MINUTES

*Confidential*
*For Members only*

GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY

# *TWENTY FIFTH MEETING*

# *OF THE*

# *ACADEMIC COUNCIL*

| | | |
|---|---|---|
| *DATE* | : | *10.11.2008* |
| *TIME* | : | *4 p.m.* |
| *VENUE* | : | *CONFERENCE ROOM* |

## MINUTES

*KASHMERE GATE, DELHI-110403*

# TWENTY FIFTH MEETING OF THE ACADEMIC COUNCIL
## TO BE HELD ON 10th NOVEMBER, 2008

## INDEX OF AGENDA ITEMS

| *Item No.* | *Particulars* | *Page No.* |
|---|---|---|
| 25.12 | To draw Panel of Subject Experts | 7 |
| 25.13 | To approve the Scheme of Examination and Syllabi of various courses offered by the University | 7 |
| 25.14 | Any other item with the permission of the Chair | |

Agenda Item No.25.12: To draw Panel of Subject Experts

The members of the Academic Council were requested to send their recommendations in sealed cover to Vice Chancellor within 10 days. Vice Chancellor was authorized to finalize the panel of experts.

Agenda Item No.25.13 : **To approve the Scheme of Examination and Syllabi of various courses offered by the University**

The Council accorded its approval to the Scheme of Examination and Syllabi of various courses placed before it.

For future, the Council authorized the Vice Chancellor to constitute a Committee consisting of the following to deliberate upon the Scheme of Examination and Syllabi of various courses:-

(i) Director, Academic Affairs as Chairperson;

(ii) Two or three members of Academic Council;

(iii) Two or three subject experts (if not covered by (ii) above);

(iv) Dean of the concerned University School as the Convenor.

The Council authorized the Vice Chancellor to approve the Scheme and Syllabi on behalf of the Council on recommendations of the above said Committee.

Each such approval granted by the Vice Chancellor will be reported to the Academic Council in the next meeting.

Agenda Item No.25.14 : **Any other item with the permission of the Chair.**

The meeting ended with a vote of thanks to the Chair.

**(Vinod K. Jain)**
**Registrar/**
**Secretary to Academic Council**

# University School of Basic &Applied Sciences

## Guru Gobind Singh Indraprastha University

# Master of Technology
# EngineeringPhysics
**(CET CODE 149)**

# Scheme and Syllabii
# 2008 Onwards

*Approved in 25th meeting of the Academic Council held on 10-11-2008, agenda item no. 25.13*

## Programme Specific Objectives (PSO)

**PSO1**.To provide abroad base that integrates physics and engineering sciences and suits students coming in from B.Tech engineering back grounds as well as M.Sc(Physics) or equivalent backgrounds.

**PSO2**. To provide education which is a combination of relevant theoretical and experimental knowledge that are at the frontiers of new innovations and research and skillsets for professional jobs, industry and research labs of global technology companies.

**PSO3**. To provide hands on experimental skills that focuses on the physics of materials and their applications inalternate energy industries and new technologies like solar, nuclear, thermo-electrics, embedded dystems, laser technology and novel materials with an aim towards academic and industrial employment. This will be realized through summer projects, minor and major projects.

**PSO4.** To provide education and skill sets in theoretical disciplines with the objective towards basic foundations on methods in theoretical Physics, computational methods, data and information sciences, futuristic subjects like quantum information, alternate energies, photonics and nano technology and their applications in diverse industries and academia.

## Programme Outcomes (PO)

**PO1.** Students coming in from both engineering & technology and Physics background get the basic training to bridge the gap between physics and engineering.

**PO2.** Students from both backgrounds gain an exposure to new skill set sand recent exciting areas of research and innovation to enable them to make future choices.

**PO3.** The summer project / six months project work undertaken by students in industry / academia exposes them to opportunities for placement in these areas.

**PO4.** Students learn to handle experiments that relate to real life applications like alternate energy technologies, material science and engineering, nanotechnology, electronics etc and adapt to working in project modes in industry and academia.

**PO5.** Students learn theoretical methods in physics and computational methods, modelling and simulations as these represents an essential component of applied sciences, technology as well as that of modern research across theoretical and experimental disciplines.

**PO6.** Students train in MATLAB and MATHEMATICA, which are modern scientific computing and programming languages and preferred the world over and give them an edge over others in both industry & research related careers. Additionally, popular software like LAB VIEW, GAUSSIAN, VASP, etc.

**PO7.** Students learn the art of presenting scientific work and results through intensive seminars presentations and projects which would upgrade their skills for industry as well as teaching in academia

**PO8.** On completion of this programme students will be in a position to choose careers in industry, academia & research as well in entrepreneurship

# SCHEME & SYLLABI

**SEMESTER -I** **26 CREDITS**

| S.No. | Course Code | Title of the course | Cre-dits | L/T/P |
|---|---|---|---|---|
| 1. | BAEP-601 | Mathematical Physics | 3 | 3/0/0 |
| 2. | BAEP-603 | Optimization Methods | 3 | 3/0/0 |
| 3. | BAEP-605 | Computational Physics-I | 3 | 3/0/0 |
| 4. | BAEP-607 | Statistical Physics | 3 | 3/0/0 |
| 5. | ITEP-609 | Concepts of OOP using C++ | 3 | 3/0/0 |
| 6. | BAEP-611 | Minor Project – I | 4 | |
| 7. | HSEP-621 | Language Behavior & | 2 | NUES* |
| 8. | BAEP-651 | Lab-I | 4 | 0/0/8 |
| 9. | ITEP-653 | Lab-OOP | 1 | 0/0/2 |

*Non- University Evaluation System

**SEMESTER -II** **26 CREDITS**

| S.No. | Course Code | Title of the course | Cre-dits | L/T/P |
|---|---|---|---|---|
| 1. | BAEP-602 | The physics of information technolo-gy | 3 | 3/0/0 |
| 2. | BAEP-604 | Advance Statistical Physics | 3 | 3/0/0 |
| 3. | BAEP-606 | Computational Physics-II | 3 | 3/0/0 |
| 4. | BAEP-608 | Alternate Energy Technologies | 3 | 3/0/0 |
| 5. | ITEP-622 | Concepts of DBMS | 3 | 3/0/0 |
| 6. | BAEP-610 | Minor Project - II | 4 | |
| 7. | HSEP-614 | Philosophy of Science & Technology | 2 | NUES* |
| 8. | BAEP-652 | Lab-II | 4 | 0/0/8 |
| 9. | ITEP-654 | Lab-DBMS | 1 | 0/0/2 |

* Non- University Evaluation System

**SEMESTER -III** **28 CREDITS**

| S. No. | Course Code | Title of the course | Credits | L/T/P |
|---|---|---|---|---|
| 1. | BAEP-701 | Embedded Systems | 3 | 3/0/0 |
| 2. | BAEP-703 | Photovoltaic systems Engineering | 3 | 3/0/0 |
| 3. | BAEP-705 | Nano-Science & Engineering | 3 | 3/0/0 |
| 4. | ITEP-717 | Computer Architecture | 3 | 3/0/0 |
| 5. | SMSEP-715 | Project Management Systems | 2 | NUES* |
| 6. | BAEP-751 | Lab-III (Simulation, Parallel & Grid Computing) | 4 | 0/0/8 |
| 7. | BAEP-753 | Training Report | 3 | NUES* |
| Elective-I | | | 3 | 3/0/0 |
| 8. | BAEP-707 | Introduction to Quantum Informa-tion and Computation | | |
| 9. | BAEP-709 | Photonics | | |
| 10. | BAEP-711 | Ion Beam Technology | | |
| Elective-II | | | 4** | 3/0/2 |
| 11. | ITEP-721 | Coding Theory | | |
| | ITEP-761 | Coding Theory Lab | | |
| 12. | ITEP-723 | Software Engineering | | |
| | ITEP-763 | Software Engineering Lab | | |
| 13. | ITEP-725 | Multimedia & Visualization Techno. | | |
| | ITEP-765 | Multimedia & Visualization Techno. Lab | | |
| 14. | ITEP-727 | Computers Networks | | |
| | ITEP-767 | Computers Networks Lab | | |

*Non-University Evaluation System

**Elective–II is 4 credit grouped into 3 credit theory and 1 credit lab

**SEMESTER -IV** **25 CREDITS**

**TotalCredits:105**

| S.No. | Course Code | Title of the course | Cre-dits | L/T/P |
|---|---|---|---|---|
| **1.** | **BAEP-702** | **Project Work(onsite)** | **20** | |
| **2.** | **BAEP-704** | **Comprehensive Viva-Voce/Seminar** | **5** | |

1. For the award of degree a student shall be required to earn a minimum of 100 credits
2. BAEP-611 (Minor Project-I) and BAEP 610(Minor Project-II) shall be a self study in nature. Internal evaluation will be on the basis of presentation by the student before the entire physics faculty of USBAS. The end semester evaluation shall be on the basis of comprehensive viva voce and project report before a committee comprising of entire physics faculty of USBAS and an external examiner approved by BOS.
3. The student shall undergo summer training after second semester for a duration of six weeks and that will constitute BAEP – 753 course. After completion of training the student shall submit a report and give a seminar before the entire physics faculty of USBAS. w.e.f. the academic session 2008 onwards Passed by BoS of USBAS on 20th March, 2008 Approved in 27th meeting of the Academic Council held on 15-06-2009, agenda item no. 27.9 3
4. Internal coordinators will be decided for the students to take care of the summer training, minor and major projects.
5. Each student shall opt for two electives one each from Elective-I and Elective -II.
6. The elective courses to be offered shall be decided and students informed thereof, before the start of third semester keeping in view the availability of the expert in the field and subject to at least five students opting to it.
7. List of experiments in the lab papers shall be upgraded regularly.
8. This scheme shall be effective from August 2008 onwards.

# ASSIGNMENT OF CATEGORIES OF EMPLOYABILITY AND/OR ENTREPRENEURSHIP AND/OR SKILL DEVELOPMENTFOR EVERY COURSE/PAPER

# MATHEMATICAL PHYSICS

## Course Code: BAEP: 601 L/T/P::3 0 0

### Course Education Objectives (CO)

**CO1:** To provide a foundation for basic concepts in mathematical physics in ordinary and partial differential equations
**CO2:** To expose students to techniques in mathematics widely used in physics and engineering of special functions; Bessel, Hermite, Laguerre and Legendre functions
**CO3:** To address examples and applications of problem solving in Fourier and Laplace transforms.
**CO4:** To enable students learning MATLAB simulations and programming of various techniques.

### Course Contents

**Unit – I :** Differential Equations: ODE, PDE, Boundary value problems in physics, eigen value, eigen functions, Sturm-Lioville problem.
**Unit – II :** Special functions: Hermite, Legendre, Laguerre, Bessel functiona 1st 2nd kind, Differential equation and generating function, recurrence relation, Gamma and Beta functions.
**Unit –III :** Transforms: Fourier, Laplace, Convolution therorem, Parseval's relations, Transfer function (Theta function), Dirac-Delta function.
**Unit-IV :** Programming in MATLAB: Simple Basics, Programme designing 2-D & 3-D plotting and simple applications.

**References:**

1. G.B. Arfken; HJ Weber, Mathematical Methods for Physicists, 4th ed. Academic Press,1995.
2. P.M. Morse and H. Feshbach; Methods of Theoretical Physics (Volume, I, II,1953)
3. Mary Boas, 'Mathematical Methods in Physical Sciences, Wiley 4.
S. Hassani, 'Mathematical Physics: A Modern Introduction to its Foundations'(1998,99)
5. MATLAB Programming for Engineers, Stephen J. Chapman, Thomson Press (2007)

### Course Outcomes (CO)

**CO1:** To become able to get grounding of the basic concepts in applied mathematics.
**CO2:** To Learn various functions in mathematics widely used in physics and engineering.

**CO3:** To enable students to be skillful in Laplace and Fourier transform for technical applications.

**CO4:** To gain skills to use MATLAB for programming and simulations of various applications.

**MAPPING WITH PROGRAMME SPECIFIC OBJECTIVES**

| BAEP-601 | | | | |
|---|---|---|---|---|
| | CO1 | CO2 | CO3 | CO4 |
| PSO1 | 3 | 3 | 2 | 3 |
| PSO2 | 2 | 3 | 3 | 2 |
| PSO3 | 2 | 2 | 3 | 2 |
| PSO4 | 3 | 2 | 2 | 3 |

**MAPPING WITH PROGRAMME OUTCOMES**

| BAEP-601 | | | | |
|---|---|---|---|---|
| | CO1 | CO2 | CO3 | CO4 |
| PO1 | 2 | 3 | 3 | 3 |
| PO2 | 3 | 3 | 3 | 2 |
| PO3 | 2 | 2 | 2 | 3 |
| PO4 | 3 | 2 | 2 | 2 |
| PO5 | 2 | 3 | 3 | 3 |
| PO6 | 3 | 3 | 3 | 2 |
| PO7 | 2 | 2 | 2 | 3 |
| PO8 | 3 | 2 | 2 | 2 |

# OPTIMIZATION TECHNIQUES

## Course Code: BAEP: 603 L/T/P::3 0 0

### Course Education Objectives (CO)

**CO:** Theobjectiveistointroducebasicconceptofoptimizationmethods.

Course Contents

Mathematical Modeling and the Operation Research Approach, Introduction to Formulation and Classification of Optimization Models, Search-Based Optimization, Algorithms, Formulation and Classification of Linear Programs.

