Master of Science
Applied Physics

FLEXILEARN
-Freedom to design your degree

Program Structure

Curriculum & Scheme of Examination

2018

AMITY UNIVERSITY RAJASTHAN

JAIPUR

Grading System:

The level of student's academic performance as the aggregate of continuous evaluation and end term examination shall be reflected by letter grades on a ten point scale according to connotation as given below

Table 1. Connotation

Grade	Qualitative meaning	Grade Point Attached
A+	Outstanding	10
A	Excellent	9
A-	Very Good	8
B+	Good	7
B	Above Average	6
B-	Average	5
C+	Satisfactory	4
C	Border Line	3
F	Fail	0

Thesemester performance of a student will be indicated as "Semester Grade Point Average (SGPA).The SGPA will be weighed average of Grade Points of all letter grades received by a student for all the course units in the semester. The formula for computing SGPA is given below

$$SGPA = \frac{U_1G_1 + U_2G_2 + U_3G_3 + - - - - - - - - - - -}{U_1 + U_2 + U_3 + - - - - - - - - - - -}$$

Where U_1, U_2 , U_3 denote credits associated with courses taken by the student and G_1,G_2,G_3 are the Grade Point of the letter grades awarded in the respective Course.

CGPA is not applicable in first semester. CGPA is calculated on the basis of SGPA.

For example in II Semester the formula for CGPA is

$$CGPA = \frac{\text{Cumulative points secured in all passed course in I \& } II Sem}{\text{Cumulative Associated Credit Units in I \& } II semesters}$$

The successful candidates shall be placed in Divisions as below:

CGPA	EQUIVALENT DIVISION
8.5 & above	First class with Distinction
6.5 but less than 8.5	First Division
5.5 but less than 6.5 for UG programmes	Second Division
6.00 but less than 6.5 for PG programmes	Second Division

FLEXILEARN

Achieving **academic excellence** expresses the core philosophy at Amity University Haryana and this is the driving force behind rigorous academic programmes and high quality teaching which instill a spirit of learning amongst students. Our academic processes focus on

- A high level scholastic achievement
- An involving attention to detail.
- Quality Research and innovation.
- Advanced critical analysis

Amity University Haryana has the vision to develop as an **Industry Integrated University** We believe in learning that takes students beyond the classroom and into the real world where they must use instinct, negotiating skills, collaboration and experiential learning with innovation.

Our pedagogy offers the opportunity to explore intellectual possibility. A coherent, integrated curriculum is the backbone. It challenges the young Amitian to risk an opinion, to listen the voice of others, to explore intellectual pathways, to discover new academic passions.

Our academic processes need to be aligned with our philosophy of achieving academic excellence and vision of being an Industry Integrated University. The introduction of the FlexiLearnfrom January 2013 is a step towards the same. The flexible credit system focuses on leveraging the talent and innovative capabilities of the budding professionals to meet the needs of the contemporary dynamic business environment thus making the student more industry ready.

1 What Flexible Credit System means

Flexible credit system offers **cross programme education** i.e. it allows students to opt for courses cutting across disciplines. This enables the students to acquire a more holistic perspective and thus have better understanding of issues. The student has flexibility as he has a wide option of courses to choose from. For example a student pursuing BA Economics Honors can now choose courses from disciplines other than Economics like a course in Photography or Animation. Flexible credit system also permits credit transfers and earning credits through live projects. It gives the students the flexibility to **design their own degree**.

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2 Objectives of the Flexible Credit System

- A multi disciplinary and application oriented focus is expected to make the student industry ready.
- The student will be able to build on his strength areas by choosing courses in areas which interest him.
- Develop innovative and creative skills by giving the students a wider perspective through a wide array of course offerings

3 Flexibility at Amity University Haryana

- Option of choosing a minor along with the major area of study.
- Allow credit transfer from one programme to another (in case the student decides to shift) – subject to meeting the eligibility criteria.
- Freedom to choose courses from other programmes.
- Earn credits through live projects/ community projects/ workshops.
- Option of taking a break after diploma and then continuing to earn a degree.

- Transfer credits to other universities (in case of twinning programme with universities abroad)

4 Highlights of FlexiLearn

- The course delivery is a perfect blend of
  - classroom studies
  - Workshops/ Seminars/ Certification programme
  - Substantial project work and Assignments with industry relevance
- Value added courses in Behavioural Science, Communication and Foreign Language which are not discipline specific are already being offered across the university for which the students are being offered credits
- **Study Abroad Program-**The student has the option of earning credits through a well designed 12 day study abroad program which helps the student to get global exposure.
- The course belongs to areas which are important for the holistic development of an individual. These areas includes
  - Values and ethics
  - Environmental Issues
  - Technology
  - Communication
  - Cross Cultural exposure

5 Structure Of Flexi Learn

To successfully earn a degree a student has to complete certain fixed number of credits. These credits can be earned through the following categories of courses

i. **Core courses**- Every semester a student compulsorily takes these courses. These courses may include compulsory summer internships and projects, dissertation, field study/ clinical exposure etc.

ii.Concentration Electives- These are courses in related areas which a student takes to get a deeper understanding. A student can choose his subjects from a list of subjects available to him. However a **minimum cohort of 10 students** in a subject is mandatory to run a course.

