate technically in functional context.
3. Proactively participate in Job Oriented activities. (Like Interview, GD etc.)
4. Aware of the skills required in corporate world.

Course Contents:

Unit – I: Job Oriented Skills  
(10 Hours)
- Cover Letter
- Preparing Resume and Curriculum-Vitae
- Writing Joining Report

Unit – II: Technical Communication  
(12 Hours)
- Technical description of engineering objects
- Data Interpretation: Tables, Charts, & Graphs
- Preparing Agenda & Minutes of the Meeting
- Technical Proposal: Types, Significance, Structure & AIDA
- Report Writing: Types, Structure& Steps towards Report writing

Unit- III: Interview Skills  
(10 Hours)
- Branding yourself
- Interview: Types of Interview, Tips for preparing for Interview and Mock Interview
- Group Discussion: Do’s and Don’ts of Group Discussion
- Negotiation skills

Unit – IV: Corporate Skills  
(8 Hours)
- Corporate Expectation
- Service mindset: Selling a product - Ad made shows
- Goal setting
- Team Building & Leadership
- Professional Ethics

Reference Books:
• Agrawal, Malti “Professional Communication” Krishana Prakashan Media (P) Ltd. Meerut.

**Note:**
- For effective communication practice, groups will be changed weekly
- Class (above 30 students) will be divided into two groups for effective teaching.

**Evaluation Scheme**

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</tr>
</tbody>
</table>

*Note: Midway external assessment of 25 marks will be submitted and considered with external evaluation with a total of 50 marks.*

**Parameters of Midway external assessment (Viva)**

<table>
<thead>
<tr>
<th>Knowledge of frequently asked questions</th>
<th>Body Language</th>
<th>Communication skills</th>
<th>Confidence</th>
<th>Voice Modulation</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>05 Marks</td>
<td>05 Marks</td>
<td>05 Marks</td>
<td>05 Marks</td>
<td>05 Marks</td>
<td>25 Marks</td>
</tr>
</tbody>
</table>

*Note: To take corrective actions, midway assessment will be conducted by 2-member committee of Director’s nominee (not by the faculty teaching English courses) and average of the two would be the 25 marks obtained by the students after two units are completed.*

**Parameters of External Viva**

<table>
<thead>
<tr>
<th>Knowledge of frequently asked questions</th>
<th>Body Language</th>
<th>Communication skills</th>
<th>Confidence</th>
<th>Voice Modulation</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>05 Marks</td>
<td>05 Marks</td>
<td>05 Marks</td>
<td>05 Marks</td>
<td>05 Marks</td>
<td>25 Marks</td>
</tr>
</tbody>
</table>

*Note: External Viva will be conducted by 3-member committee comprising*
  
a) Faculty teaching the class  
b) English faculty from other college of the University (As approved by VC).  
c) T&P officer of other colleges of the University (As approved by VC).

*Each member will evaluate on a scale of 25 marks and the average of three would be the 25 marks obtained by the students.*
Semester IV  
Design and Installation of Solar Photovoltaic System

Course Code: BAS464/EEC762 \hspace{1cm} L T P C  
\hspace{1cm} 0 2 2 2

Objective: To learn students-
- Basics of solar energy
- Installation, Maintenance and Service of solar power plant.
- Designing in AutoCAD
- Risk Management and to ensure safety and performance.

Course Outcomes: After completion, of course student should be able to-
- Explain the principles that underlie the ability of various natural phenomena to deliver solar energy
- Outline the technologies that are used to harness the power of solar energy
- Discuss the positive and negative aspects of solar energy in relation to natural and human aspects of the environment.
- Know all the design aspects of solar power plant.

Course Contents:

Unit-1  \hspace{1cm} (T Hrs-4.5, P Hrs - 3.5)
Solar PV technology overview: How does PV technology work, Other Types of Photovoltaic Technology, Costs of Solar Photovoltaics, Modern Photovoltaics.
Site survey, assessment & feasibility study: PV Site Location, Assumptions and Input Data for Analysis, Potential Rate Increases, Conclusions and Recommendations.

Unit-2  \hspace{1cm} (T Hrs-4, P Hrs -5)
Assess the customer’s Solar PV requirement: pv cost considerations, permits and covenants, stand-alone small solar electric systems, grid-connected small solar electric systems, estimating energy cost savings for net-metered pv system.
Capacity or system sizing approach: Solar PV system sizing, determine power consumption demands, Inverter sizing, Battery sizing, available area for installation of SPV.
Design of SPV Plants: Load estimation, Estimation of number of PV panels, Estimation of battery bank, Cost estimation of the system.

Unit-3  \hspace{1cm} (T Hrs-4, P Hrs -5)
Preparation of Bill of Materials (BoM): Mechanical or electrical components used to assemble or integrate major components, Size of the Plant, Type of Roof, Module Make and Specs, Inverter Make and Specs, Whether Remote Monitoring is separately required.
Installation, Maintenance and Service of SPV Plants: Modularity & scalability, Flexible location.
Civil and Mechanical parts of Solar PV System: Get Equipment Foundation constructed, Install Mounting System, Install Photovoltaic modules, Install Battery Bank Stand and Inverter Stand.
**Unit-4**

**Electrical components of Solar PV System:** Install Array JB, cost effective wiring, Using MCCBs and other essential components.