Simplex Algorithms for Solving Linear Programs, Interior Point Algorithms for solving Linear Programs, Duality and Sensitivity in Linear Programming, Goal Programming, Shortest Path in CPM, Formulation and Structure Of Network Flow Models, Formulation and Classification of Discrete Optimization Models, Methods for Solving Discrete Optimization Models.

Nature and Diversity of Nonlinear Programs, Improving Search Paradigm for Nonlinear Optimization, Formulation of Unconstrained Nonlinear Programs One-Dimensional Search, Conditions for Local Optimality, Convex and Concave Functions, Gradient Search and Newton's Method, Quasi-Newton Methods for Unconstrained Optimization, Unconstrained Optimization without Derivatives, Formulation and Classification of Constrained Nonlinear Programs, Lagrange Multiplier Methods.

References


1. Dimitais Bertsimas and J.N.Tritsiklis, Introduction to linear optimization, Athena Scientific 1997.
2. D.Bertsimas , Nonlinear Programming ,Athena Scientific 1999.
3. J.P.Ignizio and T.M.Cavalier, Linear Programming, Prentice Hall 1994.
4. A.Sofer and S.Nash, Linear and Nonlinear Programming, McGraw-hill,1996


**CourseOutcomes(CO):**

**CO1** Studentswill be familiarwith optimisation techniques
**CO2**Simplexalgorithmforsolvinglinearprogramming problem
**CO3** Goal programming problem
**CO4**Nonlinearprogramming problem

**THIS COURSE HAS CONTENTS WHICJH CAN LEAD TO EMPLOYABILITY ,ENTREPRENEURSHIP AND SKILL DEVELOPMENT**

## MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

| BAEP-603 | CO1 | CO2 | CO3 | CO4 |
|---|---|---|---|---|
| PSO1 | 3 | 3 | 2 | 2 |
| PSO2 | 3 | 3 | 3 | 2 |
| PSO3 | 3 | 2 | 2 | 2 |
| PSO4 | 2 | 3 | 2 | 3 |

## MAPPING WITH PROGRAMME OUTCOMES

| BAEP-603 | CO1 | CO2 | CO3 | C04 |
|---|---|---|---|---|
| PO1 | 2 | 3 | 3 | 3 |
| PO2 | 3 | 3 | 3 | 2 |
| PO3 | 2 | 2 | 2 | 3 |
| PO4 | 3 | 2 | 2 | 2 |
| PO5 | 2 | 3 | 3 | 3 |
| PO6 | 3 | 3 | 3 | 2 |
| PO7 | 2 | 2 | 2 | 3 |
| PO8 | 3 | 2 | 2 | 2 |

# COMPUTATIONAL PHYSICS-I

**Course Code: BAEP-605** L/T/P: 3 0 0

## Course Objectives

**CO1.** This course provides an introduction to computational methods for solving problems and simulating various systems in physics and other related fields.

**CO2.** It teaches programming tactics and numerical methods which are applied to both linear and non-linear physical systems.

**CO3.** The stress is to make a student apt in formulating a strategy and then implement it through programming.

**Contents :**

Unit-1: Random numbers, quality of test for Randomness of the number, random number generators,simpleapplications.

Unit-2: Perturbation Theory: Time dependent and time independent; Variational method, WKB Approximations.

Unit-3: Computer simulations of Linear systems.

Unit-4: Computer Simulations of Non-Linear Systems:Introduction to Chaos and Fractals.

**References:**


- Marzbacher, 'Quantum Mechanics'(Second Ed,1998)
- RC Verma, PK Ahluwalia and KC Sharma, 'Computational Physics', New Age-Publications.
- An introduction to Computational Physics : Tao Pang (Cambridge University Press).(Second Ed,2006)


**Couse outcomes**:

**CO1.** At the end of this course the student has a hand on experience in modelling, algorithm development, implementation and calculation of physical quantities of relevance in both classical and quantum systems.

**CO2.** After the completion of this course, the student is ready to undertake advanced computational courses and handle complex simulations.

**CO3.** Student can do computer simulations based project.

**THIS COURSE HAS CONTENTS WHICJH CAN LEAD TO EMPLOYABILITY ,ENTREPRENEURSHIP AND SKILL DEVELOPMENT**

## MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

| BAEP-605 | CO1 | CO2 | CO3 |
|---|---|---|---|
| PSO1 | 2 | 2 | 3 |
| PSO2 | 2 | 2 | 2 |
| PSO3 | 3 | 3 | 3 |
| PSO4 | 3 | 3 | 2 |

## MAPPING WITH PROGRAMME OUTCOMES

| BAEP-605 | CO1 | CO2 | CO3 |
|---|---|---|---|
| PO1 | 3 | 3 | 3 |
| PO2 | 3 | 3 | 2 |
| PO3 | 2 | 2 | 3 |
| PO4 | 2 | 2 | 2 |
| PO5 | 3 | 3 | 3 |
| PO6 | 3 | 3 | 2 |
| PO7 | 2 | 2 | 3 |
| PO8 | 2 | 2 | 2 |

# STATISTICAL PHYSICS

**Course Code: BAEP 607** L/T/P: 3 0 0

## Course Objectives

**CO1.** This course is one of the foundation course in physics that bridges the gap between engineering sciences and physics for the students coming from engineering backgrounds.

**CO2.** Students learn theoretical methods used for studying the properties of the system which depend on the statistics of many particles. It starts with the concepts of probability and entropy and then gives introduction to ensemble theory. These concepts are then applied to classical and quantum systems.

**CO3.** To give theoretical skill set to the student to carry out research in basic physics and bring innovations in various areas of applied physics and technology.

**Contents :**

Unit — I
Random Variables: Fundamentals of probability theory and Statistics, Entropy, Computation with Random Variables.

Unit — II
Random Variables of Space States: Classical Statistical Mechanics, Introduction to Ensembles, Micro-canonica1,macro-canonical and Grand canonical ensembles, Equipartition theorem, Approximate methods

Unit — III:
Time dependent Random Variables: Classical Stochastic process, Markov process, Masterequation,SimulationofStochasticprocesses and fields.

Unit — IV
Quantum Random Systems: Ideal Fermi and Bose gases, Simple applications.

References:


- Statistical Physics: J. Honerkamp, Second reprint 2005, Springer
- Statistical Physics: Patheria (Butterworth-Heinemann, Oxford,1972).
- Statistical Physics: K.Huang (Wiley Eastern, New Delhi).(1975)
- B. K. Aggarwal & Melvin Eisner: Statistical Physics (Wiley Eastern, NewDelhi).


## Course outcomes

**CO1.** Students learn theoretical physics methods dealing with statistical properties of both the classical and quantum systems.

**CO2.** The students learn theoretical techniques which form one of the basic foundations for futuristic subjects like material science & technology, Physics of semiconductor devices, nanotechnology alternate energies & photonics.

**CO3.** Students gain skill set to carry out modern research and bring innovations in various theoretical and experimental disciplines of physics.

## MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

| **BAEP-607** | **CO1** | **CO2** | **CO3** |
|---|---|---|---|
| **PSO1** | **3** | **3** | **3** |
| **PSO2** | **3** | **3** | **3** |
| **PSO3** | **2** | **2** | **2** |
| **PSO4** | **3** | **3** | **3** |

## MAPPING WITH PROGRAMME OUTCOMES

| **BAEP-607** | CO1 | CO2 | CO3 |
|---|---|---|---|
| PO1 | 3 | 2 | 3 |
| PO2 | 3 | 3 | 3 |
| PO3 | 2 | 2 | 2 |
| PO4 | 2 | 2 | 2 |
| PO5 | 3 | 3 | 3 |
| PO6 | 2 | 2 | 2 |
| PO7 | 2 | 2 | 2 |
| PO8 | 3 | 3 | 3 |

## Concepts of Oops using C++

**Paper code: ITEP-609** **Credits:3** **L:P:T::3 0 0**

Objects, relating to other paradigms (functional, data decomposition), basic terms and ideas (abstraction, encapsulation, inheritance, polymorphism).

Overview of C, Encapsulation, information hiding, abstract data types, object & classes: attributes, methods. C++ class declaration, state identity and behavior of an object, constructors and destructors, instantiation of objects, default parameter value, object types, C++ garbage collection, dynamic memory allocation, metaclass. Inheritance, Class hierarchy, derivation – public, private & protected, aggregation, omposition vs classification hierarchies, polymorphism, operator overloading, parametric polymorphism, generic function – template function, function name overloading, overriding

Inheritance methods, run time polymorphism. Class hierarchy, derivation – public, private & protected, aggregation, omposition vs classification hierarchies, polymorphism, operator overloading, parametric

polymorphism, generic function – template function, function name overloading, overriding inheritance methods, run time polymorphism

Reference:


1. S.B.Lippman& J.Lajoie,"C++ Primer",3th Edition,Addison Wesley.
2. A.R. Venugopalan, Rajkumar, T. Ravishankar," Mastering C++",TMH.
3. E. Balaguruswamy, " Object Oriented Programming with C++",TMH.
4. D.Parasons. ,"Object Oriented Programming with C++",BPB Publications.
5. R.Lafore,"Object Oriented Programming with C++".
6. Stevan C.Lawlor,"Art of programming Computer Science with C++", Vikas Publication.


### Course Objectives

CO1: to learn to code for a programmers educational career

CO2 : To learn concepts of abstraction, Class ,Encapsulation, Inheritance ,Interface

CO3: To apply the knowledge to real life problems in engineering and data management

### Course Outcomes

CO1: students to learn to code for a programmers educational career

CO2 :students learn concepts of abstraction, Class ,Encapsulation, Inheritance ,Interface

CO3:students apply the knowledge to real life problems in engineering and data management

**THIS COURSE HAS CONTENTS WHICJH CAN LEAD TO EMPLOYABILITY ,ENTREPRENEURSHIP AND SKILL DEVELOPMENT**

## MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

| **ITEP-609** | **CO1** | **CO2** | **CO3** |
|---|---|---|---|
| PSO1 | **2** | **2** | **3** |
| PSO2 | **2** | **2** | **2** |
| PSO3 | **3** | **3** | **3** |
| PSO4 | **3** | **3** | **2** |

## MAPPING WITH PROGRAMME OUTCOMES

| **ITEP-609** | CO1 | CO2 | CO3 |
|---|---|---|---|
| PO1 | 3 | 2 | 3 |
| PO2 | 3 | 3 | 3 |
| PO3 | 2 | 2 | 2 |
| PO4 | 2 | 2 | 2 |
| PO5 | 3 | 3 | 3 |
| PO6 | 2 | 2 | 2 |
| PO7 | 2 | 2 | 2 |
| PO8 | 3 | 3 | 3 |

# LAB - OOP Course
# Code: ITEP 653 L/T/P: 0 0 2
# Concepts of Object Oriented Programming Using C++ programming language

## Course Objectives

CO1: to learn to code for a programmers educational career

CO2 : To learn concepts of abstraction, Class ,Encapsulation, Inheritance ,Interface

CO3: To apply the knowledge to real life problems in engineering and data management

## Course Outcomes

CO1: students to learn to code for a programmers educational career

CO2 :students learn concepts of abstraction, Class ,Encapsulation, Inheritance ,Interface

CO3:students apply the knowledge to real life problems in engineering and data management

**THIS COURSE HAS CONTENTS WHICJH CAN LEAD TO EMPLOYABILITY , ENTREPRENEURSHIP AND SKILL DEVELOPMENT**

## MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

| ITEP-653 | CO1 | CO2 | CO3 |
|---|---|---|---|
| PSO1 | **2** | **2** | **3** |
| PSO2 | **2** | **2** | **2** |
| PSO3 | **3** | **3** | **3** |
| PSO4 | **3** | **3** | **2** |

## MAPPING WITH PROGRAMME OUTCOMES

| ITEP-653 | CO1 | CO2 | CO3 |
|---|---|---|---|
| PO1 | 3 | 2 | 3 |
| PO2 | 3 | 3 | 3 |
| PO3 | 2 | 2 | 2 |
| PO4 | 2 | 2 | 2 |
| PO5 | 3 | 3 | 3 |
| PO6 | 2 | 2 | 2 |
| PO7 | 2 | 2 | 2 |

| | | | |
|---|---|---|---|
| PO8 | 3 | 3 | 3 |

**Subject: Minor Project–I & II** **Paper Code: BAEP-610 & 611**

**M.Tech (EP) Credits:4**

**Course EducationalObjectives (CO):**

In both these courses students will be required to prepare a technical paper and make an oralpresentation on a current research topic relevant to Physics / Applied Physics / Technology to the rest of the class and Faculty. Thispresentation and report will be evaluated internally and by an external examiner. Thecourseeducationobjectives (CO) and thecourseoutcomes (CO) will be the same for both these courses:

**CO1.** To initiate the student to take up a research topic in which a small theoretical/numerical or experimentalprojectcan be done,written up and presented in a seminar

**CO2.** To help the student to gain confidence in approaching a research topic / problem and learning the methodology, thinking critically and coming up with problem solvingtechniques.