These courses also include Projects, Workshops/ Certification (Discipline specific) , Term papers and Study Abroad Program (12 days)

iii. Open Electives- These are the courses being offered across the university by any of the schools/Institutes. The following open electives are compulsory for all students

a) Foreign Language – A student can choose from the following languages- French, German, Spanish, Russian, Chinese, Portuguese
b) Courses in Behavioural Science (1 Credit per semester)
c) Courses in Communication Skill (1 Credit per semester)
d) Environmental Studies (for all UG programs)

In addition to the above courses the student can choose from a list of courses being offered by other schools/ centre's of excellence. A student has to earn 3 credits per semester from these courses. These courses have been grouped into various tracks and if a student earns **15-18 credits** from courses in a particular track he is eligible to get a **minor** in that track area. For example if a student follows the Animation track and chooses one course each semester for 5 semesters from that track , at the end of the programme he will get a B.A. (Honors) degree with a minor in Animation.

Mentor- Every student is allocated a faculty mentor to support him in making the right choice of courses

Summary Sheet

M.Sc. (Applied Physics)

Credits PG(2 yrs/4 semester) - M. Sc Applied Physics					
Semester	**CC**	**DE**	**VA**	**OE**	**Total**
1	23	-	4	3	30
2	20	4	4	3	31
3	22	4	4	-	30
4	30	-	-	-	30
	95	8	12	6	121

Programme Structure M.Sc in Applied Physics (Total Credits 121)

FIRST SEMESTER

Course Code	Course Title	Category	Lectures (L) Hours per week	Tutorial (T) Hours per week	Practical (P) Hours per week	Total Credits
MAP101	Mathematical Physics	CC	3	1	-	4
MAP102	Classical Mechanics	CC	3	1	-	4
MAP103	Electronics	CC	3	1	-	4
MAP104	Electromagnetic Theory	CC	3	1	-	4
MAP105	Computer Programming using C Language	CC	3	1		4
MAP120	Electronics Lab	CC	-	-	4	2
MAP121	Computer Programming Lab Using 'C' – Language	CC	-	-	2	1
Open Elective I						
		OE	3	-	-	3
Value Added Courses						
BCS111	Communication Skills – I		1	-	-	1
BSS111	Behavioral Science – I		1	-	-	1
	Foreign Language – I					
FLT 101 FLG 101 FLS 101 FLC 101	French-I German-I Spanish-I Chinese-I		2	-	-	2
	TOTAL					**30**

Note:- CC - Core Course, VA - Value Added Course, OE - Open Elective, DE - Domain Elective, FW - Field Work

SECOND SEMESTER

Code	Course	Category	L	T	P	Credits
MAP201	Solid State Physics	CC	3	1	-	4
MAP202	Statistical Mechanics	CC	3	1	-	4
MAP203	Quantum Mechanics	CC	3	1	-	4
MAP204	Numerical Methods & Data Analysis	CC	3	1	-	4
MAP220	Solid State Physics Lab	CC			4	2
MAP221	MAT Lab	CC			4	2
Domain Elective						
MAP205	Nanotechnology	DE	3	1	-	4
MAP206	Optical Fibers and Communications	DE				
MAP207	Material Science					
Value Added Courses						
BCS211	Communication Skills – II	VA	1	-	-	1
BSS211	Behavioral Science – II	VA	1	-	-	1
	Foreign Language – II	VA	2	-	-	2
FLT 201 FLG 201 FLS 201 FLC 201	French-II German-II Spanish-II Chinese-II					
	OPEN ELECTIVES (OE-2)	OE				3
	TOTAL					**31**

SUMMER INTERNSHIP (8-10 WEEKS)

Note: Students must submit their summer internship report immediately on return from summer vacation in July /August and the same would be evaluated for 6 credit units, which would be included in the Third Semester marks.

THIRD SEMESTER

MAP301	Atomic & Molecular Physics	CC	3	1	-	4
MAP302	Nuclear Physics	CC	3	1	-	4
MAP303	Lasers & their Applications	CC	3	1	-	4
MAP320	Laser & Fiber Optics Lab	CC	-	-	4	2
MAP321	Optics Lab	CC	-	-	4	2
MAP355	Summer Internship (Evaluation)	CC	-	-	-	6
Domain Elective: Student has to choose one course from the following list						
MAP306 MAP307 MAP308	• Digital Electronics & Microprocessors • Non–conventional Energy Sources • Astrophysics	DE	3	1	-	4
Value Added Courses						
BCS311	Communication Skills - III	VA	1	-	-	1
BSS311	Behavioral Science - III	VA	1	-	-	1
	Foreign Language - III	VA	2	-	-	2
FLT 301 FLG 301 FLS 301 FLC 301	French-III German-III Spanish-III Chinese-III					
	TOTAL					**30**

FOURTH SEMESTER

MAP460	Research Work Based Project*	CC	-	-	-	30
	TOTAL					**30**

Student will be sent to laboratories at universities, national institute and industries for their project based research work during 4th semester. At the end of 4th semester student will be evaluated on the basis of dissertation followed by presentation of their research work.

Syllabus- First Semester

MATHEMATICAL PHYSICS

Course Code: MAP101 **Credit Units: 04**

Course Objective:
Aim is to introduce the concept of mathematical methods and techniques which form the basis to study the post graduate level Physics Courses.

Course Contents:

Module I: Complex Analysis
Functions of complex variable, derivative and Cauchy-Riemann differential equations, Cauchy's integral theorem and integral formula, Taylor's and Laurent's series, Singularities of an analytic function, Residues and their evaluation, Cauchy's residue theorem.