**Advanced Solar Power plant Engineering:** Photovoltaic Inverter Topologies for Grid Integration Applications, Advanced Control Techniques for PV Maximum Power Point Tracking, Maximum Power Point Tracking Methods for PV Systems, Photovoltaic Multiple Peaks Power Tracking Using Particle, Swarm Optimization with Artificial Neural Network Algorithm

**Intro – Google Sketchup, PV Syst, AutoCAD:** Creation of a grid-connected project, Construction and use of 3D shadings scenes, Meteorological data in PV-syst.

**Unit-5**

**Solar project development phases and issues:** Initiation phase, Definition phase, Design phase, Development phase, Implementation phase, Follow-up phase.

**Project planning and schedule of activities:** Management activities, Project planning, Project scheduling, Risk management, Risk identification, Risk analysis, Risk planning, Risk monitoring

**Best practices in design & installation to ensure safety and performance:** Work History, Financial Transparency, Health and Safety, Insurance.

**Evaluation of Practical Examination:**

**Internal Evaluation (50 marks)**

Each experiment (Min. 06 experiment) would be evaluated by external trainer or by faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by external trainer or the faculty concerned. The marks shall be entered on the index sheet of the practical file. Each experiment will be evaluated in 5 marks as per given distribution.

**Evaluation scheme:**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Experiment (10 marks)</th>
<th>Attendance (10 marks)</th>
<th>Test result (20 marks)</th>
<th>Viva (10 MARKS)</th>
<th>Average in 5 Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment 1</td>
<td></td>
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<tr>
<td>Experiment 2</td>
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<tr>
<td>Experiment 10</td>
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</tr>
</tbody>
</table>

**External Evaluation (50 marks)**

The external evaluation would also be done by the external trainer or industrial expert or by faculty based on the experiment conducted during the examination.

<table>
<thead>
<tr>
<th>EXPERIMENT (20 MARKS)</th>
<th>FILE WORK (10 MARKS)</th>
<th>VIVA (20 MARKS)</th>
<th>TOTAL EXTERNAL (50 MARKS)</th>
</tr>
</thead>
</table>
There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.
2. Participation in Conferences /Workshops / Seminars.
3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.
4. Participation in community projects including NSS.
5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.
6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.
7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.
8. General behavior

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IIInd & IIIrd CT in semester:

<table>
<thead>
<tr>
<th>S No</th>
<th>Enroll No.</th>
<th>Student Name</th>
<th>Dress code</th>
<th>Participation in Conferences /Workshops / Seminars</th>
<th>Participation in guest lectures, invited talks and special technical sessions</th>
<th>Participation in community Services</th>
<th>Participation in Culture &amp; extra curriculum activities, Department Club Activities</th>
<th>General Behavior</th>
<th>Any Extra Achievement</th>
</tr>
</thead>
<tbody>
<tr>
<td>(5)</td>
<td>(15)</td>
<td>(20)</td>
<td>(10)</td>
<td>(20)</td>
<td>(20)</td>
<td>(5)</td>
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</tr>
</tbody>
</table>

Responsible for marks:

- Mentor
- Head
- Head
- Mentor
- Cultural Events Coordinator & Department Club Coordinator
- Sports Coordinator
- Mentor
- Director or Principal
Semester-V
Electromagnetic Theory

Course Code: BAS520

L T P C
4 0 0 4

Objective: To learn laws of EM theory; e.g. Maxwell’s equations, wave propagation in unbounded media and bounded media, polarization of EM waves, waveguides and optical fibers.

Course Outcomes: After completion of the course, student will be able to understand

- Physical Concept of Electromagnetic Field Energy Density, Momentum Density and Angular Momentum Density with relative medium, etc.
- Fresnel's Formulae for perpendicular & parallel polarization cases and its use in higher order effects, etc.

Course Contents:

Unit I

Unit II
EM Wave Propagation in Unbounded Media: Wave Equations, Transverse nature of plane EM waves Plane EM waves through vacuum and isotropic dielectric medium, refractive index and dielectric constant, wave impedance. Propagation through conducting media, skin depth.

Unit III

Unit IV

Unit V
Text & Reference Books:

1. Introduction to Electrodynamics, D.J. Griffiths, Benjamin Cummings. Elements of Electromagnetics, M.N.O. Sadiku, Oxford University Press.
5. Electromagnetic Field Theory for Engineers & Physicists, G. Lehner, Springer.

* Latest editions of all the suggested books are recommended
Semester-V
Laser Physics

Course Code: BAS521

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</table>

**Objective:** The objective the course is to provide advanced learning of laser and its application in various areas of science technology research medicine.

**Course Outcomes:** After completion of the course student get familiarized with:
1. Basic concept of laser such as population inversion, stimulated Emission, Einstein Coefficient and its relation with life time, line broadening, optical resonator, principle of Q-switching
2. Various types of laser like solid state gas liquid etc
3. Laser application in science, medicine and in industry etc

**Course Contents:**

**Unit I** (08 Lectures)
Basic Principle of Laser, Einstein Coefficients, condition for Light Amplification- Population Inversion, threshold condition, Laser Rate Equations-two, three and four level systems.

**Unit II** (08 Lectures)
Laser power around threshold, optimum output coupling, Line Broadening Mechanisms – Natural, Collision and Doppler, Optical Resonators – Modes of a rectangular cavity and open planar resonator, Modes of a Con-focal resonator system, General Spherical resonator, Higher order modes.