**CO3.** To teach the student how to write up a piece of work in a technical report as well as to make a presentation and communicate a topic and results in a clear, comprehensive and effective manner as well as to tackle questions from a critical audience

**Course Outcomes**

**CO1.** The student will be in a position to approach a new topic or research problem and understand it through self study making her/him ever ready to learn new things and take on challenges in their career.

**CO2**. The exercise of doing these projects will take the student to working with researchers in research labs, industry, companies etc. giving them both exposure and an opportunity for future placements and careers.

**CO3.** The student will learn to write technical papers and reports, make seminar presentations well and communicate ideas and results with clarity, making them well prepared for future jobs.

**THIS COURSE HAS CONTENTS WHICJH CAN LEAD TO EMPLOYABILITY, ENTREPRENEURSHIP AND SKILL DEVELOPMENT**

**MAPPINGWITH PROGRAMME SPECIFIC OBJECTIVES**

| BAEP-611, 610 | CO1 | CO2 | CO3 |
|---|---|---|---|
| PSO1 | 3 | 3 | 2 |
| PSO2 | 3 | 3 | 3 |

| | | | |
|---|---|---|---|
| PSO3 | 3 | 2 | 2 |
| PSO4 | 2 | 3 | 2 |

## MAPPING WITH PROGRAMME OUTCOMES

| BAEP-611,610 | | | | |
|---|---|---|---|---|
| | CO1 | CO2 | CO3 | CO4 |
| PO1 | 2 | 3 | 3 | 3 |
| PO2 | 3 | 3 | 3 | 2 |
| PO3 | 2 | 2 | 2 | 3 |
| PO4 | 3 | 2 | 2 | 2 |
| PO5 | 2 | 3 | 3 | 3 |
| PO6 | 3 | 3 | 3 | 2 |
| PO7 | 2 | 2 | 2 | 3 |
| PO8 | 3 | 2 | 2 | 2 |

## Language Behavior & Communication Skills

**Paper Code: HSEP-621** **Credits:2**

### Course Objectives

CO: To learn to write and communicate effectively

### Course Outcomes

CO: Students learn to write and communicate effectively

**THIS COURSE HAS CONTENTS WHICJH CAN LEAD TO EMPLOYABILITY, ENTREPRENEURSHIP AND SKILL DEVELOPMENT**

### MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

| HSEP-621 | CO |
|---|---|
| PSO1 | 3 |
| PSO2 | 3 |
| PSO3 | 3 |
| PSO4 | 2 |

### MAPPING WITH PROGRAMME OUTCOMES

| HSEP-621 | |
|---|---|
| HSEP-621 | CO |
| PO1 | 2 |
| PO2 | 3 |
| PO3 | 2 |
| PO4 | 3 |
| PO5 | 2 |
| PO6 | 3 |
| PO7 | 2 |
| PO8 | 3 |

# Laboratories

**Paper Code: BAEP-651 & 652** **Credits:4**

**Course Educational Objectives (CO):**

These laboratories have been designed to understand the basic concept of physics and engineering applications in the emerging area of research such as Lasers, Electronics, Renewable Energy, Nuclear Physics and Model Designing etc. All these list of experiments will give clear cut understanding the fundamental concepts, crystal clear visual vision and provides hands on training, to take the real challenges in the dynamic areas where student can excel their carrier. Laboratory will provide a platform to implement creative demonstrative models.

- Understanding the diffraction effect and studying beam profile and hence learning to calculate spot size and beam divergence.
- Develop ability to understand various diffraction effects and calculate various parameters.
- To find out Characteristic of give G.M. Counter which includes following

(i) Counter-operating voltage V (volt) (ii). Using V, background counts / min (without radioactive source) – statistical study of background (iii). Dead time of the GM tube / GM counter.

- To study the absorption of Beta Particlesin Aluminum and range of betaparticles.
- To determining the Efficiency of a given Geiger-Muller counter.
- To study the energy transfer between two gliders in collision.
- To check the variation of kinetic energy of the glider with distance travelled on an air track.
- To study the conservation of momentum with initial momentum non-zero.
- To study the potential energy curve due to magnet-magnet inter-action
- To measure Solar radiation using Solarimeter, sunshine recorder and pyranometer
- To calculate total solar radiation on a tilted surface.

**AdvancedPhysics**

- Develop understanding to handle laser and optical components with optical fibre and learn to calculate numerical aperture and critical angle.
- To study beam profile and hence calculate spot size and beam divergence of He-Nelaser.
- Estimate thickness of given objects such as human hair, track distance of CD, track distance of DV Dusing He-Ne Laser
- To study diffraction of circular aperture, rectangular aperture and planegrating with He-Nelaser.
- To estimate refractive index of medium using plan egrating with He-Ne Laser.
- Evolve learning to use optical fibre and He-Ne Laser estimating propagation loss.
- To study and calculate propagation loss through optical fibre.

- To study propagation of light through optical fibre and calculate numerical aperture and critical angle with He-Ne Laser.
- Giving the good exposure to synthesis nano materials using chemical reduction techniques.
- Synthesis of different thickness of nano thin films by spin coating method.
- Synthesis of thermo electric materials by hydro thermal method & melt grown method
- Giving hands on training on powder XRD as well analyzing the data.
- Giving hands on training on micro Raman as well analyzing the data.
- Giving hands on training on UV-IR as well analyzing the data.
- Giving hands on training on powder XRD as well analyzing the data.

**Engineering Physics & Applications:**

1. To demonstrate the I-V and P-V characteristics of P V module with varying radiation and temperature level.

- To demonstrate the I-V and P-V characteristics of series and parallel combination of PV modules. Experiment
- To show the effect of variation in tiltangleonPVmodulepower.
- Todemonstratetheeffectofshadingonmoduleoutputpower.
- ToWorkoutpowerflowcalculationsofstand-alonePVsystemofDCloadwithbattery
- MakingaNanocoatingondifferentsurfacessubstratesusingSpincoatingmethod
- Fabricationofdifferentsizeandshapesofnanomaterialandconfirmationoftheirstructure byXR-Dandcalculatethelatticeparameters.
- Makingdifferenttypeof crystalstructuresusing3Dprinter.
- Makingmorecomplicatedsystemsusing3Dprinting. CourseOutcomes
- Perform case studies of solar system establishments.

**Course Outcomes**

- Studentsacquireconfidencetohandlesophisticatedinstrumentssuchas XRD,MicroRamanan dUV-IR. Studentswillbemotivatedtotakeuptherealindustrialchal-lenges.Studentswillbeabletorealizetheirvisualthinkinggivingthepracticaldemos.

**THIS COURSE HAS CONTENTS WHICH CAN LEAD TO EMPLOYABILITY ,ENTREPRENEURSHIP AND SKILL DEVELOPMENT**

| BAEP-651 | CO |
|---|---|
| PSO1 | 3 |
| PSO2 | 3 |

## MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

| | |
|---|---|
| PSO3 | 3 |
| PSO4 | 2 |

## MAPPING WITH PROGRAMME OUTCOMES

| BAEP-651 | |
|---|---|
| BAEP-651 | CO |
| PO1 | 2 |
| PO2 | 3 |
| PO3 | 2 |
| PO4 | 3 |
| PO5 | 2 |
| PO6 | 3 |
| PO7 | 2 |
| PO8 | 3 |

# THE PHYSICS OF INFORMATION TECHNOLOGY

## Course Code: BAEP:602 L/T/P:: 3 0 0

### Course Education Objectives (CO)

**CO1.** To introduce the student to the inside world of physics that forms the heart of information technologies that drives almost all enterprises for fast communication and information storage. To go beyond viewing Information technology as merely a user and learn the science and phenomena that can be tapped for novel application

**CO2.** To familiarise the student to the notion of information theory, Shannon's theorems and its physical basis and the rich interface between physic and information.

**CO3.** To understand the current need for faster and smarter technologies from the point of view of physics and the limitations imposed on computing speed by fundamental laws. To expose the student to futuristic alternative information technologies that will replace conventional silicon transistors.

### Course contents

**Unit – I**

Introduction: History of computers, Information systems, Noise in physical system, Random Variables, Probability distributions, Noise mechanism, Information in physical systems ,Channel capacity, Gaussian Channel, Fisher Information, Information in Thermodynamics .

## Unit -II

The physics of Lasers and Optical Fibres, Fourier series, Fourier transform, Bandwidth, Modes, fibre optics communication.

## Unit – III

Magnetic storage –Diamagnetism, Paramagnetism, Ferro, Antiferro & Ferrimagnetism, Magnetic recording and recording systems, Giant Magnetoresistance(special topic).

## Unit – IV

Future Information technologies- (Term paper topics) (i) Quantum information & computation (ii) Optical computing (iii) DNA computing (iv) Nano technology & The future of computing.

## References:


The Physics of Information Technology-Neil Gershenfeld (Cambridge University Press)(2000)
The Quantum Dot – Richard Turton –Oxford University Press(1996).
Text on Laser &Fibre Optics

Text on Magnetism
Internet Resources

**THIS COURSE HAS CONTENTS WHICJH CAN LEAD TO EMPLOYABILITY ,ENTREPRENEURSHIP AND SKILL DEVELOPMENT**

## Course Outcomes (CO)

**CO1.** The student will be in a position to better understand the inner workings of current computer and information technologies involving storage and communication and hence in a better position in enterprises and industry related to IT

**CO2.** The student will be familiar with the intrinsic. connection between physics and information theory and understand the concepts of data compression and channel capacity which are at the heart of storage and speed.

**CO3.** The student will be exposed to the implications of Moore's law and the need for alternate future technologies which are fast emerging in the developed world like quantum information and computing. This will open doorways for jobs in the rapidly growing job market as well as in frontline research and academia

### MAPPING WITH PROGRAMME SPECIFIC OBJECTIVES

| BAEP-602 | CO1 | CO2 | CO3 |
|---|---|---|---|
| PSO1 | 3 | 3 | 3 |
| PSO2 | 3 | 3 | 3 |
| PSO3 | 3 | 3 | 3 |
| PSO4 | 3 | 3 | 2 |

### MAPPING WITH PROGRAMMEOUTCOMES

| BAEP-602 | CO1 | CO2 | CO3 |
|---|---|---|---|
| PO1 | 3 | 2 | 3 |
| PO2 | 3 | 3 | 3 |
| PO3 | 2 | 2 | 2 |
| PO4 | 2 | 2 | 2 |
| PO5 | 3 | 3 | 3 |
| PO6 | 2 | 2 | 2 |

| | | | |
|---|---|---|---|
| **PO7** | **2** | **2** | **2** |
| **PO8** | **3** | **3** | **3** |

## ADVANCED STATISTICAL PHYSICS

**Course Code: BAEP 604 L/T/P: 3 0 0**

**Objectives:**

**CO1.** This course provides introduction to advanced theoretical techniques in physics of materials after completing the basic foundation course in semester-1.

**CO2.** To teach the advanced formalism and tools required for calculating the static and dynamic properties of materials. It starts with study of statistical equilibrium state of semiconductors and junctions and then introduces the advanced formalism for the non-equilibrium state of transport in the presence of forces and temperature gradients. The formalism to study properties of the system in the presence of magnetic field is also taught.

**CO3.** To give them the theoretical skill set required at the frontiers of new innovations and research related to material science.

**Contents :**

Unit – I SemiconductorStatistics:

Statistical equilibrium of free electrons in semiconductors, impurity semiconductors, degenerate semiconductors, electrostatic properties of p-n junctions and metal-semiconductor junctions.

Unit -II Transport in Bulk:

Boltzmann transport equation, Particle diffusion, electrical and thermal conductivity, isothermal Hall effect, Non-equilibrium semiconductors, Quantum Hall Effect.

Unit - III Transport inNanostructures:

Quantum and classical regimes of electron transport, important quantities in mesoscopic transport, Landauer formula, double barrier resonant tunneling structures: coherent and sequential tunneling, negative differential resistance, single electron transfer, coulombblockade

Unit - IV Cooperative Phenamena: Ising Model

Phase transitions of the second kind, ising model, Bragg-Williams Approximation, One- Dimensional Ising Model, Lattice gas, binary mixture alloy

References:


- Statistical Physics: Patheria (Butterworth-Heinemann, Oxford,1972).
- Statistical Physics: K.Huang (Wiley Eastern, New Delhi,1975).
- B.K.Aggarwal & Melvin Eisner: Statistical Physics (Wiley Eastern, NewDelhi).


**Couse outcomes**:

**CO1.** Students learn advanced theoretical methods for predicting the properties of materials in bulk materials as well as nanostructured materials.

**CO2.** The advanced formalism taught in this course forms foundation for carrying out the fundamental research as well as bringing out the technological innovations in the applied physics areas such as nanotechnology, solar, thermo-electrics, laser technology, novel materials etc.

**CO3.** Students gain skill set to carry out modern research in R&D labs and global technology companies based on above mentioned areas.

## MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

| BAEP-604 | CO1 | CO2 | CO3 |
|---|---|---|---|
| PSO1 | 3 | 2 | 3 |
| PSO2 | 3 | 3 | 3 |
| PSO3 | 2 | 2 | 2 |
| PSO4 | 3 | 2 | 2 |

## MAPPING WITH PROGRAMME OUTCOMES

| BAEP-604 | CO1 | CO2 | CO3 |
|---|---|---|---|
| PO1 | 2 | 3 | 3 |
| PO2 | 3 | 3 | 3 |
| PO3 | 2 | 2 | 2 |
| PO4 | 3 | 2 | 2 |
| PO5 | 2 | 3 | 3 |
| PO6 | 3 | 3 | 3 |

| | | | |
|---|---|---|---|
| PO7 | 2 | 2 | 2 |
| PO8 | 3 | 2 | 2 |

## ADVANCED COMPUTATIONAL PHYSICS

**CourseCode:BAEP:606** **L/T/P:3**0 0

**Objectives:**

**CO1.** This course is an advanced level course taught to the students after completing the foundation course in the previous semester. The aim is to make a student apt in handling complex computer simulations independently.

**CO2.** To make the students learn the techniques of carrying out random experiments on a computer. The students learn to generate random samples through various algorithms and then develop Monte Carlo algorithms into code without needing to use ready made packages. Monte Carlo method is one of the leading methodology that pervades much of contemporary science and engineering.

**CO3.** To understand the source, propagation, magnitude and rate of growth of errors.

**Contents :**

Unit-I

Errors in computation, Review of Taylor Series, Mean Value Theorem, Representation of numbers (integers and floating point), Loss of significance in computation. Linear Simplex Method, numerical solutions of linear systems, dual-simplex method, Linear Programming.

Unit-II

Random number generation, Test for quality, random sampling techniques; interior point method.

Unit-Ill

Monte Carlo methods and simulation: Numerical Integration, Boundary Value Problems, Simulation of radioactive decay, Neutron transport and Percolation, Random Walk, Ising Model.

Reference:


- Introduction to Computational Physics , Tao Tang, CambridgePress(2006)
- Computational Physics, R.C. Verma .New AgePublication(2000)
- Numerical Mathematics and Computing, Ward Cheney & David Kincaid, ThomsonPress(2007)
- Monte Carlo Methods in Statistical Physics, KPN Murthy, UniversityPress(2004)


**Couse outcomes**:

**CO1.** The students become apt to formulate a strategy to solve a given problem, implement it through programming and then critically analyse the obtained result.

**CO2.** The students are apt to handle complex computer simulation projects independently.

**CO3.** Monte Carlo techniques give them a skill set to solve complex estimation and optimization problems in engineering, statistics, mathematics, finance, life sciences, physical and computer sciences which raises their job opportunities in these realms.

**THIS COURSE HAS CONTENTS WHICJH CAN LEAD TO EMPLOYABILITY ,ENTREPRENEURSHIP AND SKILL DEVELOPMENT**

## MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

| BAEP-606 | CO1 | CO2 | CO3 |
|---|---|---|---|
| PSO1 | 3 | 3 | 3 |
| PSO2 | 3 | 3 | 2 |
| PSO3 | 2 | 2 | 2 |
| PSO4 | 3 | 3 | 3 |

## MAPPING WITH PROGRAMME OUTCOMES

| BAEP-606 | CO1 | CO2 | CO3 |
|---|---|---|---|
| PO1 | 2 | 3 | 3 |
| PO2 | 3 | 3 | 3 |
| PO3 | 2 | 2 | 2 |
| PO4 | 3 | 2 | 2 |
| PO5 | 2 | 3 | 3 |
| PO6 | 3 | 3 | 3 |
| PO7 | 2 | 2 | 2 |
| PO8 | 3 | 2 | 2 |

## ALTERNATE ENERGY TECHNOLOGIES

**Course Code : BAEP-608 (3 credits)** **L/T/P: 3 0 0**

### Course Education Objectives (CO)

**CO1** To learn the current and future energy scenario.
**CO2** To understand the need for energy conservation
**CO3** To understand concepts of renewable energy sources like wind, solar, bio and other renewable energy resources.
**CO4** To understand concepts of solar radiation and sun earth geometry

**UNIT I**Energy scenario current, energy future, energy sources, environmental effects of energy sources, cheap energy versus environment, why renewable energy,solar day, equation of time, local and solar time, sun earth angles, shadow angles, sunrise and sunset

**UNIT II** Solar radiation, Thermal radiation fundamentals, Solar radiation and electromagnetic spectrum, solar radiation entering the earth system, Solar radiation using satellite, Instruments for measuring solar radiation: Pyranometer, Pyrheliometer, Sunshine recorder, Solar radiation on horizontal and inclined surface, Liu and Jordan Formula, Daily and monthly solar radiation, simulations to calculate sun earth angles and hourly solar radiation on tilted surface

**UNIT III**Photovoltaic (PV) cell technologies, solar pv power systems: semiconductors, p-n junction under equilibrium and biasing, equation, pv cell, modules and array, open circuit voltage and short circuit current, I-V and P-V curves, Array design, peak power point operation, pv system example, Design for remote photovoltaic Application, environmental effects of PV system, cost considerations

**UNIT IV**Nuclear Energy Engineering: Fundamentals of nuclear energy and radiation; introduction to the nuclear processes occurring in a reactor; basics concepts of nuclear reactors and power systems. Reactor Technology: The analysis & design of nuclear assemblies with emphasis on design; nuclear reactor kinetics, stability and control; Breeder reactors; Safety & environmental Norms.

**Reference:**

1. Solar Energy: Fundamentals, design, Modeling and Applications: G.N.Tiwari, 2002, Narosa Publishing house
2. Understanding renewable energy systems, Volker Quaschning, 2006, Replika Press Pvt. Ltd., India
3. Alternative Energy, V0l 1-3, Neil Schlager and Jayne Weisblatt, 2006, Thompson Gale Generating electricity from the sun, Fred C Treble, 1991, Pergamon Press
4. Accelerator Based Research in Basic and Applied Sciences, 2002, Amit Roy and D K Avasthi, Phoenix Publishers
5. Solar Energy : S.P. Sukhatme (Tata McGraw-Hill, New Delhi)(1990).

6. Solar CellDevices : Fonash (AcademicPress, New York)(1981)

**Course Outcome (CO)**

CO1 Students will have knowledge about Renewable Energy resources and its importance
CO2 Understanding of process of solar thermal and solar photovoltaic power generation
CO3 Understand the concept of solar radiation, calculation of direct, diffuse and total solar radiation both theoretically and experimentally.
CO4 Summarize the fundamentals of other renewable energy resources like wind, bio, geo-thermal, ocean etc.

**THIS COURSE HAS CONTENTS WHICJH CAN LEAD TO EMPLOYABILITY ,ENTREPRENEURSHIP AND SKILL DEVELOPMENT**

**MAPPING WITH PROGRAMME SPECIFIC OBJECTIVES**

| BAEP-608 | | | | |
|---|---|---|---|---|
| | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
| **CO1** | 3 | 3 | 3 | 2 |
| **CO2** | 2 | 2 | 2 | 3 |
| **CO3** | 3 | 2 | 3 | 2 |
| **CO4** | 3 | 2 | 3 | 3 |

**MAPPING WITH PROGRAMME OUTCOMES**

| BAEP-608 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** |
| **CO1** | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 |
| **CO2** | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 3 |
| **CO3** | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 3 |
| **CO4** | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 2 |

## CONCEPTS OF DATA BASE MANAGEMENT SYSTEMS

**Paper code: ITEP-622** **Credits:3** **L:P:T::3 0 0**

Basic concepts: database & database users, characteristics of the database, database systems, concepts and architecture, date models, schemas & instances, DBMS architecture & data independence, database languages & interfaces, data modelling using the entity-relationship approach. Overview of hierarchical, Network & Relational Data Base Management Systems. Relational model, languages & systems:

Relational data model & relational algebra: relational model concepts, relational model constraints, relational algebra, SQL- a relational database language: date definition in SQL, view and queries in SQL, specifying constraints and indexes in sql, a relational database management systems,

DB2. DB2 Architecture, Logical Data Structures Physical Data Structure, Instances, Table Spaces, Types of Table spaces, Internal Memory Structure, Background Processes, Data Types, Roles & Privileges, Stored Procedures, User Defined Functions, Cursors, Error Handling, Triggers.

Relational data base design: function dependencies & normalization for relational databases: functional dependencies, normal forms based on primary keys, (1NF, 2NF, 3NF & BCNF), lossless join and dependency preserving decomposition.

Concurrency control & recovery techniques: concurrency control techniques, locking techniques, time stamp ordering, granularity of data items, recovery techniques: recovery concepts, database backup and recovery from catastrophic failures.

Concepts of object oriented database management systems, Distributed Data Base ManagementSystems . Reference: 1. Database Management System: Henry Korth (1986).

### Course Objectives

**CO**: To teach the essentials of a database management system and to use of the system to perform several kinds of operations on such a system for manipulation of the data in the database and the management of the database structure

### Course Outcomes

**CO**: Students learn the essentials of a database management system and learn to use the system to perform several kinds of operations on such a system for manipulation of the data in the database and the management of the database structure

**THIS COURSE HAS CONTENTS WHICJH CAN LEAD TO EMPLOYABILITY ,ENTREPRENEURSHIP AND SKILL DEVELOPMENT**

### MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

| ITEP-622 | CO |
|---|---|
| PSO1 | 3 |
| PSO2 | 3 |
| PSO3 | 3 |

| | |
|---|---|
| PSO4 | 2 |

**MAPPING WITH PROGRAMME OUTCOMES**

| | |
|---|---|
| | |
| **ITEP-622** | **CO** |
| **PO1** | **2** |
| **PO2** | **3** |
| **PO3** | **2** |
| **PO4** | **3** |
| **PO5** | **2** |
| **PO6** | **3** |
| **PO7** | **2** |
| **PO8** | **3** |

**DATA BASE MANAGEMENT SYSTEMS LAB**.
Course Code: ITEP: 654 L/T/P:0 0 2 Database Management System: SQL Plus Query Language.

### Course Objectives

CO: To teach the essentials of a database management system and to use of the system to perform several kinds of operations on such a system for manipulation of the data in the database and the management of the database structure

### Course Outcomes

CO: Students learn the essentials of a database management system and learn to use the system to perform several kinds of operations on such a system for manipulation of the data in the database and the management of the database structure

**THIS COURSE HAS CONTENTS WHICH CAN LEAD TO EMPLOYABILITY, ENTREPRENEURSHIP AND SKILL DEVELOPMENT**

## MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

| ITEP-654 | CO |
|---|---|
| PSO1 | 3 |
| PSO2 | 3 |
| PSO3 | 3 |
| PSO4 | 2 |

## MAPPING WITH PROGRAMME OUTCOMES

| | |
|---|---|
| ITEP-654 | CO |
| PO1 | 2 |
| PO2 | 3 |
| PO3 | 2 |
| PO4 | 3 |
| PO5 | 2 |
| PO6 | 3 |
| PO7 | 2 |
| PO8 | 3 |

LAB-II (BAEP-652)

## BAEP-652 04 CREDITS LAB

### Course Education Objectives

**CO1.**To introduce and train students in computational methods in Physics with MATLAB as the programming language. To also diversify to using other popular and useful software like MATHEMATICA, GAUSSIAN, LAB VIEW, VASP AND R.

**CO2**. To expose students to introductory topics and the basics of numerical techniques and programming. Problems are selected from a list which is updated from time to time in tune with the needs of industry/research and topical subjects.

**CO3**. To educate students to learn the logic behind solving problems related to real physical examples, simulation, modelling and designing the algorithms and translating them into programmes

### Course contents

**List of experiments [Semester -II]**

1. Introduction to the Matlab programming language
2. Operations in Matlab: basic mathematical operations with matrices & arrays
3. Plotting with Matlab: line plots, 1-D, 2-D, 3-D, meshgrid, labeling axes, legends, importing and plotting data files in Matlab
4. Simple animations
5. Learning to use if, while, elseif commands
6. Numerical methods for Solving Ordinary Differential Equations (ODEs) - Euler method, RungeKutta method etc.
7. Programming in Matlab to solve 1st order and 2nd order ODEs by Euler and RungeKutta methods
8. Solving ODEs using inbuilt matlab solvers
9. The Newton Raphson method for root finding
10. Programming in Matlab to find roots using Newton Raphson method
11. Using direct matlab solvers for root finding
12. Numerical methods for Integration – Rectangular Method
13. Trapezoidal and Simpson's methods
14. Programming in Matlab for integration using the above methods
16. Curve Fitting

**Specific real physical examples covering the above techniques from different topics:**
**Classical mechanics**: Newton's laws, Projectile Motion, Simple Harmonic Oscillator , Damped Harmonic Oscillator, Driven Harmonic Oscillator, Van der Pol Oscillator; **Quantum mechanics**; Particle in a box: 1D, 2D; Energy levels & density of states; Schrödinger equation for simple quantum systems; Plotting &visualisation of various potentials; **Chaos &Fractals**; Lorenz Equations, I D cellular automata, Simple Fractals; Radioactive Decay, wave packet dynamics etc.