Module II: Linear Differential Equations
Introduction, Second order linear Ordinary Differential Equations with variable coefficients; Solution by series expansion; Legendre Polynomial, Bessel's Function, Hermite and Lagauerre Polynomials and their solutions; Physical applications; Generating functions; reccursion relations.

Module III: Laplace Transforms
Laplace transform (LT); First and second shifting theorems; Inverse LT by partial fractions; LT of derivative and integral of a function; Solution of differential equation using LT, Some simple applications of Laplace Transforms: Electric Circuit, Solution of Simultaneous differential equation by LT, Solution of Partial Differential Equation by LT, Laplace Transform of delta function and their uses.

Module IV: Fourier Transforms
Fourier series; Partial sums; Fourier integral and transforms; Fast Fourier Transforms, Fourier Transform of delta function and their uses., Physical Application of Fourier series Analysis :Forced Vibartion, Reimann Zeta Function and Half wave rectifier

Examination Scheme:

Components	CT	HA	S/V/Q	Attendance	EE
Weightage%	10	8	7	5	70

CT – Class Test, S/V/Q – Seminar/Viva/Quiz, HA – Home Assignment, EE – End Semester Examination

Text & References:

- L.A. Pipes and L.R. Harvill, Applied Mathematics for Engineers and Physicists, McGraw-Hill, New Delhi (1970).
- G. B. Arfken and H.J. Weber, Mathematical Methods for Physicists, 5th edition, Academic Press, London (2001).
- E. Kreyszig, Advanced Engineering Mathematics, 5th edition, Wiley Eastern (1991).

CLASSICAL MECHANICS

Course Code: MAP102 **Credit Units: 04**

Course Objective:
A detailed exposition of classical mechanics for the students, opting for physics is vitally important for a clear understanding of recent intricate theories of quantum mechanics, Modern Physics and research to build a well developed and conceptualized foundation.

Course Contents:

Module I: Symmetries and Conservation Laws
Mechanics of a system of particles, constraints, D'Alembert's principle, Variational calculus and its applications, Hamiltons variational Principle, Lagrangian equations, applications of Lagrangian formulation, conservation theorems and symmetry properties.

Module I1: Hamiltonian Formulation
Hamiltonian equation of motion, applications of hamiltonian formulation, Principle of least action, the equations of canonical transformations, cyclic coordinates, phase space and Liouville's theorem, Poisson bracket, Jacobi's Indentity .

Module III: Central Force Problem
Reduction to one body problem, equation of motion and first integral, one dimensional problem and classification of orbits, Differential equation for the orbit, Kepler problem and planetary motion, Rutherford formula, scattering in central force field, transformation to laboratory frames.

Module IV: Rigid Body and Vibrating System
Euler angles, tensor of inertia, kinetic energy of a rotating body, symmetric top and applications. Vibrating string, solution wave equation, normal vibrations, dispersion, coupled vibrating system.

Examination Scheme:

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

CT – Class Test, S/V/Q – Seminar/Viva/Quiz, HA – Home Assignment, EE – End Semester Examination

Text & References:

- H. Goldstein, Classical Mechanics, 2nd edition, Narosa Publishing House (1994).
- W. Greiner, Classical Mechanics, Springer-Verlag (2003).
- Classical mechanics – S.L.Gupta, Meenakshi Prakashan, 1970, New Delhi.
- Introduction to classical mechanics – R.G.Takwall and P.S.Puranik, Tata – McGraw Hill, 1980, New Delhi.
- Classical mechanics – N.C.Rana and P.S.Joag, Tata McGraw Hill, 1991, New Delhi.

ELECTRONICS

Course Code: MAP103 **Credit Units: 04**

Course Objective:
The main aim of the course is to give concept of Electronics which are useful for research and industrial application.

Course Contents:

Module I: Network Analysis
Kirchoff's laws, Thevenin, Norton's theorems, superposition, reciprocity, compensation theorems, Source transformation, Delta and Star transformations.

Module II: Amplifiers and Oscillators
CE, CB, CC amplifier, RC coupled amplifier, Low frequency gain, High frequency gain, Miller Effect, Transformer coupling, Push-Pull amplifier, Wien bridge and phase shift oscillators, Crystal oscillators **Operational Amplifiers**: Differential amplifier-circuit configurations, CMRR. Operational amplifier: characteristics, frequency response, slew rate. Inverting and non-inverting amplifiers, Feedback types, Applications: current to voltage and voltage to current conversion, Voltage follower, Sum and difference amplifiers, Integrating and differentiating circuits, Phase Lock Loop (PLL), Multivibrator circuits, Triangle and square wave generation, NE 555, 556 timers, Voltage controlled oscillator, Filter – types and characteristics

Module III: Modulation and Demodulation
Analog modulation systems-amplitude, frequency and angle modulation and demodulation systems, spectral analysis of these operations, super heterodyne receivers, Basic sampling theorems. Pulse code modulation (PCM), differential pulse code modulation (DPCM), delta modulation (DM). Digital modulation schemes: amplitude, phase and frequency shift keying schemes (ASK, PSK, FSK). Multiplexing - time division and frequency division. Signal- to-noise ratio (SNR) calculations for amplitude modulation (AM) and frequency modulation (FM) for low noise conditions. Applications of Modulation Techniques in Radio wave Commutation and Telecom mutation.