**Unit III** (08 Lectures)
Principle of Q-switching, different methods of Q-switching, electro-optic Q-switching, and mode locking Laser Beam Propagation: Laser beam propagation, properties of Gaussian beam, Gaussian beam focusing

**UNIT-IV** (08 Lectures)
Types of Lasers: Solid State lasers - Ruby and Nd-YAG Laser; Gas lasers - He-Ne and CO₂ lasers; semiconductor lasers - Liquid Dye lasers

**UNIT-V** (08 Lectures)

**Text and References Books:**
3. Optics and LASER, by- V. K. Sewane
4. Introduction to Lasers, by- Dr. Avadhanulu, Dr. P. S. Hemne, Publisher: S. Chand & Company Ltd. New Delhi.

*Latest editions of all the suggested books are recommended*
Semester-V
Classical Mechanics

Course Code: BAS522

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</tbody>
</table>

Objective: To study systems of particles; Calculus of Variation, Lagrange's equation for non-holonomic systems, Virial theorem, Generalized Notations, Atwood’s machine & Twin Paradox.

Course Outcomes: After completion of the course, student will be able to understand
- Physical concept of Calculus of Variation, Lagrange's equation for non-holonomic systems, Virial theorem, etc.
- Velocity dependent potential of electro-magnetic field & its use.
- Linear Harmonic oscillator, Simple pendulum, Atwood’s machine.

Course Contents:

Unit I (08 Lectures)
System of particles, Constraints, Generalized coordinates, Velocity, acceleration and momentum and force, D'Alemberts principle and Lagrange's equation, Velocity dependent potential of electro-magnetic field.

Unit II (08 Lectures)
Calculus of Variation, Hamilton's principle, Lagrange's equation, Lagrangian for simple systems, Linear Harmonic oscillator, Simple pendulum, Atwood’s machine. Cyclic coordinates symmetries and conservation laws.

Unit III (08 Lectures)
Basic concepts of Classical mechanics: Lagrange's undetermined multipliers, Lagrange's equation for non-holonomic systems, Virial theorem, Principle of mechanical similarity, Legendre transformations and Hamilton's equations of motion, Hamiltonian for a charge particle in Electro-magnetic field, Hamilton equation for simple system.

Unit IV (08 Lectures)

Unit V (08 Lectures)
Generalized Notations-II: Two body central force problem, reduction to the equivalent one body problem Differential equation for the orbit and integrable power law potentials, Condition for stable circular orbit, Kepler problems.

Text and References Books:

* Latest editions of all the suggested books are recommended
Semester-V
Quantum Mechanics

Course Code: BAS523

L T P C: 4 0 0 4

Objective: To study origin of quantum theory through described experiments-mechanism, Uncertainty principle & Operators and its use, application of Schrödinger equation like, electron sharing in covalent bonds, fusion in the sun, cold emission, scanning tunneling microscope & indistinguishability in quantum mechanics, bosons and fermions.

Course Outcomes: After completion of the course, student will be able to understand

- The origin of quantum theory through described experiments-mechanism, etc.
- The application of Schrödinger equation like, electron sharing in covalent bonds, fusion in the sun, cold emission.
- The indistinguishability in quantum mechanics.

Course Contents:

Unit-I (08 Lectures)
Origin of quantum theory: Davisson-Germer experiments, wave-particle duality for photons and material particles, wave function and its Born interpretation, relation with measurement of dynamical variables, delta-function as definite position and plane wave as definite momentum wave function, wave packet as superposition of delta-functions and of plane waves.

Unit-II (08 Lectures)
Uncertainty principle & Operators: Position-momentum uncertainty principle, time energy uncertainty; Gaussian wave packets, applicability of classical physics on the basis of uncertainty product, operator formulation, commuting operators, simultaneous Eigen-functions, degenerate eigenfunctions, Schrödinger equation for time evolution.

Unit-III (08 Lectures)
Application of Schrödinger equation-I: Square well potentials, practical examples like metal-vacuum interface, contact potential between metals, bilayer and sandwiched, thin film etc., bound states in deep potential well and finite potential well, double, well potentials, delta function potentials and examples like electron sharing in covalent bonds.

Unit-IV (08 Lectures)
Application of Schrödinger equation-II: Linear harmonic oscillator, outline of getting stationary states, molecular vibrations and spectroscopy, barrier tunneling, examples of alpha-decay, nuclear fission, fusion in the sun.

Unit-V (08 Lectures)
Text and References Books:

1. Quantum Physics: S. Gasiorowicz.
4. Quantum Mechanics: V. Devanathan.
5. Quantum Mechanics: C. S. Chaddha

* Latest editions of all the suggested books are recommended
 Semester-V
Solid State Physics

Course Code: BAS524

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<tr>
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<td>4</td>
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</tbody>
</table>

Objective: To study physical properties of crystal structure like, lattice translation vectors, lattice with a basis unit cell, Miller Indices, reciprocal lattice, elementary of lattice dynamics, magnetic, dielectric and ferroelectric properties of matter, superconductivity and elementary band theory etc.

Course Outcomes: After completion of the course, student will be able to understand
- The physical properties of crystal structure like, lattice translation vectors, lattice with a basis unit cell.
- The physical significance in elementary of lattice dynamics, magnetic, dielectric and ferroelectric properties of matter, etc.
- The superconductivity and elementary band theory.