**THIS COURSE HAS CONTENTS WHICH CAN LEAD TO EMPLOYABILITY, ENTREPRENEURSHIP AND SKILL DEVELOPMENT**

## Course Outcomes

**CO1.** Students learn the basics of problem solving with examples from physics and mathematics. They get familiar with simple operations to visualisation techniques and solving differential equations.

**CO2**. The techniques learnt are applied to real physical problems from classical mechanics, quantum mechanics and many interesting problems and situations.

**CO3.** The students learn to think critically and learn how to apply the techniques learnt to real problems that they can encounter in projects/research/industry/academia

### MAPPING WITH PROGRAMME SPECIFIC OBJECTIVES

| **BAEP-652** | **CO1** | **CO2** | **CO3** |
|---|---|---|---|
| PSO1 | **3** | **3** | **3** |
| PSO2 | **3** | **3** | **3** |
| PSO3 | **3** | **3** | **3** |
| PSO4 | **3** | **3** | **2** |

### MAPPING WITH PROGRAMME OUTCOMES

| **BAEP-652** | CO1 | CO2 | CO3 |
|---|---|---|---|
| PO1 | 3 | 2 | 3 |
| PO2 | 3 | 3 | 3 |
| PO3 | 2 | 2 | 2 |
| PO4 | 2 | 2 | 2 |
| PO5 | 3 | 3 | 3 |
| PO6 | 2 | 2 | 2 |
| PO7 | 2 | 2 | 2 |
| PO8 | 3 | 3 | 3 |

**Programme M.Tech-(EP)** **3L** **Credits 3**

**Paper Code- BAEP 701 Subject: Embedded Systems**

**Course Objectives:**

**CO1:** To familiarize the student with the basic hardware and software architecture of embedded systems and learn codesign and know applications of embedded systems in physics and engineering

**CO2:** To make them learn assembly level programming (simulation) and use them for programming serial communication ports, timers for application in real time embedded systems design both for physics as well as engineering applications

**CO3:** To make them aware of various networks , debugging ports, simulators, emulators, etc hardware and software tools, interfacing methods and study different examples of embedded systems in household, offices, industry etc. and understand their applications in academia and industry

**Contents:**

**Introduction to an embedded Systems design**

Introduction to embedded system, embedded system project management, ESD and Co-design issues in system development process, Design cycle in the development phase for an embedded system, Use of target system or its emulator and In-circuit emulator. Use of software tools for development of an ES.

**Processes and operating systems:**

The Processes abstraction, Switching contexts between programs, Real time operating systems. Inter process communication, Performance analysis and power consumption.

**Microcontroller:**

Role of processor selection in Embedded System (Microprocessor v/s Micro-controller), 8051 Microcontroller: Architecture, basic assembly language programming concepts. Instruction set, Addressing Modes, Logical Operation, Arithmetic Operations Subroutine, Interrupt handling, Timing subroutines, Serial data transmission, Serial data communication

**Networks for Embedded Systems**

The $I^2C$ bus, The CAN bus, SHARC link Ports, Ethernet, Myrinet, Introduction to Bluetooth, Specification, Core Protocol, Cable Replacement protocol, IEEE 114.9 (JTAG) Testability, Boundary Scan Architecture

**Reference Books**


- The 8051 microcontroller by Kenneth J. Ayala, Cengage Learning

- Embedded Systems Architecture, Programming, and Design. (2/e), Raj Kamal, Tata McGraw Hill
- Introduction To Embedded Systems, K.V. Shibu Tata McGraw Hill
- The 8051 Microcontrollers and Embedded Systems, Muhammad Ali Mazidi, Pearson Publication

**Course Outcomes**: Upon successful completion of this course, the students possess advanced knowledge, skills and competences that enable them to:

**CO1**: Make use of the enabling technologies for implementing embedded systems code sign with emphasis on different characteristics of Microcontrollers like architecture, Memory, Cost, Size of Data bus, type of architecture etc (both theoretically and experimentally), select software tools, apply basic physics understanding from electricity, magnetism in working of electronic peripherals and use them for higher research, summer projects, teaching or industry.

**CO2**: Apply IDE programming(simulation) tools in the interfacing of electronic peripherals, implementing new technologies, applying interrupts, threads, processes, scheduling algorithms, and software optimization for real life applications in Physics as well as engineering applications, and can work as system software engineer and embedded software engineer and can get placement in these fields.

**CO3**: Design and analyze real time embedded systems using the concepts of RTOS, analyze different networks used in embedded systems like automobiles, spacecrafts etc and utilize debugging tools like JTAG , able to project ideas and submit presentations on how a practical embedded system can be designed and can undertake designing as six months or summer training projects as well as can use it in futuristic research in academia and industry

**THIS COURSE HAS CONTENTS WHICH CAN LEAD TO EMPLOYABILITY ,ENTREPRENEURSHIP AND SKILL DEVELOPMENT**

**MAPPING WITH PROGRAMME SPECIFIC OBJECTIVES**

| BAEP-701 | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
|---|---|---|---|---|
| CO1 | **3** | **3** | **3** | **3** |
| CO2 | **3** | **2** | **3** | **3** |
| CO3 | **2** | **3** | **3** | **3** |

**MAPPING WITH PROGRAMME OBJECTIVES**

| BAEP-701 | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 |
| CO3 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | 3 |

**PHOTOVOLTAIC SYSTEMS ENGINEERING**

**Course Code: BAEP-703** **L/T/P: 3 0 0**

## Course Objectives

**CO1** To recognize the physics of semiconductors behind working of different type of solar cells.
**CO2** To develop a comprehensive understanding of components used in solar Photovoltaic (PV) system
**CO3** To provide in-depth understanding to design and simulate the performance of a solar PV power plant
**CO4** To learn planning, project implementation and operation of solar PV power generation

**Unit – I :**Physics of solar cells: Review of semiconductor properties, dynamics of electrons and holes, densities of electrons and holes, location of Fermi level in doped semicoductors, carrier Transport, Interaction of light with semiconductor, Absorption of light in direct and Indirect Band gap Semiconductor, various recombination processes, electrosttics of p-n junctions, junction capacitance, carrier injection, minority carriers in Quasi Neutral Regions under dark and illuminated conditions, saturation current density, light generated current, solar cell output parameters: Isc, Voc, FF, Efficiency, Efficiency limit, Effect of Temperature.

**Unit – II:** Introduction to PV Systems: PV cell, module, Array, Energy storage, study of associated system electronic components in brief like charge controller, battery, inverter, wiring, stand etc.

**Unit – III:** PV System examples: Designing, modeling and simulation Stand alone Systems, hybrid systems, utility interactive system, designing of PV system: components, load evaluation system design, Example of PV remote cabin

**Unit – IV:** Present and future scope in SPV: Status of SPV in industry and research labs in India and abroad, Manufacturing processes in brief like CZ, floatzone, MBE, EFG etc., emerging technologies–Organic Solar cells, Bilayer and bulk heterojunction organic solar cell, dye sensitized solar cells, Quantum dot sensitized solar cells, CNT based solar cells etc.

**Reference:**

1. Solar Energy: Fundamentals, design, Modeling and Applications: G.N. Tiwari, 2002, Narosa Publishing house.
2. Understanding renewable energy systems, Volker Quaschning, 2006, Replika Press Pvt. Ltd., India.
3. Alternative Energy, Vol 1-3, Neil Schlager and Jayne weisblatt, 2006, Thompson Gale Generating electricity from the sun, Fred C Treble, 1991, Pergramon Press.
4. Solar Cells: Operating principles, technology and system Applications, Martin A. Green.
5. Physics of solar cells, Peter Wurfel, Wiley VCH Verlag GmbH & Co. KGaA. 6. Terrestrial solar photovoltaics, Tapan Bhattacharya, Narosa Publishing House. 7. Solar Cell Devices : Fonash (Academic Press, New York)(1981)

8. Internet resources and journals of the field

**Course Expected Outcomes**

**CO1** Students will be able to understand the operation of a silicon PV cell.
**CO2** Students will be able to understand and explain the operation and performance characteristics of various solar power plant components and select them to meet specific criteria
**CO3** Students will be able to perform a solar resource assessment of a potential site and develop understanding on the PV plant design
**CO4** Students will be able to design and simulate a PV power plant

**THIS COURSE HAS CONTENTS WHICH CAN LEAD TO EMPLOYABILITY, ENTREPRENEURSHIP AND SKILL DEVELOPMENT**

**MAPPING WITH PROGRAMME SPECIFIC OBJECTIVES**

| BAEP-703 | | | | |
|---|---|---|---|---|
| | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
| **CO1** | 3 | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 3 | 3 |
| **CO4** | 3 | 3 | 3 | 3 |

**MAPPING WITH PROGRAMME OUTCOMES**

| BAEP-703 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** |
| **CO1** | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 |
| **CO2** | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 |
| **CO3** | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 |
| **CO4** | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 |

**Course Title : Nano Science and Engineering**

**Course Code : BAEP-705** **L/T/P: 3 0 0**

## Course Education Objectives (CO)

**CO1.** The purpose of this course is to give the student to an overview of basic fundamental concepts of nanoscience.

**CO2.** This course will give a good understanding of the various synthesis process and characterization techniques for nanomaterials.

**CO3.** The student will be in a position to think and apply their mind towards application in the emerging areas of industry and research.

**CO4.** The student will be able to plan to execute their ideas to miniaturization of nanoscale for many applications in research projects.

**UNIT-I**

Introduction and scope of nano science and technology Properties of Nano particles: Optical properties, Magnetic properties, Heat Capacity etc.

**UNIT-II**

Synthesis and fabrication of nano particles: Ball milling, thermal evaporation, Chemical vapor deposition, biological method.

**UNIT-III**

Characterization of Nano particles: X-ray diffraction, SEM, TEM, EDX Analysis

**UNIT-IV**

Nano Device and Modelling

**Reference:**

Introduction to Solid State Physics by Kittel, John Wiley, (1996)
Introduction to Nanotechnology by Charles P. Poole Jr., Frank J. Owens (2003)
Nanomaterials: Synthesis properties and Applications Edited by AS Edelstein and R C Cammarata (1998)

**Course Outcome (CO)**

**CO1.** The student will learn to understand the basic concepts, critical thinking, and fundamental ideas of nanoscience and think diverse applications.
**CO2.** The student will be familiar with various synthesis processes of nanomaterials and characterization techniques.
**CO3**. These fundamental concepts will help to think miniaturization of things and will develop a curiosity to stimulate/fabricate nanodevice.
**CO4.** On completion of this course, the student will be ready to apply their mind to take up real challenges in the industry and R & D.
**THIS COURSE HAS CONTENTS WHICH CAN LEAD TO EMPLOYABILITY ANDSKILL DEVELOPMENT**

**MAPPING WITH PROGRAMME SPECIFIC OBJECTIVES**

| **BAEP 705** | CO1 | CO2 | CO3 | CO4 |
|---|---|---|---|---|
| PSO1 | 2 | 2 | 3 | 3 |
| PSO2 | 3 | 2 | 3 | 2 |
| PSO3 | 3 | 3 | 2 | 2 |
| PSO4 | 2 | 2 | 3 | 3 |

**MAPPING WITH PROGRAMME OBJECTIVES**

| BAEP705 | CO1 | CO2 | CO3 | CO4 |
|---|---|---|---|---|
| PO1 | 2 | 3 | 2 | 2 |
| PO2 | 2 | 2 | 2 | 3 |
| PO3 | 3 | 3 | 3 | 3 |
| PO4 | 2 | 2 | 2 | 2 |
| PO5 | 2 | 2 | 2 | 3 |
| PO6 | 3 | 3 | 3 | 3 |
| PO7 | 2 | 2 | 2 | 2 |
| PO8 | 1 | 2 | 2 | 1 |

**Code: ITEP 717** **L:3 T/P:1 C: 4**

**Paper: Computer Architecture**

**Unit I**

**Computer Arithmetic and Register transfer language:**

Unsigned notation, signed notation, binary coded decimal, floating point numbers, **IEEE 754 floating point standard**, Micro-operation, Bus and Memory Transfers, Bus Architecture, Bus Arbitration, Arithmetic Logic, Shift Micro operation, Arithmetic Logic Shift Unit.

**Unit II**

**Instruction set architecture & computer organization**

Levels of programming languages, assembly language instructions, **8085 instruction set architecture**, Instruction Codes, Computer Registers, Computer Instructions, Timing & Control, Instruction Cycle, Memory Reference Instructions, Input-Outputand Interrupts

**Unit III**

**Control Design:**

Instruction sequencing & interpretation, Hardwired & Micro Programmed (ControlUnit), Micrprogrammed computers, Micro coded CPU: Pentium processor

**CPU Design**

Specifying a CPU, Design & implementation of simple CPU, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, **Internalarchitecture of 8085 microprocessor**.