Module IV: Architecture and Programming
8085 Microprocessor Architecture - Programmer's model - Registers - ALU - Control units - Stacks - Complete instruction set of 8085 - State transition and timing diagrams - T States - Machine cycles - Instruction cycles - Fetch, Execute, overlap in instruction cycles - Addressing modes - Assembly language programs - use of arithmetic, logical, Data transfer, stack and I/O instructions in programming - Subroutines.

Examination Scheme:

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

CT – Class Test,S/V/Q – Seminar/Viva/Quiz, HA – Home Assignment, EE – End Semester Examination

Text & References:

- J. Milman and C.C. Halkias, Electronic Devices and Circuits, McGraw-Hill (1981).
- A.P. Malvino, Electronics: Principles and Applications, Tata McGraw-Hill (1991).
- G.B. Calyton, Operation Amplifiers, ELBS (1980).
- J. Millman and C.C. Halkias, Integrated Electronics, Tata McGraw Hill (2001).
- R. A. Gayakwad, op-Amps and Linear IC'S, Pearson Education (2003).
- R. P. Singh and S. D. Sapre, Communication Systems: Analog and Digital, Tata McGraw Hill (2007)

ELECTROMAGNETIC THEORY

Course Code: MAP104 **Credit Units: 04**

Course Objective:
The main aim of the course is to give concept of Electromagnetic field theory which is useful for research and industrial applications.

Course Contents:

Module I: Electromagnetic (EM) Fields and Potentials
Electrostatics: Laplace and Poisson equations. Boundary value problems. Dirichlet and Neumann boundary conditions. Method of images. Magnetostatics: Ampere's law and Biot-Savart's law. Maxwell equations. Boundary conditions on field vectors D, E, B and H. Vector and scalar potentials. Gauge transformations: Lorentz and Coulomb gauges. Energy density of Fields and Poynting's theorem.

Module II: Maxwell's Equations & Electromagnetic Waves
Propagation of waves in free space, dielectrics, semiconductor and conducting media. Wave propagation through ionized medium. Propagation of EM waves in anisotropic medium. Reflection and refraction of electromagnetic waves. Fresnel's equations. Normal and Anomalous dispersion. Dispersion in Gases, Solids and Liquids, Clasusius Mossotti relation; Scattering and scattering parameters, scattering theory of EM waves.

Module III: Guided Waves and Radiation
Guided Waves, Surface waves, Parallel plane guiding system, Modes of Rectangular and cylindrical waveguides, Cavity Resonator. Transmission line- circuit representations.Vector Potential due to a current distribution, Short Antenna, Half-Wave dipole. Radiation from moving charges, Lienard-Wiechert potentials, retarded potentials. Cherenkov radiation.

Module IV: Relativistic Electrodynamics
Introduction, Magnetism as a relativistic phenomenon, Four vectors, Four vector Electromagnetic Potentials, Covariance of Electrodynamics, Lorentz Transformation of Fields.

Examination Scheme:

Components	CT	HA	S/V/Q	Attendance	EE

Weightage (%)	10	8	7	5	70

CT – Class Test, S/V/Q – Seminar/Viva/Quiz, HA – Home Assignment, EE – End Semester Examination

Text & References:

- Electromagnetics – Kraus & Carver, TMH, 1973.
- Introduction to electrodynamics, D. J. Griffith, Benjamin-Cummins (1999)
- Foundations of Electromagnetic theory – Reitz, Milford & Frederick, Narosa publishing House,1986.
- Fields and Waves in Communication Electronics by S. Ramo, J.R. Whinnery and T.V. Duzer.
- Electromagnetic Waves and Radiating Systems- E.C. Jordan and K.G. Balsain.
- Electromagnetic theory and Electrodynamics – Satya Prakash, Kedarnath Ramnath & Co, 1985.

COMPUTER PROGRAMMING USING C LANGUAGE

Course Code: MAP105 **Credit Units: 04**

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

Course Contents:

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

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

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

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

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

Examination Scheme:

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

CT – Class Test, S/V/Q – Seminar/Viva/Quiz, HA – Home Assignment, EE – End Semester Examination

Text & References:

- "ANSI C" by E Balagurusamy
- Yashwant Kanetkar, "Let us C", BPB Publications, 2nd Edition, 2001.
- Herbert Schildt, "C:The complete reference", Osbourne Mcgraw Hill, 4th Edition, 2002.
- V. Raja Raman, "Computer Programming in C", Prentice Hall of India, 1995.
- Kernighan & Ritchie, "C Programming Language", The (Ansi C Version), PHI, 2nd Edition.
- J. B Dixit, "Fundamentals of Computers and Programming in 'C'.
- P.K. Sinha and Priti Sinha, "Computer Fundamentals", BPB publication.

ELECTRONICS LAB

Course Code: MAP120 **Credit Units: 02**

List of Experiment (Any Eight)

1. To study the transient response of a series LCR circuit and calculate its resonant frequency, damping factor, quality factor, relaxation time and logarithmic decrement.
2. To design the two stages RC Coupled CE Amplifier and plot the variation of voltage gain with change in frequency of carrier wave.
3. To study modulation and demodulation of Audio Frequency wave
4. To study the phase shift oscillator and determine the frequency of oscillation, current gain h_{fe} and input impedance of the transistor h_{ie}.
5. To study an operational amplifier circuit and use it as
6. Adder (b) Subtractor (c) differentiator and (d) Integrator
7. To study the operational amplifier as Voltage follower, Current follower and clipper.
8. To study the operational amplifier as inverting amplifier and Non-Inverting amplifier.
9. To study of DC gate control characteristics and Anode current characteristics of silicon controlled rectifier (SCR).
10. To design and calculate frequency of Astable and Monostable Multivibrator using Transistor circuit.
11. To design and calculate frequency of Bistable Multivibrator using Transistor circuit.
12. To design and calculate frequency of Astable and Monostable Multivibrator using 555 Timer for different duty cycles.
13. To design and calculate frequency of Bistable Multivibrator using 555 Timer for different duty cycles.
14. To design and study the TTL NAND and NOR gate.