Course Contents:
Unit I (08 Lectures)

Unit II (08 Lectures)
Elementary Lattice Dynamics: Lattice Vibrations and Phonons: Linear Monoatomic and Diatomic Chains; Acoustical and Optical Phonons, Qualitative Description of the Phonon Spectrum in Solids. Dulong and Petit’s Law, Einstein and Debye theories of specific heat of solids; \( T^3 \) law.

Unit III (08 Lectures)

Unit IV (08 Lectures)

Unit V (08 Lectures)
Superconductivity and Elementary band theory: Critical Temperature. Critical magnetic field. Meissner effect. Type I and type II Superconductors, London’s Equation and Penetration

Text and References Books:
1. Introduction to Solid State Physics, Charles Kittel, Wiley India Pvt. Ltd.

* Latest editions of all the suggested books are recommended
Semester-V
Introduction to MATLAB

Course Code: BAS565

L  T  P  C
0  2  2  2

Objective: How to use MATLAB as a programming tool and how to write a program that is well documented and easy to read.

Course Outcomes:
- Write simple program modules to implement single numerical methods and algorithms
- Test program output for accuracy using hand calculations and debugging techniques
- Synthesize multiple program modules into larger program packages
- Able to generate plots and export this for use in reports and presentations.
- Able to use basic flow controls (if-else, for, while)

Course Contents:

Unit-I
MATLAB Software Working Environment: MATLAB Initializing & Ending, Quick Access Tool Bar, Command Window, Command History, Workspace Browser, Current folder window, Editor Window, Help Browser, Figure Window, Simulink Window, Creating Command Shortcuts, MATLAB Path Options MATLAB Programming, Debugging MATLAB codes.

Unit-II
Matrices: Arrays, Matrix representation, Matrix & Inverse of Matrix, Entry Retrieving, Matrix Division, Eigen values and vectors, Special matrices.

Unit-III
Solving Equations: Solution to first order differential Equations, Solving Second Order Differential Equations, Partial Fraction Expansion

Unit-IV
MATLAB Graphics: 2-D Plot, Plotting Process, Creating a Graph, Exploring Data, Editing the Graph Components, Annotating Graphs, Printing and Exporting Graphs, Accessing Properties with the Property Inspector, Plotting Two Variables with Plotting Tools, Changing the Appearance of Lines and Markers, Placing Markers at Every Tenth Data Point, Adding More Data to the Graph, To add data using the Plot Browser, Changing the Type of Graph, Modifying the Graph Data Source, Providing New Values for the Data Source, Figure Windows, Clearing the Figure for a New Plot, Controlling the Axes, Setting Axis Limits, Setting the Axis Aspect Ratio - Setting Axis Visibility, Setting Grid Lines.
Unit-V (Lectures 08)
Application Tools: Partial Differential Equation (PDE), Curve fitting

Text Books-
1. Amos Gilat, “MATLAB: An Introduction with Applications”, Wilay Publication

* Latest editions of all the suggested books are recommended
Semester-V
Laser Physics (Lab)

Course Code: BAS566

L T P C
0 0 3 2

Objective: To study various laws and physical constant practically like, Malus law for plane polarized light, Stefan’s law of radiation, Boltzmann constant using V-I characteristics of PN junction diode, Cauchy’s constant, etc.

Course Outcomes: After completion of the lab course, student will be able to understand
- The EM theory through described experiments-mechanism.
- The physical constant and their relations.

List of Experiments:
Note: Select any ten experiments from the following list.

1. To verify the law of Malus for plane polarized light.
2. To determine the specific rotation of sugar solution using Polarimeter.
3. To determine the wavelength and velocity of ultrasonic waves in a liquid (Kerosene Oil or Xylene) by studying the diffraction through ultrasonic grating.
4. To verify the Stefan’s law of radiation and to determine Stefan’s constant.
5. To determine the Boltzmann constant using V-I characteristics of PN junction diode.
6. To study Faraday’s effect.
7. To study Optical absorption – spectrophotometer.
8. Laser coherence and divergence measurement.
9. Determine of Cauchy’s constant by using spectrometer.
10. Determine of the grating radial spacing of the Compact Disc (CD) by reflection using He-Ne or solid state laser.
11. V-I Characteristics of IR sensor.
12. To find the polarization angle of laser light using polarizer and analyzer.
13. Study the Characteristics of LDR.
14. V-I Characteristics of LED.

Text and References Books:
3. Optics and LASER, by- V. K. Sewane
4. Introduction to Lasers, by- Dr. Avadhanulu, Dr. P. S. Hemne, Publisher: S. Chand & Company Ltd. New Delhi.