**Unit IV**

**Memory organization**

Memory Technology, Main Memory (RAM and ROM Chips), Virtual memory, High-speed memories

**Input/Output organization**

Asynchronous Data Transfers, Programmed I/O, interrupts, Direct memory Access,Serial communication, UARTs, **RS-232-C & RS-422** standard

**Text**:


1. J. D. Carpinelli, "Computer Systems Organization and Architecture", PearsonEducation, 2006.
2. J. P. Hayes, "Computer Architecture and Organization", McGraw Hill, 1988.


**Reference**:


1. J. L Hennessy and D. A. Patterson, "Computer Architecture: A quantitativeapproach", Morgon Kauffman, 1992.
2. W. Stallings, "Computer organization and Architecture", PHI, 7th ed, 2005.
3. B. Parhami, "Computer Architecture: From Microprocessors to Supercomputers",Oxford University press, 2006.

LAB-III **(BAEP-751) :**
**PART-I : EMBEDDED SYSTEMS LAB (2 CREDITS)**
**PART-II: COMPUTATIONAL PHYSICS LAB (2 CREDITS)**

## BAEP-751-PART-II
## COMPUTATIONAL PHYSICS LAB

### Course Education Objectives

**CO1.**To carry forward from semester II into advanced computational methods in physics with MATLAB as the programming language. To also diversify to using other popular and useful software like MATHEMATICA, GAUSSIAN, LAB VIEW, VASP AND R.

**CO2**. To expose students to solving from a selected list of higher level problems which involve concepts of random numbers, Monte Carlo methods, Molecular dynamics and other techniques with the list updated from time to time in tune with the needs of industry/research and topical subjects.

**CO3**. To educate students to learn the logic behind solving problems related to real physical examples, simulation, modelling and designing the algorithms and translating them into programmes

### Course contents

**List of experiments [Semester -III]**

1. Introduction to the concept of random numbers
2. Matlab commands rand, randn, randint and examples problems based on random numbers – tossing of coin, rolling of dice, mean, variance, standard deviation, histogram plotting, uniform and normal distributions
3. Simulation of Brownian motion by MC method
4. Simulation of Radioactive Decay by using random numbers
5. Generation of random numbers through computer programs
6. Algorithm – I for Generation of random numbers – mid square method
7. Algorithm – II for Generation of random numbers -linear congruence method
8. Testing the Quality of Random numbers
9. Uniformity test
10. Autocorrelation test
11. Simulating a Fractal Fern using random numbers
12. Introduction to the Monte Carlo method
13. Estimating the value of pi by Monte Carlo method
14. Integration using Monte Carlo method– single, double, triple integrals
15. Introduction to Molecular Dynamics
16. The Verlet Algorithm
17. The Velocity Verlet Algorithm
18. Implementation to simple systems using the Lennard Jones potential

Small projects based on the above techniques from classical and quantum mechanics and mathematics and relevant physical examples are given to the students

## Course Outcomes

**CO1.** Students learn problem solving with examples from physics and mathematics. They get familiar with operations to visualisation techniques and techniques like Monte Carlo and Molecular Dynamics which have a wide range of applications

**CO2**. The techniques learnt are applied to real physical problems from classical mechanics, quantum mechanics and many interesting problems and situations.

**CO3.** The students learn to think critically and learn how to apply the techniques learnt to real problems that they can encounter in projects/research/industry/academia

**THIS COURSE HAS CONTENTS WHICH CAN LEAD TO EMPLOYABILITY, ENTREPRENEURSHIP AND SKILL DEVELOPMENT**

### MAPPING WITH PROGRAMME SPECIFIC OBJECTIVES

| BAEP-751-Part-II | | | | |
|---|---|---|---|---|
| | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
| **CO1** | 3 | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 3 | 3 |

### MAPPING WITH PROGRAMME OBJECTIVES

| BAEP-751-Part-II | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** |
| **CO1** | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 |
| **CO2** | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 |
| **CO3** | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 |

**Program: M.Tech (EP)**

**Semester-III**

**BAEP-751** Embedded Systems Lab (in sharing with Matlab) 4P Credits:4/2

**Objectives:**

**CO1.** The Lab Course provides hands on experimental skills and focuses on learning of programming and interfacing the 8051 microcontroller using KEIL software for various embedded applications in physics, and engineering and understand their role in academia nad industry. The students can make programming and design part of their minor and major project.

**CO2**. The course prepares students to apply the process of Software Testing during software development. It enables the students to program, simulate and test the 8051/AVR processor based circuits and their interfaces using the UNI-SDK-51 Kit . Students prepare themselves for academia and industry

**CO3**. To educate students to learn the logic behind solving problems related to real life physical examples, simulation, modelling and designing the algorithms and translating them into programmes. Lab environment aims in inculcating the spirit of Team work and improves their communication skills.

**Embedded Lab -List of Experiments:**

- Familiarization with IDE
- Familiarization with the 8051 microcontroller
- Writing codes in assembly/ C for the following:
  - Addition , Subtraction , Multiplication, Division using Hexadecimal numbers
  - Use of Different Addressing modes
  - Transfer of data from ROM and RAM
  - Addition of BCD numbers
  - Data conversion from ASCII to BCD
  - Use of Subroutine, jump call instructions
  - Use of stack
  - Use of Ports
  - Use of Bit addressable and special function registers
  - Generation of square pulse using timers and display it using logic analyzer
  - Use of counters
  - Use of Serial communication port with baud rate calculation

- Programming with interrupts signals
- Display data on LCD

4). Learning of Interfacing the UNI-SDK-51 8051/AVR microcontroller based kit on the system's COM /USB port and programming the following peripherals using ISP programming

- LCD/Seven segment display
- Keyboard
- Blinking of LED's
- Buzzer and relay
- e)ADC chip
- Sensors
- RTC
- EEPROM

**Reference Books**


- The 8051 microcontroller by Kenneth J. Ayala, Cengage Learning
- The 8051 Microcontrollers and Embedded Systems, Muhammad Ali Mazidi, Pearson Publication


**Course Outcomes:**

CO1: Developing new skills, Apply assembly level programming, Implementation of Device-Level Programming, Learn In system programming Implementation of Embedded Debugging. Design and programming an embedded system for real life applications using electronics and physics knowledge and can take up this in summer or six months project.

CO2: Learn handling hardware components and peripherals like RAM , UART, ADC, Buzzer, Serial Peripheral Interface, RTC, Relay, LCD,LED, 7 segment display, temperature sensor, keyboard etc. on the UNI-SDK 51 hardware kit, learning use of peripherals in real life systems, learning new networks like $I^2C$, JTAG etc. and also softwares simulation with Keil or C etc.and analyzing the datasheets. enabling them to work as embedded hardware/ software engineers or doing futuristic research in industry or academia.

CO3:Develop communication skills for presenting scientific work and demonstrate experiments, learning skills of team work required for working in industry or as entrepreneur and honing their skills for placement.

**THIS COURSE HAS CONTENTS WHICH CAN LEAD TO EMPLOYABILITY, ENTREPRENEURSHIP AND SKILL DEVELOPMENT**

**MAPPING WITH PROGRAMME SPECIFIC OBJECTIVES**

| BAEP-751 | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 |
| CO2 | 2 | 3 | 3 | 3 |
| CO3 | 2 | 3 | 3 | 3 |

**MAPPING WITH PROGRAMME SPECIFIC OBJECTIVES**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 |
| CO2 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 |
| CO3 | 2 | 3 | 3 | 2 | 2 | 2 | 3 | 3 |

**SUMMER PROJECT/TRAINING**
**BAEP-753 (3 credits NUES)**

## Course Education Objectives (CO)

The purpose of this course is to utilise the time during the summer vacation period and spend 45 days working on a project related a current research topic relevant to Physics / Applied Physics / Technology either in-house or externally and write a technical report and make an evaluative oral presentation to the rest of the class and Faculty.

**CO1.** To initiate the student to take up a research topic in which a small theoretical/numerical or experimental project can be done, written up and presented in a seminar

**CO2.** To help the student to gain confidence in approaching a research topic/problem and learning the methodology, thinking critically and coming up with problem solving techniques.

**CO3.** To teach the student how to complete a project and learn some new techniques which can be useful later projects/internships/career placements and to also effectively write, make a presentation and communicate results in a clear, comprehensive and effective manner.

## Course Outcomes (CO)

**CO1.** The student will be in a position to approach a new research problem and learn techniques under an expert making her/him ready to learn new things and take on challenges in their career.

**CO2**. The exercise of doing these projects will take the student to working with researchers in research labs, industry, companies etc. giving them both exposure and an opportunity for future placements and careers.

**CO3.** The student will learn to write technical papers and reports, make seminar presentations well and communicate ideas and results with clarity, making them well prepared for future jobs.

**THIS COURSE HAS CONTENTS WHICH CAN LEAD TO EMPLOYABILITY ,ENTREPRENEURSHIP AND SKILL DEVELOPMENT**

**MAPPING WITH PROGRAMME SPECIFIC OBJECTIVES**

| BAEP-753 | | | | |
|---|---|---|---|---|
| | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
| **CO1** | 3 | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 3 | 3 |

**MAPPING WITH PROGRAMME OBJECTIVES**

| BAEP-753 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** |
| **CO1** | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

# INTRODUCTION TO QUANTUM INFORMATION AND COMPUTATION

**Course Code: BAEP – 707** **L/T/P 3 0 0**

## Course Education Objectives (CO)

**CO1.** Quantum information and computation is currently one of the hottest topics in computer science, physics & engineering, expected to revolutionise future information technology. The Government of India has announced a National Mission for Quantum Technologies and Applications and allocated INR 8000 crores for this purpose in 2020. This course demands an unusual combination of theoretical computer science and quantum mechanics and will introduce students to this exciting new field and cover its main ideas, current developments and future trends.

**CO2.** To introduce students to the basic concepts in quantum information and to familiarise them with its unique computing paradigms and its powerful potential applications which form a base for both working in upcoming companies as well as research groups in top IT companies and academia

**CO3.** To educate students with the basics of quantum computing - qubits, quantum gates, quantum circuits, and working with quantum algorithms. To introduce them to various physical systems that can implement quantum information protocols

## Course Contents

**Introduction :** Computers as physical systems, technological issues, Introduction to Turing machines, classical probabilistic and deterministic Turing machines, Quantum Turing machines; Introduction to computability, complexity, classical complexity and quantum complexity classes

**Quantum Physics and Computers:** Review of Quantum Mechanics- state vectors, superpositions, unitary operators, hermitian operators, Schrödinger equation, Hamiltonian evolution, the concept of quantum measurement, the concept of qubits, quantum registers and quantum gates

**Quantum Algorithms:** Introduction to quantum algorithms, Deutsch's algorithm, Shor's algorithm and Grover's search Algorithm, Physical implementation of simple quantum gates

**Quantum Cryptography and Quantum Teleportation, real physical systems and technological feasibility:** Heisenberg uncertainty principle, polarization states of photons, quantum cryptography using polarized photons, entanglements, introduction to the EPR paradox, BELL's theorem, Bell basis, teleportation of a single qubit, review of some current experiments and candidate physical systems, technological feasibility of a quantum computer and the limitations imposed by noise.

**References**:

1. Quantum Computation and Quantum Information, Nielsen & Chuang (Cambridge University Press)

2. Introduction to Quantum Computation and Information, Hoi-Kwong Lo, Tim Spiller, SanduPopescu (World Scientific 1998).

3. The Quantum Computer by Jacob West (April 28, 2000)

## Course Outcomes (CO)

**CO1.** The student will be in a position to better understand the impact of this powerful discipline and be ready for the new frontiers opening up in computing, communication and cyber security

**CO2.** The student will be familiar with the basic tools required to work with quantum information applications and will be exposed to the cutting edge discoveries and advances being made the world over

**CO3.** On completion of this course, the student will be ready for assignments and placement in the growing quantum computing market world wide and the opportunities opening up in the billion dollar industry of the biggest technological giants.

**THIS COURSE HAS CONTENTS WHICH CAN LEAD TO EMPLOYABILITY ANDSKILL DEVELOPMENT**

### MAPPING WITH PROGRAMME SPECIFIC OBJECTIVES

| BAEP-707 | | | | |
|---|---|---|---|---|
| | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
| **CO1** | 3 | 3 | 2 | 3 |
| **CO2** | 3 | 3 | 2 | 3 |
| **CO3** | 3 | 3 | 2 | 3 |

### MAPPING WITH PROGRAMME OBJECTIVES

| BAEP-707 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** |
| **CO1** | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 3 |
| **CO2** | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 2 |
| **CO3** | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 3 |

**PHOTONICS**
**Course Code: BAEP:709** **L/T/P::3 0 0**

**Course Education Objectives (CO)**

**CO1:** To introduce basic concepts of Laser theory and design in order to students can familiarize content of Laser Physics. It is leading to the students to have various topics of advanced Lasers and semiconductor Lasers.
**CO2:** To make students capable to understand the concept of Optical Fiber with Laser together various optical fibers. Students gain experience about dispersion and optical losses in optical fiber.
**CO3:** To make students able to learn the theory and experiment of detector physics and technology. To familiarize students with various merits and properties of detection technology and physics.
**CO4:** To make students learning concepts of optimization of various components of optical fiber technology i.e. Wavelength Division Multiplexing, Dense Wavelength Division Multiplexing and Erbium Doped Fiber Amplifier.