Examination Scheme:

Components	**TA**	**V**	**LR**	**Attendance**	**EE**
Weightage (%)	7	10	8	5	70

TA : Teacher Assessment,V: Viva, LR: Lab Record EE: External Examination

Text & References:

- J. Milman and C.C. Halkias, Electronic Devices and Circuits, McGraw-Hill (1981).
- A.P. Malvino, Electronics: Principles and Applications, Tata McGraw-Hill (1991).
- G.B. Calyton, Operation Amplifiers, ELBS (1980).
- J. Millman and C.C. Halkias, Integrated Electronics, Tata McGraw Hill (2001).
- R. A. Gayakwad, op-Amps and Linear IC'S, Pearson Education (2003).
- R. P. Singh and S. D. Sapre, Communication Systems: Analog and Digital, Tata McGraw Hill (2007)

COMPUTER PROGRAMMING LAB USING C LANGUAGE

Course Code: MAP121 **Credit Units: 01**

List of Experiments: Any 10 programs are compulsory

1 C program to print Fibonacci series.
2 C program to swap two numbers
(a) By using third variable
(b) Without using third variable
3 C program to determine largest of given three numbers
4 C program to print the result of the quadratic equation
(a) Without using if statement
(b) By using if statement
5 C program to print factorial of a number
6 C program to check whether a string is palindrome or not
7 C program to read ten values to an array variable
8 C program to perform arithmetic operations on an array
9 C program to calculate length of string using pointers
10 C program to arrange a list of numbers using any sorting method
11 C program to copy contents of a file to another file
12 C program to create, display, modify and append a file

Examination Scheme:

Components	**TA**	**V**	**LR**	**Attendance**	**EE**
Weightage (%)	7	10	8	5	70

TA: Teacher Assessment, V: Viva, LR: Lab Record EE: External Examination

Text & Reference:

- "ANSI C" by E Balagurusamy
- Yashwant Kanetkar, "Let us C", BPB Publications, 2nd Edition, 2001.
- Herbert Schildt, "C:The complete reference", Osbourne Mcgraw Hill, 4th Edition, 2002.
- V. Raja Raman, "Computer Programming in C", Prentice Hall of India, 1995.
- Kernighan & Ritchie, "C Programming Language", The (Ansi C Version), PHI, 2nd Edition.
- J. B Dixit, "Fundamentals of Computers and Programming in 'C'.
- P.K. Sinha and Priti Sinha, "Computer Fundamentals", BPB publication.

COMMUNICATION SKILLS – I

Course Code: BCS 111 **Credit Units: 01**

Course Objective:
The Course is designed to give an overview of the four broad categories of English Communication thereby enhance the learners' communicative competence.

Course Contents:

Module I: Fundamentals of Communication
Role and purpose of communication 7 C's of communication
Barriers to effective communication
Forms of Communication: one-to-one, informal and formal

Module II: Oral Communication
Effective Listening: Principles and Barriers
Effective Speaking: Pronunciation and Accent

Module III: Building Advanced Vocabulary
Word Formation; Synonyms; Antonyms; Eponyms; Homonyms, Homophones & Homographs
One word Substitution; Phrasal Verbs, Idiomatic Expressions & Proverbs;
Foreign words in English

Module IV: Written Communication
Coherence and structure
Precise Writing
Writing Paragraphs & Essays

Examination Scheme:

Components	CT	A	Group Presentation	Group Discussion	End Term Written Exam
Weightage (%)	10	05	15	10	60

Text & References:

- Jones, Working in English, 1st ed. Cambridge, CUP 2001
- Raman Prakash Business Communication, 2nd ed. Delhi OUP 2006
- Comfort , Jermy Speaking Effectively, Jermy, et.al, Cambridge, CUP, 1994
- Soft skills for everyone, Jeff Butterfield, Cengage Learning. 2011

BEHAVIOURAL SCIENCE – I

Course Code: BSS 111 **Credit Units: 01**

Course Objective:
This course aims at imparting an understanding of:
Self and the process of self exploration
Learning strategies for development of a healthy self esteem
Importance of attitudes and their effect on work behaviour
Effective management of emotions and building interpersonal competence.