* Latest editions of all the suggested books are recommended

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

<table>
<thead>
<tr>
<th>PRACTICAL PERFORMANCE &amp; VIVA DURING THE SEMESTER (35 MARKS)</th>
<th>ON THE DAY OF EXAM (15 MARKS)</th>
<th>TOTAL INTERNAL (50 MARKS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXPERIMENT (5 MARKS)</td>
<td>EXPERIMENT (5 MARKS)</td>
<td></td>
</tr>
<tr>
<td>FILE WORK (10 MARKS)</td>
<td>VIVA (10 MARKS)</td>
<td></td>
</tr>
<tr>
<td>VIVA (10 MARKS)</td>
<td>ATTENDANCE (10 MARKS)</td>
<td></td>
</tr>
<tr>
<td>ATTENDANCE (10 MARKS)</td>
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</tr>
</tbody>
</table>

**External Evaluation (50 marks)**

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

<table>
<thead>
<tr>
<th>EXPERIMENT (20 MARKS)</th>
<th>FILE WORK (10 MARKS)</th>
<th>VIVA (20 MARKS)</th>
<th>TOTAL EXTERNAL (50 MARKS)</th>
</tr>
</thead>
<tbody>
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</table>

B.Sc. (Hons.) Physics Syllabus Applicable w.e.f. Academic Session 2017-18
Semester-V
Solid State Physics (Lab)

Course Code: BAS567

<table>
<thead>
<tr>
<th>L</th>
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<tr>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

**Objective:** To study physical properties of materials, Hall effect, dielectric constant, Characteristics of Transistor, Zener diode or Tunnel diode & magnetic susceptibility etc.

**Course Outcomes:** After completion of the lab course, student will be able to understand
- The physical properties of solid/liquid materials.
- Measurement of Hall coefficients & dielectric constant.
- The Characteristics of transistor, Zener diode or Tunnel diode & magnetic susceptibility.

**List of Experiments:**

**Note:** Select any ten experiments from the following list.

1. Measurement of resistivity by using 4-probe technique.
2. Study of Hall effect.
5. Study of thermoluminescence of color center
6. Study of magnetic hysteresis.
7. Measurement of dielectric constant.
8. Study of Raman effect.
10. Characteristics of Zener or Tunnel diode.

**Text and References Books:**

1. Introduction to Solid State Physics, Charles Kittel, Wiley India Pvt. Ltd.

*Latest editions of all the suggested books are recommended*

**Evaluation Scheme of Practical Examination:**

**Internal Evaluation (50 marks)**
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

<table>
<thead>
<tr>
<th>PRACTICAL PERFORMANCE &amp; VIVA DURING THE SEMESTER (35 MARKS)</th>
<th>ON THE DAY OF EXAM (15 MARKS)</th>
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</thead>
<tbody>
<tr>
<td>EXPERIMENT (5 MARKS)</td>
<td>FILE WORK (10 MARKS)</td>
<td>VIVA (10 MARKS)</td>
</tr>
</tbody>
</table>

B.Sc. (Hons.) Physics Syllabus Applicable w.e.f. Academic Session 2017-18 Page 90
External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

<table>
<thead>
<tr>
<th>EXPERIMENT (20 MARKS)</th>
<th>FILE WORK (10 MARKS)</th>
<th>VIVA (20 MARKS)</th>
<th>TOTAL EXTERNAL (50 MARKS)</th>
</tr>
</thead>
</table>


Semester V
DISCIPLINE & GENERAL PROFICIENCY

Course Code: BGP511  C-1

There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.
2. Participation in Conferences /Workshops / Seminars.
3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.
4. Participation in community projects including NSS.
5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.
6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.
7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.
8. General behavior

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IIInd & IIIrd CT in semester:

<table>
<thead>
<tr>
<th>S No</th>
<th>Enroll No.</th>
<th>Student Name</th>
<th>Dress code</th>
<th>Participation in Conferences /Workshops / Seminars</th>
<th>Participation in guest lectures, invited talks and special technical sessions</th>
<th>Participation in community Services</th>
<th>Participation in Culture &amp; extra curriculum activities, Department Club Activities</th>
<th>Participation in sports/ co-curricular activities</th>
<th>General Behavior</th>
<th>Any Extra Achievement</th>
</tr>
</thead>
<tbody>
<tr>
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<td>(5)</td>
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<td>(10)</td>
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<td>(20)</td>
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</tr>
</tbody>
</table>

Responsible for marks:

- Mentor
- Head
- Mentor
- Cultural Events Coordinator 
- Department Club Coordinator
- Sports Coordinator
- Mentor
- Director or Principal
Semester-VI
Statistical Mechanics

Course Code: BAS620

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<tr>
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<td>4</td>
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</tbody>
</table>

**Objective:** To learn laws of Statistical Mechanics; Classical theory of radiation, Quantum theory of radiation, M-B, B-E & F-D distribution laws.

**Course Outcomes:** After completion of the course, student will be able to understand
- Physical concept of Statistical Mechanics.
- Different laws of distribution like, M-B, B-E & F-D Statistics.

**Course Contents:**

**Unit I** *(Lectures 08)*


**Unit II** *(Lectures 08)*


**Unit III** *(Lectures 08)*


**Unit IV** *(Lectures 08)*

**Bose-Einstein Statistics:** B-E distribution law. Thermodynamic functions of a Completely Degenerate Bose Gas, Bose-Einstein condensation, properties of liquid He (qualitative description).

Radiation as photon gas, Bose’s derivation of Planck’s law.

**Unit V** *(Lectures 08)*


**Text Books:**
1. Statistical Physics: Berkeley Physics Course by F Reif (Tata McGraw-Hill Company Ltd.
**Reference Books:**
2. Statistical Mechanics by K. Huang, Wiley.

*Latest editions of all the suggested books are recommended*
Semester-VI
Nuclear & Particle Physics

Course Code: BAS621

Objective: To study physical properties of Nuclei and Models, Two-nucleon System, Nuclear Stability, Accelerators and Detectors and Elementary Particles etc.