**Course Contents**

**Unit I:** Review of wave nature and particle nature of light, Light sources-black body radiation, Interaction of light with matter-Emission and absorption of radiation, Laser Fundamentals: Stimulated and spontaneous Emission, Einstein relations, Optical feedback, threshold condition, lineshape function, Laser Modes, classification of laser, Requirement of Sources for Optical Fiber Communication, Injection Laser Diode (ILD) and Light emitting Diode (LED), Optical Power Launching and coupling from LED/ILD to optical fiber, Single mode operation, mode locking and Q switching of laser, LED and ILD drive circuitry.Elementry ideas of Display devices – Plasma, Liquid Crystal and Numeric Displays.
**Unit II:** Optical fiber Communication and its advantages, Classification of optical fibers, Numerical aperture, light ray propagation through step index and graded index fiber, Timer dispersion, Light wave propagation through optical fibers, Eigen-value equation and its solution, Pulse Broadening, Material and Waveguide Dispersion. Signal Attenuation, Splice and connector loss.
**Unit III:** Photodetection, PIN and Avalanche Photo diode (APD), Quantum Efficiency, Responsivity and Speed of Response Noise mechanism in photo detectors, Photomultipliers, Photon Counting techniques.
**Unit IV:** Components of Optical Fiber Communication Systems, Modulation Scheme, System design consideration, Optical power budget, Rise time budget. Over view of recent developments in optical fiber communication with special reference to Erbium Doped Fiber Amplifier (EDFA), coherent optical communication, Wavelength Division Multiplexing (WDM) and Dense WDM (DWDM) based optical fiber communication. Introduction to Non linear fiber optics and Solutions. Elementary ideas of Optical Fiber Sensors and applications of specialty optical fibers.

**References:**
1. Optoelectronics: An Introduction by J. Wilson and JFB Hawkes, PHI (2000)
2. Optical fiber Communication by Gerd Keiser, McGraw Hill(2000).
3. Fiber Optics by Ghatak&Thyagarajan. Tata McGraw Hill (1998)

4. The hand book of Photonics: Gupta and Ballato-CRC Press(2006).

## Course Outcomes

**CO1:** To understand basic concepts related to Laser Science & optical fiber technology.
**CO2:** To analyse the physics of various components of fiber optics and related technology.
**CO3:** To learn the various concepts of optical detectors for optical fiber technology.
**CO4:** To understand the mechanism of applications of photonics

**THIS COURSE HAS CONTENTS WHICH CAN LEAD TO EMPLOYABILITY ,ENTREPRENEURSHIP AND SKILL DEVELOPMENT**

## MAPPING WITH PROGRAMME SPECIFIC OBJECTIVES

| BAEP-709 | | | | |
|---|---|---|---|---|
| | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
| **CO1** | **2** | **3** | **2** | **3** |
| **CO2** | **3** | **2** | **2** | **3** |
| **CO3** | **2** | **3** | **3** | **3** |
| **CO4** | **3** | **2** | **3** | **2** |

## MAPPING WITH PROGRAMME OUTCOMES

| BAEP-709 | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO5** | **PO6** | **PO7** | **PO8** |
| **CO1** | **3** | **3** | **2** | **3** | 3 | 2 | 3 |
| **CO2** | **3** | **2** | **3** | **3** | 2 | 2 | 2 |
| **CO3** | **2** | **2** | **2** | **2** | 2 | 3 | 2 |
| **CO4** | **2** | **3** | **3** | **2** | 2 | 3 | 3 |

# ION BEAM TECHNOLOGY

## Course Code: BAEP -711 L/T/P: 3 0 0

## Course Education Objectives (CO)

**CO1.** Ion Beam Technology is currently one of the most modern topics in nuclear science and technology.

**CO2:**The main objective of this ion beam technology course is to trained students with new accelerator technology in the field of research, health care, industry and different theoretical design and usage of various accelerators.

## Course Contents

**Vacuum :**Elements of a Vacuum system, molecular & viscous flow & conductance pumping speed, Displacement & containment pumps, design of ultra vacuum system, vacuum measurement gauges, Leak detection techniques.

**Beam Optics & Beam Transport:** Motion of charged particles in electric and magnetic fields, Phase space (both transverse and longitudinal) and Liouville's theorem , Focusing devices :Einzel lens, solenoid, quadruple, magnetic and electric sector fields; Matrix method Aberrations, Design of a beam line for beam transport & computer simulations.

**Ion source:** Production of charged particles Space charge limitation, Extraction & Focusing geometries, Positive and negative ion sources, Radio frequency ion sources, Duo plasmatron, Penning ionization source, sputter ion source, ECR source–room temperature & super conducting.

**Accelerators:** Electrostatic accelerators – Cockroft- Walton, Van – de – Graf , Pelletron, Pulsed accelerator – Cyclotron, Synchrotron, Radio frequency linear accelerators – LINAC, Storage rings – future trends.

**Cryogenic:** Introduction to cryogenics and its application to accelerator , Achieving low temperature, Various Thermodynamic Cycles, Heat transfer at low temperature : Conduction , Convection , Radiation process ,Insulation , LN2/He storage vessels , Cryostat Design , Properties of materials at low temperature , Heat load calculation , Superconducting magnet / cavity for accelerator, superconducting magnet vs conventional magnet, Cryogenic instrumentation- Temperature sensor, Liquid Helium, Nitrogen level, Flow sensors.

**Applications of accelerator:** Trace element analysis , Various methods , RBS measurements of elemental ratios & concentrations , channeling RBS , ERDA – depth resolution & sensitivity ,

high resolution& sensitivity , high resolution sub monolayer thickness studies, Nuclear reaction analysis (NRA), Particle induced X – ray emission (PIXE ) studies, Accelerator mass spectrometry (AMS), Medical applications of accelerators.

**Reference:** Accelerator Based Research in Basic and Applied Sciences, 2002, Amit Roy and D K Avasthi, Phoenix Publishers.

## Course Outcomes (CO)

**CO1.:**The student will be familiar with the basic tools required to work with accelerator, ion source, beam optics, vacuum technology, ion implantation and latest accelerator available around the world.

**CO2.:**On completion of this course, the student will be ready for assignments and placement in the growing accelerator technology in many fields like, health care, medicines, reactor technology, nuclear technology and accelerator based research and industry.

**CO3:** Future Technology & Applications like: (a) Free Electron Laser (FEL) (b) Superconducting Linacs & Cyclotrons

**THIS COURSE HAS CONTENTS WHICH CAN LEAD TO EMPLOYABILITY AND SKILL DEVELOPMENT**

**MAPPING WITH PROGRAMME SPECIFIC OBJECTIVES**

| BAEP-711 | | | | |
|---|---|---|---|---|
| | PSO1 | PSO2 | PSO3 | PSO4 |
| CO1 | 2 | 3 | 2 | 3 |
| CO2 | 3 | 2 | 2 | 3 |
| CO3 | 2 | 3 | 3 | 3 |

**MAPPING WITH PROGRAMME OBJECTIVES**

| BAEP-711 | | | | | | | |
|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO5 | PO6 | PO7 | PO8 |
| CO1 | 3 | 3 | 2 | 3 | 3 | 2 | 3 |
| CO2 | 3 | 2 | 3 | 3 | 2 | 2 | 2 |
| CO3 | 2 | 2 | 2 | 2 | 2 | 3 | 2 |
| CO4 | 2 | 3 | 3 | 2 | 2 | 3 | 3 |

**Paper Code: ITEP 721:**

| L | T | C |
|---|---|---|
| 3 | 1 | 4 |

## Paper: Coding Theory

## Course Outcome

1. Comprehend the quantitative theory of information in conceptualizing a reliable and efficient communication system.
2. Understand the principles of data compression, channel capacity of common communication channels.
3. Design and evaluate the performance linear, Cyclic and Quaternary codes.

**Unit I**

Definitions, Uniquely Decodable Codes, Instantaneous Codes, Krafts Inequality, McMillan's Inequality, Optimal Codes, Binary Huffman Codes, r-ary Huffman codes, Information and Entropy, Properties of Entropy Function, Entropy and Average Word-Length, Shannon-Fano Coding, Shannon's First Theorem, Information Channels, Binary Symmetric Channel, System Entropies, System Entropies for Binary Symmetric Channel, Extension of Shannon's First Theorem to Information Channels, Mutual Information, Mutual Information for the Binary Symmetric Channel, Hamming Distance, Shannon's Second (Fundamental) Theorem, Converse of Shannon's Theorems.[T1 T2R1]

### Unit II

Linear Codes: Block Codes, Linear Codes, Hamming Codes, Majority Logic Coding, Weight Enumerators, The Lee Metric, Hadamard Codes, Golay Codes (Binary and Ternary), Reed Muller Codes, And Kerdock Codes. Bounds on Codes: Gilbert Bound, Upper Bound, Linear Programming Bounds, Hamming's Sphere –Packing Bound, Gilbert Varshamov Bound, Hadamard Matrices and Codes[T1 T3].

### Unit III

Cyclic Codes: Generator Matrix, Check polynomial, Zeros of Cyclic Codes, BCH Codes, Reed-Solomon Codes, Quadratic Residue Codes, Generalized Reed-Muller Codes. Perfect Codes and Uniformly Packed Codes: Lloyd's Theorem, Characteristic Polynomial of a Code, Uniformly Packed Codes, Nonexistence Theorems.[T2 R1 R3]

### Unit IV

Quaternary Codes, Binary Codes Derived from codes over Z4, Galois Rings over Z4, Cyclic Codes over Z4. Goppa Codes. Algebraic Curves, Divisors, Differentials on a Curve, Riemann – Roch Theorem, Codes from Algebraic Curves. Arithmetic Codes: AN Codes, Mandelbaum – Barrows Codes, Convolutional Codes.[T1 T2 T3]

### Text:


**T1**. G. A. Jones and J. M. Jones, "Information and Coding Theory", Springer, 2000.
**T2**. J. H. van Lint, "Introduction to Coding Theory", Springer, 1999.
**T3**. Cover Thomas, "Elements of Information Theory", and Wiley 2006.


### Reference:


**R1**. R. W. Hamming, "Coding and Information Theory", Prentice Hall, 1986.
**R2**. T. M. Cover and J. A. Thomas, "Elements of Information Theory", Wiley, 1991.
**R3**. R. E. Blahut, "Principles and Practice of Information Theory," AWL, 1987.
**R4**. A. I. Khinchin, "Mathematical Foundations of Information Theory", Dover, 1957.
**R5**. F. M. Reza, "An Introduction to Information Theory", Dover, 1994.
**R6.** R. B. Ash, "Information Theory", Dover, 1990.
**R7**.T. K. Moon, "Error Correction Coding: Mathematical Methods and Algorithms", Wiley, 2006.
**R8**. W. C. Huffman and V. Pless, "Fundamentals of Error – Correcting Codes", CUP, 2003
**R9.** S. Lin and D. J. Costello, "Error Control Coding: Fundamentals and Application", 1983.
**R10**. R. H. Morelos-Zaragoza, "The Art of Error Correcting Codes", Wiley, 2002.

**R11**. R. E. Blahut, "Theory and Practice of Error Control Codes," AWL, 1983.

## Coding Theory Lab

**Course Code: ITEP 761** **L/T/P 0 0 2**

This lab course will be based on the paper Coding Theory. The concerned teacher shall announce the list of practicals in the first week of teaching. At least ten practicals have to be performed by student studying for this paper. Course outcomes are the same as the corresponding theory paper.

| | | L | T/P | C |
|---|---|---|---|---|
| **Code: ITEP 723** | **Paper: Object Oriented Software Engineering** | **3** | **1** | **4** |

Skill Development/Employability

## Course Outcome

1. Ability to identify requirements, analyze and prepare models.
2. Ability to select a suitable architecture for the project. Also plan, schedule and track the progress of the project.
3. Ability to design and develop software project and understand the maintenance concept of object oriented systems.
4. Ability to apply testing principles on object oriented software project and understand the methods to determine reliability in software.

### Unit I

**Introduction to Software Engineering:** Software Engineering Development, Software Life Cycle Models, Standards for developing life cycle models.

**Object Methodology & Requirement Elicitation:** Introduction to object Oriented Methodology, Overview of Requirements Elicitation, Requirements Model-Action & Use cases, Requirements Elicitation Activities, Managing Requirements Elicitation.

### Unit II

**Architecture:** Model Architecture, Requirements Model, Analysis Model, Design Model, Implementation Model, Test Model

### Unit III

**Modeling with UMLZ:** Basic Building Blocks of UML, A conceptual Model of UML, Basic Structural Modeling , UML Diagram

**System Design:** Design concepts & activities, Design Models, Block design, Testing

### Unit IV

**Testing Object Oriented Systems:** Introduction, Testing Activities & Techniques, The Testing Process, Managing Testing

### Case Studies

### Text Books:


1. I. Jacobson, “Object-Oriented Software Engineering: A Use Case DrivenApproach”, Pearson, 1992
2. B. Breugge and A. H. Dutoit, “Object Oriented Software Engineering:Using UML, Patterns, and Java”, Prentice Hall, 2004.
3. G. Booch, J. Rumbaugh and I. Jacboson, “The Unified ModelingLanguage User Guide” Addison-Wesley, 2005.