Course Contents:

Module I: Understanding Self
Formation of self concept
Dimension of Self
Components of self
Self Competency

Module II: Self-Esteem: Sense of Worth
Meaning and Nature of Self Esteem
Characteristics of High and Low Self Esteem
Importance & need of Self Esteem
Self Esteem at work
Steps to enhance Self Esteem

Module III: Emotional Intelligence: Brain Power
Introduction to EI
Difference between IQ, EQ and SQ
Relevance of EI at workplace
Self assessment, analysis and action plan

Module IV: Managing Emotions and Building Interpersonal Competence
Need and importance of Emotions
Healthy and Unhealthy expression of emotions
Anger: Conceptualization and Cycle
Developing emotional and interpersonal competence
Self assessment, analysis and action plan

Module V: Leading Through Positive Attitude
Understanding Attitudes
Formation of Attitudes
Types of Attitudes
Effects of Attitude on
Behaviour

Perception
Motivation
Stress
Adjustment
Time Management
Effective Performance
Building Positive Attitude

Module VI: End-of-Semester Appraisal
Viva based on personal journal
Assessment of Behavioural change as a result of training
Exit Level Rating by Self and Observer

Examination Scheme:

Components	**SAP**	**IWT (CT)**	**JFS**	**A**	**End Term Written Exam**
Weightage (%)	10	10	15	05	60

SAP: Social Awareness Progammes; IWT: Internal Written Test; JFS: Journal Success; A: Attendance

Text & References:

- Towers, Marc: Self Esteem, 1st Edition 1997, American Media
- Pedler Mike, Burgoyne John, Boydell Tom, A Manager's Guide to Self-Development: Second edition, McGraw-Hill Book Company.
- Covey, R. Stephen: Seven habits of Highly Effective People, 1992 Edition, Simon & Schuster Ltd.
- Khera Shiv: You Can Win, 1st Edition, 1999, Macmillan
- Gegax Tom, Winning in the Game of Life: 1st Edition, Harmony Books
- Chatterjee Debashish, Leading Consciously: 1998 1st Edition, Viva Books Pvt. Ltd.
- Dr. Dinkmeyer Don, Dr. Losoncy Lewis, The Skills of Encouragement: St. Lucie Press.
- Singh, Dalip, 2002, Emotional Intelligence at work; First Edition, Sage Publications.
- Goleman, Daniel: Emotional Intelligence, 1995 Edition, Bantam Books
- Goleman, Daniel: Working with E.I., 1998 Edition, Bantam Books.

FRENCH - I

Course Code: FLF 111 **Credit Units: 02**

Course Objective:

To familiarize the students with the French language

- with the phonetic system
- with the syntax
- with the manners
- with the cultural aspects

Course Contents:

Module A: pp. 01 to 37: Unités 1, 2, Unité 3 Objectif 1,2
Only grammar of Unité 3: objectif 3, 4 and 5

Contenu lexical: **Unité 1: Découvrir la langue française: (oral et écrit)**

1. se présenter, présenter quelqu'un, faire la connaissance des autres, formules de politesse, rencontres
2. dire/interroger si on comprend
3. Nommer les choses

Unité 2: Faire connaissance

1. donner/demander des informations sur une personne, premiers contacts, exprimer ses goûts et ses préférences
2. Parler de soi: parler du travail, de ses activités, de son pays, de sa ville.

Unité 3: Organiser son temps

1. dire la date et l'heure

Contenu grammatical:

1. organisation générale de la grammaire
2. article indéfini, défini, contracté
3. nom, adjectif, masculin, féminin, singulier et pluriel
4. négation avec « de », "moi aussi", "moi non plus"
5. interrogation: Inversion, est-ce que, qui, que, quoi, qu'est-ce que, où, quand, comment, quel(s), quelle(s)
   Interro-négatif: réponses: oui, si, non
6. pronom tonique/disjoint- pour insister après une préposition
7. futur proche

Examination Scheme:

Components	CT	A	Assignment	Class Performance/ Presentation/ Viva	End Term Written Exam
Weightage (%)	10	05	10	15	60

Text & References:

- le livre à suivre: Campus: Tome 1

GERMAN - I

Course Code: FLG 111 **Credit Units: 02**

Course Objective:

To enable the students to converse, read and write in the language with the help of the basic rules of grammar, which will later help them to strengthen their language.
To give the students an insight into the culture, geography, political situation and economic opportunities available in Germany

Course Contents:

Module I: Introduction

Self introduction: heissen, kommen, wohnwn, lernen, arbeiten, trinken, etc.
All personal pronouns in relation to the verbs taught so far.
Greetings: Guten Morgen!, Guten Tag!, Guten Abend!, Gute Nacht!, Danke sehr!, Danke!, Vielen Dank!, (es tut mir Leid!),
Hallo, wie geht's?: Danke gut!, sehr gut!, prima!, ausgezeichnet!,
Es geht!, nicht so gut!, so la la!, miserabel!

Module II: Interviewspiel

To assimilate the vocabulary learnt so far and to apply the words and phrases in short dialogues in an interview – game for self introduction.

Module III: Phonetics

Sound system of the language with special stress on Dipthongs

Module IV: Countries, nationalities and their languages

To make the students acquainted with the most widely used country names, their nationalitie and the language spoken in that country.

Module V: Articles

The definite and indefinite articles in masculine, feminine and neuter gender. All Vegetables, Fruits, Animals, Furniture, Eatables, modes of Transport

Module VI: Professions

To acquaint the students with professions in both the genders with the help of the verb "sein".

Module VII: Pronouns

Simple possessive pronouns, the use of my, your, etc.
The family members, family Tree with the help of the verb "to have"

Module VIII: Colours

All the color and color related vocabulary – colored, colorful, colorless, pale, light, dark, etc.

Module IX: Numbers and calculations – verb "kosten"
The counting, plural structures and simple calculation like addition, subtraction, multiplication and division to test the knowledge of numbers.
"Wie viel kostet das?"

Module X: Revision list of Question pronouns
W – Questions like who, what, where, when, which, how, how many, how much, etc.