Course Outcomes: After completion of the course, student will be able to understand

- The two-nucleon system.
- The physical significance in nuclei and models etc.
- The accelerators and detectors and elementary particles.

Course Contents:

Unit-I (08 Lectures)
Properties of Nuclei and Models: Introduction to the nucleus, Fermi gas model, Binding energy, Bethe-Weizsaecker mass formula and its application to explain most stable isobars and nuclear fission, Inferences of nuclear size from elastic electron-nucleus experiments (no derivation).

Unit-II (08 Lectures)
Nuclear Force and Two-nucleon System: Properties of nucleon-nucleon interaction, General forms of N-N potential, Description of low energy neutron-proton scattering to show the spin dependence of nuclear force, Ground state properties of deuteron, Simple consideration of deuteron using central potential (square well).

Unit-III (08 Lectures)
Nuclear Stability: Nucleon emission, separation energy, Alpha decay and its energy spectrum, Q-value, Gamow’s theory of alpha decay (no derivation), Beta decay and its energy spectrum (for example, 137Cs), Need for neutrinos, Q-value for beta decay, Gamma decay, Selection rules for gamma transitions (no derivation).

Unit-IV (08 Lectures)
Accelerators and Detectors: Van de Graaff and Linear accelerators, Synchrotrons, Geiger Muller detector, Scintillation detector.

Unit-V (08 Lectures)
Elementary Particles: Classification of particles and their interactions, Quantum numbers, Quarks as the building blocks of hadrons colour degree of freedom.

Text and References Books:
1. Introductory Nuclear Physics: S. S. M. Wong.
* Latest editions of all the suggested books are recommended
Semester-VI
Medical Physics

Course Code: BAS622

Objective: To study physical properties of X-rays, radiation units, exposure, absorbed dose, etc. imaging techniques and radiation therapy & protection physics etc.

Course Outcomes: After completion of the course, student will be able to understand

- The physical properties of X-rays, radiation units, exposure, absorbed dose.
- The imaging techniques.
- The radiation therapy & protection physics.

Course Contents:

Unit I


Unit II


Unit III


Unit IV


Unit V

Text and References Books:

2. Christensen’s Physics of Diagnostic Radiology: Curry, Dowdey and Murry - Lippincot Williams and Wilkins.
4. The essential physics of Medical Imaging: Bushberg, Seibert, Leidholdt and Boone Lippincot Williams and Wilkins.
5. HE Johns and Cunningham - The Physics of Radiology.
6. Nuclear medicine physics: Chandra - Lippincot Williams and Wilkins.

* Latest editions of all the suggested books are recommended
Semester-VI
Atmospheric Physics

Course Code: BAS623

Objective: The objective of this course is to provide the basic structure of earth atmosphere, their observation. Student will also learn remote sensing as well as atmospheric dynamics.

Course Outcomes: After completion of the course student will able to know

- The vertical composition and thermal structure of the atmosphere.
- The observational parameters and apparatus and physics behind them.
- The basic of space physics, remote sensing and atmospheric dynamics.

Course Contents:

Unit I: (Lectures 08)
Elements of earth’s atmosphere - Vertical variations in compositions of the atmosphere – homosphere, hetereosphere, ionosphere; auroras; thermal structure of the atmosphere – troposphere, stratosphere, mesosphere, thermosphere; horizontal distribution of temperature, pressure and density, distribution of winds, horizontal and vertical winds, land breeze and sea breeze.

Unit II (Lectures 08)
Atmospheric observations: Importance of meteorological observations, measurement of temperature and humidity, measurement of wind and pressure, measurement of precipitation, upper air observations - radiosonde, rawinsonde, rocketsonde, pyrgeometer, pyrheliometer, Radar, Doppler weather radar & applications.

Unit III (Lectures 08)
Space physics: Basics of ionosphere formation, D-, E- and F-layers, composition of the ionosphere, effect of terrestrial and solar radiation on earth’s atmosphere, photochemical processes, currents in ionosphere, electrical conductivity, techniques of ionosphere measurements

Unit IV (Lectures 08)
Remote sensing: Concepts of remote sensing, Energy interaction with earth’s surface features, Signatures of vegetation, soil and water bodies of the earth’s surface, Classification of remote sensors, Spectral, spatial and temporal resolution, IR and microwave sensors, Data reception and products, Application of Remote sensing for earth’s resource management.

Unit V (Lectures 08)
Atmospheric dynamics: Large scale motions, vorticity and divergence, streamline and trajectories, dynamics of horizontal flow – apparent and real forces, equation of motion, geostrophic wind, effect of friction, gradient wind, thermal wind, suppression of vertical
motions, conservation law for Vorticity, potential vorticity; primitive equations – pressure as a vertical coordinate, hydrostatic balance, thermodynamic energy equation.

**Reference & Text Books:**

3. A course in Dynamic meteorology, Naval Pandarinath, BS Publications.
5. Basic Space Plasma Physics: W Baumjohann and RA Treumann, Imperial College Press.

*Latest editions of all the suggested books are recommended*
Semester-VI

Open Elective

Introduction to Statistical Package for Social Sciences

Subject Code: BAS011

L T P C
3 0 0 3

Objectives: This course is intended for students with limited or no experience with the statistical package SPSS. This course is designed to give students the necessary skills to analyze research projects.