## Object Oriented Software Engineering Lab

**Course Code: ITEP 763** **L/T/P 0 0 2**

This lab course will be based on the paper Object Oriented Software Engineering. The concerned teacher shall announce the list of practicals in the first week of teaching. At least ten practicals have to be performed by student studying for this paper. Course outcomes are the same as the corresponding theory paper.

| | | L | T/P | C |
|---|---|---|---|---|
| **Code: BAEP 725** | **Paper: Multimedia and Visualization Technology** | **3** | **1** | **4** |

## Skill Development and Employability

**Course Outcome**

1. Understand multimedia streams, systems, storage and H/W/ and S/W requirements.
2. Understand audio, video, text and animation techniques and their amalgamation to create a multimedia system.
3. Ability to use Maya to create multi-media applications.

**UNIT I**

**Introduction:** Concept of Multimedia, Multimedia Applications, Hardware Software requirements, Multimedia products & its evaluation.Components of multimedia: Text, Graphics, Audio, Video.Design & Authoring Tools, Categories of Authority Tools, Types of products.

**UNIT II**

Introduction, Basic Terminology techniques, Motion Graphics 2D & 3D animation.Introduction to MAYA(Animating Tool)

**UNIT III**

Fundamentals, Modeling: NURBS, Polygon, Organic, animation, paths & boxes, deformers.

**UNIT IV**

Rendering & Special Effects: Shading & Texturing Surfaces, Lighting, Special effects.

# Text / Reference Books:


1. David Hillman, "Multimedia Technology & Applications", Galgotia Publications.
2. Rajneesh Agrawal, "Multimedia Systems", Excel Books.
3. Nigel Chapman & Jenny Chapman, "Digital Multimedia", Wiley Publications.
4. D.P. Mukherjee, "Fundamentals of Computer Graphics and Multimedia", PHI.

## Multimedia and Visualization Technology Lab

**Course Code: ITEP 765** **L/T/P 0 0 2**

This lab course will be based on the paper Multimedia and Visualization Technology Lab. The concerned teacher shall announce the list of practicals in the first week of teaching. At least ten practicals have to be performed by student studying for this paper. Course outcomes are the same as the corresponding theory paper.

## COMPUTER NETWORKS LAB

**Course Code: ITEP 767** **L/T/P 0 0 2**

1. Perform and Simulate the experiment of PAM using the PAM Kit.
2. Perform and Simulate the experiment of PPM using the PPM Kit
3. Perform and Simulate the experiment of CSMA Protocol with LAN Trainer Kit with Bus Toplogy
4. Perform and Simulate the experiment of CSMA/CD Protocol with LAN Trainer Kit with Bus Topology
5. Perform and Simulate the experiment of CSMA Protocol with LAN Trainer Kit with Star Toplogy
6. Perform and Simulate the experiment of CSMA/CD Protocol with LAN Trainer Kit with Star Topology
7. Write a Program to implement Connection Oriented Client Server communication (Socket Programming) using TCP Protocol
8. Write a Program to implement UDP oriented Client Server communication (Socket Programming)

Note: List of experiments will be regularly upgraded.

### Course Objectives

**CO: To learn the basics of computer networks and the concepts of exchange of data and sharing of resources.**

### Course Outcomes

**CO: Students learn the basics of computer networks and the concepts of exchange of data and sharing of resources which can be applied to real life problems and situations**

**THIS COURSE HAS CONTENTS WHICH CAN LEAD TO EMPLOYABILITY, ENTREPRENEURSHIP AND SKILL DEVELOPMENT**

### MAPPING WITH PROGRAMME SPECIFIC OBJECTIVES

| ITEP-767 | CO |
|---|---|
| PSO1 | 3 |
| PSO2 | 3 |
| PSO3 | 3 |
| PSO4 | 2 |

### MAPPING WITH PROGRAMME OBJECTIVES

| BAEP-727 | CO |
|---|---|
| PO1 | 2 |
| PO2 | 3 |
| PO3 | 2 |
| PO4 | 3 |
| PO5 | 2 |
| PO6 | 3 |
| PO7 | 2 |
| PO8 | 3 |

**COMPUTER NETWORKS**
**Course Code: ITEP 727 L T P 3 0 0**

UNIT – I

Introduction and The Physical Layer: Uses of Computer Networks, Network Hardware, Network Software, Reference Model (OSI, TCP/IP Overview), Topology , Types of Networks , Theoretical Basis for Data Communication, Guided Transmission Media, Unguided Transmission Media : Wireless Transmission, Communication Satellites.
[No. of Hrs.: 10]

UNIT – II

Digital Signal Encoding Formats – NRZ-L, NRZI, Bipolar-AMI, Manchester, Differential Manchester, Digital Modulation – ASK, FSK, PSK, QPSK, Digitization – Sampling Theorem, PCM, DM, Analog Modulation – Introducing AM, FM, PM.
[No. of Hrs.: 10]

UNIT – III
The Data Link Layer: Ethernet Frame Format , Flow Control Protocols, Stop-and-wait Flow Control, Sliding – Window Flow Control, Error Control, Stop-and-wait ARQ, Goback- N, Selective-repeat. The Network Layer: IPv4 Addressing Mechanism , Routers , Introduction to Routing Protocols.
[No. of Hrs.: 10]

UNIT – IV
The Transport Layer : Connection Oriented and Connection less Service Protocols :
UDP, TCP. Application Layer: DNS, E-Mail, SMTP , MIME.
Network Security: Firewalls (Application and packet filtering), Cryptography : Public and Private Key Cryptography.
[No. of Hrs.: 10]

TEXT:
1. A. S. Tanenbaum, “Computer Networks”, 4thEd., Pearson, 2003
2. Data Communications and Networking 2nd Ed.,TMH,2000
2. W. Stallings, “Data and Computer Communications”, 7thEd., Pearson, 2002.
REFERENCES:
1. Black U, “Computer Networks-Protocols, Standards and Interfaces”, PHI 1996
2. Comer E. Doughlas, “Computer Networks and Internets”, 2nd Ed., Pearson, 2000
3. Comer E. Doughlas, “Internetworking with TCP/IP, Vol. 1, PHI, 2000
4. Laura Chappell (Ed), “Introduction to Cisco Router Configuration”, Techmedia, 99.

**Course Objectives**

**CO: To learn the basics of computer networks and the concepts of exchange of data and sharing of resources**.

**Course Outcomes**

**CO: Students learn the basics of computer networks and the concepts of exchange of data and sharing of resources which can be applied to real life problems and situations**

## MAPPING WITH PROGRAMME SPECIFIC OBJECTIVES

| ITEP-727 | CO |
|---|---|
| PSO1 | 3 |
| PSO2 | 3 |
| PSO3 | 3 |
| PSO4 | 2 |

## MAPPING WITH PROGRAMME OBJECTIVES

| BAEP-727 | CO |
|---|---|
| PO1 | 2 |
| PO2 | 3 |
| PO3 | 2 |
| PO4 | 3 |
| PO5 | 2 |
| PO6 | 3 |
| PO7 | 2 |
| PO8 | 3 |

**PROJECT MANAGEMENT SYSTEMS Course Code: SMSEP – 715 L/T/P 2 0 0**

Introduction : Project management overview; Forms of project organisation; Project planning; Project control.

Project Identification and Presentation : Socio-economic consideration in project formulation; Social infrastructure projects for sustainable development; Investment opportunities; Project screening and presentation of projects for decision making; Expansion of capacity; Diversification.

Market and Technical Analysis: Market and demand analysis – Market survey, Demand forecasting, Uncertainties in demand forecasting; Technical Analysis – Product mix, Plant capacity, Materials and inputs, Machinery and equipment.

Project Costing and Finance : Cost of project; Cost of production; Break even analysis; Means of financing project; Tax aspects in project finance; Role of financial institution in project finance.

Project Appraisal : Time value of money; Project appraisal techniques – Payback period, Accounting rate of return, Net present value, Internal rate of return, Benefit cost ratio; Social cost benefit analysis; Effective rate of protection.

Risk Analysis: Measures of risk; Sensitivity analysis; Simulation analysis; Decision tree analysis.

Project Scheduling/Network Techniques in Project Management : CPM and PERT analysis; Float times; Crashing of activities; Contraction of network for cost optimization, updating; Cost analysis of resources allocation.

Multiple Projects : Project dependence; Capital rationing; Ranking methods of projects; Mathematical programming approach; Linear programming model; Post ProjectEvaluation.

Course Objectives

CO: To introduce students to the basics of project managements systems and prepare them for real life situations

Course Outcomes

CO: students learn the basics of project managements systems and prepare for real life situations

## MAPPING WITH PROGRAMME SPECIFIC OBJECTIVES

| ITEP-715 | CO |
|---|---|
| PSO1 | 3 |
| PSO2 | 3 |
| PSO3 | 3 |
| PSO4 | 2 |

## MAPPING WITH PROGRAMME OBJECTIVES

| BAEP-715 | CO |
|---|---|
| PO1 | 2 |
| PO2 | 3 |
| PO3 | 2 |
| PO4 | 3 |
| PO5 | 2 |
| PO6 | 3 |
| PO7 | 2 |
| PO8 | 3 |

**MAJOR PROJECT**
**BAEP-702 (20 credits)**

## Course Education Objectives (CO)

The purpose of this course is to spend six months in working on a project related a current research topic relevant to Physics / Applied Physics / Technology either in-house or externally and write a technical report which will be evaluated by an internal and external seminar presentation.

**CO1.** To initiate the student to take up a research topic in which a major theoretical/numerical or experimental project can be done, written up and presented in a seminar

**CO2.** To help the student to gain confidence in approaching a research topic/problem and learning the methodology, thinking critically and coming up with problem solving techniques.

**CO3.** To teach the student how to complete a major project and learn some new techniques which can be useful later projects/internships/career placements and to also effectively write, make a presentation and communicate results in a clear, comprehensive and effective manner.

### MAPPING WITH PROGRAMME SPECIFIC OBJECTIVES

| BAEP-702 | | | | |
|---|---|---|---|---|
| | PSO1 | PSO2 | PSO3 | PSO4 |
| CO1 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 |

## COURSE OUTCOMES (CO)

**CO1.** The student will be in a position to approach a new research problem and learn techniques under an expert in the field of choice making her/him ready to learn new things and take on challenges in their career.

**CO2**. The exercise of doing these projects will take the student to working with expert researchers in research labs, industry, companies etc. giving them both exposure and an opportunity for future placements and careers.

**CO3.** The student will learn to write technical papers and reports, make seminar presentations well and communicate ideas and results with clarity, making them well prepared for future jobs.

**THIS COURSE HAS CONTENTS WHICH CAN LEAD TO EMPLOYABILITY, ENTREPRENEURSHIP AND SKILL DEVELOPMENT**

## MAPPING WITH PROGRAMME OBJECTIVES

| BAEP-702 | | | | | | | |
|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO5 | PO6 | PO7 | PO8 |
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

**COMPREHENSIVE VIVA/VIVA VOCE**
**BAEP-704 (5 credits)**

## Course Specific Objectives (CO)

The purpose of this course is to prepare the student to be able to communicate her/his learning experience in the entire programme and involves an exhaustive and comprehensive viva voce based on all the courses covered and the major project undertaken in the last semester to be evaluated by an internal and external viva and presentation.

**CO1.** To prepare the student to be well versed in the training and study of the entire duration of the M.Techprogramme

**CO2.** To help the student to gain confidence to face a panel of examiners and to be mindful of basic concepts and fundamental ideas of the various courses.

**CO3.** To teach the student how to communicate their knowledge in a clear, comprehensive and effective manner which prepares them for job interviews and challenges in future.

## Course Outcomes (CO)

**CO1.** The student will be able to take a comprehensive view of all subjects studied thoroughly

**CO2**. The student will have the confidence to face job interviews in research labs, industry, companies etc. giving them both exposure and an opportunity for future placements and careers.

**CO3.** The student will learn to pay attention to basic concepts and ideas and critical thinking and go beyond rote learning.

**THIS COURSE HAS CONTENTS WHICH CAN LEAD TO EMPLOYABILITY ,ENTREPRENEURSHIP AND SKILL DEVELOPMENT**

**MAPPING WITH PROGRAMME OBJECTIVES**

| BAEP-704 | | | | | | | |
|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO5 | PO6 | PO7 | PO8 |
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

**MAPPING WITH PROGRAMME SPECIFIC OBJECTIVES**

| BAEP-704 | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO5** | **PO6** | **PO7** | **PO8** |
| **CO1** | **3** | **3** | **3** | **3** | **3** | **3** | **3** |
| **CO2** | **3** | **3** | **3** | **3** | **3** | **3** | **3** |
| **CO3** | **3** | **3** | **3** | **3** | **3** | **3** | **3** |