Examination Scheme:

Components	**CT**	**A**	**Assignment**	**Class Performance/ Presentation/ Viva**	**End Term Written Exam**
Weightage (%)	10	05	10	15	60

Text & References:

- Wolfgang Hieber, Lernziel Deutsch
- Hans-Heinrich Wangler, Sprachkurs Deutsch
- Schulz Griesbach, Deutsche Sprachlehre für Ausländer
- P.L Aneja, Deutsch Interessant - 1, 2 & 3
- Rosa-Maria Dallapiazza et al, Tangram Aktuell A1/1,2
- Braun, Nieder, Schmöe, Deutsch als Fremdsprache 1A, Grundkurs

SPANISH – I

Course Code: FLS 111 **Credit Units: 02**

Course Objective:
To enable students acquire the relevance of the Spanish language in today's global context, how to greet each other. How to present / introduce each other using basic verbs and vocabulary

Course Contents:

Module I
A brief history of Spain, Latin America, the language, the culture…and the relevance of Spanish language in today's global context.
Introduction to alphabets

Module II
Introduction to '*Saludos*' (How to greet each other. How to present / introduce each other).
Goodbyes (despedidas)
The verb *llamarse* and practice of it.

Module III
Concept of Gender and Number
Months of the years, days of the week, seasons. Introduction to numbers 1-100, Colors, Revision of numbers and introduction to ordinal numbers.

Module IV
Introduction to *SER* and *ESTAR* (both of which mean To Be).Revision of '*Saludos*' and '*Llamarse*'. Some adjectives, nationalities, professions, physical/geographical location, the fact that spanish adjectives have to agree with gender and number of their nouns. Exercises highlighting usage of *Ser* and *Estar*.

Module V
Time, demonstrative pronoun (Este/esta, Aquel/aquella etc)

Module VI
Introduction to some key AR /ER/IR ending regular verbs.

Examination Scheme:

Components	CT	A	HOI	End Term Written Exam
Weightage (%)	10	05	25	60

Text & References:

- Español, En Directo I A

- Español Sin Fronteras

CHINESE – I

Course Code: FLC 111 **Credit Units: 02**

Course Objective:
There are many dialects spoken in China, but the language which will help you through wherever you go is Mandarin, or Putonghua, as it is called in Chinese. The most widely spoken forms of Chinese are Mandarin, Cantonese, Gan, Hakka, Min, Wu and Xiang. The course aims at familiarizing the student with the basic aspects of speaking ability of Mandarin, the language of Mainland China. The course aims at training students in practical skills and nurturing them to interact with a Chinese person.

Course Contents:

Module I
Show pictures, dialogue and retell.
Getting to know each other.
Practicing chart with Initials and Finals. (CHART – The Chinese Phonetic Alphabet Called "Hanyu Pinyin" in Mandarin Chinese.)
Practicing of Tones as it is a tonal language.
Changes in 3rd tone and Neutral Tone.

Module II
Greetings
Let me Introduce
The modal particle "ne".
Use of Please 'qing" – sit, have tea …….. etc.
A brief self introduction – Ni hao ma? Zaijian!
Use of "bu" negative.

Module III
Attributives showing possession
How is your Health? Thank you, Where are you from?
A few Professions like – Engineer, Businessman, Doctor, Teacher, Worker.
Are you busy with your work? May I know your name?

Module IV
Use of "How many" – People in your family?
Use of "zhe" and "na".
Use of interrogative particle "shenme", "shui", "ma" and "nar".
How to make interrogative sentences ending with "ma".
Structural particle "de".
Use of "Nin" when and where to use and with whom. Use of guixing.
Use of verb "zuo" and how to make sentences with it.

Module V
Family structure and Relations.
Use of "you" – "mei you".
Measure words
Days and Weekdays.
Numbers.
MPs, different languages and Countries.

Examination Scheme:

Components	**CT**	**A**	**HOI**	**End Term Written Exam**
Weightage (%)	10	05	25	60

Text & References:

- "Elementary Chinese Reader Part I" Lesson 1-10

SEMINAR

Course Code: MSP155 **Credit Units: 02**

Guidelines for Seminar

a) Choosing the topic
b) Finding relevant materials
c) Presentation
d) Response to queries
e) Submission of the write up

Presentation of the seminar will be of 30 min maximum (25 min presentation and rest question answer session)

Examination Scheme:

Components	**Weightage**
Content	30
Presentation	40
Response to the queries	20
Write up	10

Syllabus- Second Semester

SOLID STATE PHYSICS

Course Code: MAP201 **Credit Units: 04**

Course Objective:
The aim of this course is to introduce the concept of different solids, their structure and properties which form the basis to study the post graduate level Physics Course on Solids.

Course Contents:

Module I: Crystal Structure and Lattice Vibrations
Bravais lattices, crystal systems, point groups, space groups and typical structures, Reciprocal Lattice, Vander Waals binding: rare gas crystals and binding energies, Covalent and metallic binding: characteristic features and examples, Diffraction techniques: X-rays, neutrons, electrons, Bragg's law in direct and reciprocal lattice, Structure factor, Lattice dynamics: monoatomic and diatomic lattices, Phonon frequencies and density of states, Dispersion curves, inelastic neutron scattering.

Module II: Conductors and Semiconductors
Free electron theory of metals, Thermal and transport properties, Bloch functions, Nearly free electron approximation, Formation of energy bands. Kronig Penny Model, Brillouin zone, Effective mass, concept of holes, Fermi surface, *Semiconductors:* carrier statistics in intrinsic and extrinsic crystals, electrical conductivity, Hall Effect Electronic specific heat.