Course Outcomes:

- Understanding the layout and interface of SPSS
- Introducing the main menus
- Opening and creating new datasets
- Analyzing data using descriptive statistics

Course Contents-

Unit-I
(Lectures 08)
Introduction to SPSS: Overview of statistical packages; Data analysis with SPSS: General aspects, workflow, and critical issues; SPSS interface: data, variable, output, and syntax view; General description, functions, menus, and commands.

Unit-II
(Lectures 08) Input
and data management: Defining variables; Entering and modifying data: manual and automated input of data, and file import; Data Management: Listing cases, replacing missing values, computing new variables, exploring data, selecting cases, sorting cases, merging files etc.; Data Transformation; Output management.

Unit-III
(Lectures 08)
Descriptive analysis of data: Frequencies; Descriptive Statistics: measures of central tendency, variability, deviation from normality; Crosstabs and chi-square analyses; Charts: creating & editing graphs (Bar; histograms; scatter diagram; percentiles etc.).

Unit-IV
(Lectures 08)
Statistical tests: Parametric Tests: Means; t-test (Independent samples, paired samples, and one sample tests); One-way ANOVA; Non parametric tests: Mann-Whitney U, Wilcoxon signed-rank, Kruskal-Wallis.

Unit-V
(Lectures 08)
Correlation and regression: Correlation: Bivariate and Partial correlation; correlation matrix; Regression: Simple linear regression; Multiple regression analysis; Factor analysis, Cluster analysis.
Text and References Books:


*Latest editions of all the suggested books are recommended.
Industrial Chemistry

Course Code: BAS012

L T P C
3 0 0 3

Objective: Industrial chemistry course content include silicate technology, glass manufacturing, nitogenous & phosphate fertilizers and application of lubricants. The other industrial preparations are soap, detergents, paints, insecticides & drug.

Course Outcome:
Silicate is of great importance in our daily life as they are used in industry for making sheets. Production of glass, fertilizers and lubricants, soap, detergents, paints, insecticides & drug have great importance in human life.

Course Contents:
Unit I
Silicate Industries:
Glass: Glassy state and its properties, classification (silicate and non-silicate glasses). Manufacture and processing of glass. Composition and properties of the following types of glasses: Soda lime glass, lead glass, armoured glass, safety glass, borosilicate glass, fluorosilicate, coloured glass, photosensitive glass.
Ceramics: Important clays and feldspar, ceramic, their types and manufacture. High technology ceramics and their applications.
Cements: Classification of cement, ingredients and their role, Manufacture of cement and the setting process, quick setting cements.

Unit II
Fertilizers:
Different types of fertilizers. Need for fertilizers, Straight and mixed fertilizers, Sources of fertilizers, Artificial fertilizers, Manufacture of the following fertilizers: Urea, ammonium nitrate, calcium ammonium nitrate, Ammonium sulphate, ammonium phosphates; polyphosphate, superphosphate, compound and mixed fertilizers, potassium chloride, potassium sulphate. NPK fertilizers.

Unit III
Alloys:
Classification of alloys, ferrous and non-ferrous alloys, Specific properties of elements in alloys. Manufacture of Steel (removal of silicon decarbonization, demagnetization, desulphurization dephosphorisation) and surface treatment (argon treatment, heat treatment, nitriding, carburizing). Composition and properties of different types of steels.

Unit IV
Paints and Pigments: Introduction, Characteristic of the pigments Classification of paints, Manufacture of paints, for example white lead, Sublimed white lead (Basic sulphate), Zinc oxide, Lithophone, Titanium dioxide, manufacture, Ultramarine blue, Red lead, Chrome green, Guignet’s green, Reinmann’s green, Setting of the paints Requirements of a good paint Emulsion paints, Constituents of emulsion paints. Advantages, Luminescent paints. Heat resistant paints, Varnishes, Manufacturing of varnishes, Lacquers, Solvents and thinners.
Unit V  
Soaps & Detergents:  
(08 Lectures)  
Introduction to oils and fats; common fatty acids present in oils and fats, Hydrogenation of fats and oils, Saponification value, acid value, iodine number. Reversion and rancidity.  
Soap: Soap and its manufacture, Toilet and transparent soap, Other soaps, Oil to be used for soap, Cleansing action of soap.  
Detergents: Principal groups of synthetic detergents, Classification of surface active agents, Anionic detergents, Cationic detergents. Non-ionic detergents. Amphoteric detergents.  

Text & Reference Books:  

* Latest editions of all the suggested books are recommended
Introduction to Nanoscience & Technology

Course Code: BAS013

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Objective: To study physical properties of nanoscale systems, QDs, Synthesis of various nanomaterials, characterization & applications of nanomaterials etc.

Course Outcomes: After completion of the course, student will be able to understand
- The physical properties of nanoscale systems.
- The QDs, Synthesis of various nanomaterials.
- The characterization & applications of nanomaterials.

Course Contents:

Unit I  
Nanoscale Systems: Length, energy, and time scales - Quantum confinement of electrons in semiconductor nanostructures: Quantum confinement in 3D, 2D, 1D and zero dimensional structures - Size effect and properties of nanostructures - Landauer-Buttiker formalism for conduction in confined geometries - Top down and Bottom up approach.

Unit II  

Unit III  

Unit IV  

Unit V  
Text & References Books:


* Latest editions of all the suggested books are recommended
Semester-VI 
Seminar, Viva & Presentation

Course Code: BAS698
L T P C
0 0 4 2

For students to enter into preliminary research field both in theory and experiment the concept of Seminar, Presentation & Viva has been introduced in the final Semester. In this report, student will explore new developments from the books and journals, collecting literature / data and prepare the report in form of power point presentation based on his / her work and studies, and submit in concern department.

General guidelines are as follows-

1. Students will make seminar report which should be preferably a working of third thoughts based on their subject.

2. The student will be assigned a faculty guide who will be the supervisor of the students. The faculty would be identified at the end of the Vth semester.

3. Internal assessment of the students should be done at least twice in the semester.

4. The students shall present the final presentation live using overhead projector PowerPoint presentation on LCD to the internal committee and the external examiner.

5. The internal evaluation committee shall consist of faculty members constituted by the college which would be comprised of at least three members comprising of the department Coordinator’s, Class Coordinator and a nominee of the Director/Principal. The students guide would be special in invitee to the presentation. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each members of the committee.

The Marking shall be as follows.

Internal: 50 marks
By the Faculty Guide – 25 marks
By Committee appointed by the Director/Principal – 25 marks

External: 50 marks
By External examiner appointed by the University – 50
Top Cover- The sample top cover shall be as under:

**TITLE (18 pt Times New Roman CAPS)**

**SEMINAR REPORT (14)**

Submitted in Partial Fulfillment of the Requirements for the Degree of (14)

**BACHELOR OF SCIENCE (16)**

In (16)

**Physics (16)**

Submitted by (12)

Name

Enrollment No

Under the guidance of (12)

Name of Guide & Designation (14)

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Department of Physics (14)
Faculty of Engineering
Teerthanker Mahaveer University (14)
Moradabad-244001(14)

(December, 2017) (14)
# EVALUATION SHEET

(To be filled by the GUIDE & Internal Examiners only)

**Name of Candidate:**
**Roll No:**

**Class and Section:**

Please evaluate out of Five marks each.

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<thead>
<tr>
<th>S. No.</th>
<th>Details</th>
<th>Marks (5)</th>
<th>Marks (5)</th>
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<td>1.</td>
<td>Objective Identified &amp; Understood</td>
<td>Guide</td>
<td>Int. Exam. 1</td>
<td>Int. Exam. 2</td>
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<td>2.</td>
<td>Literature Review / Background Work (Coverage, Organization, Critical Review)</td>
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<td>3.</td>
<td>Discussion/Conclusions (Clarity, Exhaustive)</td>
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<td>4.</td>
<td>Slides/Presentation Submitted (Readable, Adequate)</td>
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<td>5.</td>
<td>Frequency Of Interaction (Timely Submission, Interest Shown, Depth, Attitude)</td>
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Signature: ____________________________  Signature: ____________________________  Signature: ____________________________
Date: ____________________________  Date: ____________________________  Date: ____________________________
EVALUATION SHEET FOR EXTERNAL EXAMINER
(To be filled by the External Examiner only)

Name of Candidate:

Roll No:

I. For use by External Examiner ONLY

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<th>S. No.</th>
<th>Details</th>
<th>Marks (10) each</th>
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<td>2.</td>
<td>Literature Review / Back ground Work (Coverage, Organization, Critical Review)</td>
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<td>Discussion/Conclusions (Clarity, Exhaustive)</td>
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<td>Power Point Presentation (Clear, Structured)</td>
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<td>5.</td>
<td>Slides (Readable, Adequate)</td>
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<td><strong>Total (Out of 50)</strong></td>
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Signature:

Date:
### EVALUATION SUMMARY SHEET
(To be filled by External Examiner)

<table>
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<tr>
<th>Name and Roll No.</th>
<th>Internal Examiners (50)</th>
<th>External Examiner (50)</th>
<th>Total (100)</th>
<th>Result (Pass/Fail)</th>
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**Note:** The summary sheet is to be completed for all students and the same shall also be compiled for all students examined by External Examiner. The Format shall be provided by the course coordinator.
Semester VI  
**DISCIPLINE & GENERAL PROFICIENCY**

**Course Code: BGP611**

There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.
2. Participation in Conferences /Workshops / Seminars.
3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.
4. Participation in community projects including NSS.
5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.
6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.
7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.
8. General behavior

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IIInd & IIIrd CT in semester:

<table>
<thead>
<tr>
<th>S No</th>
<th>Enroll No.</th>
<th>Student Name</th>
<th>Dress code</th>
<th>Participation in Conferences / Workshops / Seminars</th>
<th>Participation in guest lectures, invited talks and special technical sessions</th>
<th>Participation in Community Services</th>
<th>Participation in Culture &amp; extra curriculum activities, Department Club Activities</th>
<th>General Behavior</th>
<th>Any Extra Achievement</th>
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<th>Responsible for marks</th>
<th>Mentor</th>
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<th>Head</th>
<th>Mentor</th>
<th>Cultural Events Coordinator &amp; Department Club Coordinator</th>
<th>Sports Coordinator</th>
<th>Mentor</th>
<th>Director or Principal</th>
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**B.Sc. (Hons.) Physics Syllabus Applicable w.e.f. Academic Session 2017-18**  
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