Module III: Super conducting Optical and Dielectric materials
Superconductors: Properties, BCS theory, Flux quantization, Applications, *Optical Materials:* Optical absorption, colour centres, Trap, recombination, excitons, Photoconductivity, luminescence, *Dielectrics:* Macroscopic electric field, Local electric field in an atom, dielectric constant and polarizability, Clausius-Mossotti equation, measurement of dielectric constant, Ferroelectrics, 1^{st} order, 2^{nd} order phase transitions, Curie-Weiss Behaviour.

Module IV: Magnetic Materials
Magnetic materials: Types, Quantum theories of dia and para magnetism, *Susceptibility measurement:* Quincke's method, Ferromagnetic order, Hysterisis, Curie point and exchange intergral, Langevin's theory of paramagnetism, Quantum Theory of paramagnetism, Magnons, domain theory, Ferri and antiferrimagnetic order, Curie temperature, susceptibility and Neel Temperature.

Module V: Thin Films and Nanostructures
Difference of behaviour of thin film from bulk, preparation techniques: Thermal evaporation, sputtering, sol-gel and spin coating. Spinning and ion-implantation techniques for amorphous films. Boltzmann transport equation for a thin film, expression for electrical conductivity, optical properties of thin films. Nano materials, Nano Clusters, Nano Particles, Nano Onions and Nano Tubes.

Examination Scheme:

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

CT – Class Test, S/V/Q – Seminar/Viva/Quiz, HA – Home Assignment, EE – End Semester Examination

Text & References:

- Charles Kittel, Introduction to Solid State Physics, Wiley Eastern, 5th edition.
- A.J. Dekker, Solid State Physics, Prentice Hall of India (1971).
- N.W. Ashcroft and N.D. Mermin, Solid State Physics, Saunders College Publishing (1976).
- Ali Omar, Elementary Solid State Physics, Narosa Publishing House.
- J.S. Blakemore, Solid State Physics, 2nd edition, Cambridge University Press (1974).

STATISTICAL MECHANICS

Course Code: MAP202 **Credit Units: 04**

Course Objective:

The aim of the course is to introduce the concept of statistical mechanics and applications to various problems in applied Physics.

Course Contents:

Module I

Review of phase space, Liouville's theorem, basic postulates of statistical mechanics, ensembles: microcanonical, canonical, grand canonical, and isobaric, connection to thermodynamics, fluctuations, applications of various ensembles, equation of state for a non-ideal gas, Van der Waals' equation of state, Meyer cluster expansion, virial coefficients.

Module II

Relation between entropy and probability, Boltzmann's equation, Maxwell & Boltzmann statistics, Equipartition theorem and its Simple applications. i) Mean kinetic energy of a molecule in a gas ii) Brownian motion iii) Harmonic Oscillator iv) Specific heat of solid. Maxwell velocity distribution, Related distributions and mean values.

Module III

Fermi-Dirac and Bose-Einstein statistics. Applications of the formalism to: (a) Ideal Bose gas, Debye theory of specific heat, properties of black-body radiation, Bose- Einstein condensation, experiments on atomic BEC, BEC in a harmonic potential.(b) Ideal Fermi gas, properties of simple metals, Pauli paramagnetism, electronic specific heat, Compressibility of Fermi gas, A relativistic degenerate electron gas.

Module IV

Kinetic theory of a gas, black body radiation, Rayleigh Jeans' formula, Wien's law, Planck radiation law, master equation and irreversibility, Fokker-Planck equation, ergodic theorem. Langevin equation, fluctuation-dissipation theorem, Einstein model of lattice vibrations, Phonons, Debye's theory of specific heat of solids, Random Walk Problem.

Examination Scheme:

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

CT – Class Test, S/V/Q – Seminar/Viva/Quiz, HA – Home Assignment, EE – End Semester Examination

Text & References:

- F. Reif, Fundamentals of Statistical and Thermal Physics, International Students Edition, Tata McGraw-Hill (1988).
- K. Haung, Statistical Mechanics, Wiley Eastern (1991).
- Elementary Statistical Mechanics – S.L.Gupta, V.Kumar Pragati Prakashan Publication 1979.

QUANTUM MECHANICS

Course Code: MAP203 **Credit Units: 04**

Course Objective:
The course is intended to introduce the concept of quantum mechanics to students at the advanced level so that they can solve problem of various branches of Physical Sciences.

Course Contents:

Module I: Approxmation Methods:
Time-independent Perturbation theory (non-degenerate and degenerate) and applications to fine structure splitting, Zeeman effect (Normal and anomalous), Stark effect, Variational method – Ground state of helium atom, W.K.B approximation, Application to bound states.

Module II: Time Evolution:
Time dependent perturbation theory, The Fermi golden rule and application, Adiabatic Approximation, Sudden Approximation, Semi classical and quantum theory of radiation, Einstein Coefficients, Charged Particle in an Electromagnetic field, Rayleigh and Raman scattering – Selection rules.

Module II: Scattering Theory:
Differential and total Scattering cross-sections laws, partial wave analysis and application to simple cases; Integral form of scattering equation, Born approximation validity and simple applications.

Module IV: Relativistic Quantum Mechanics & Field Quantization:
Klein Gordon equation, Dirac equation, Covariance of Dirac equation, negative energy solutions, Dirac hole theory, Lagrangian density and equation of motion for field, Symmetries and conservation laws, electromagnetic field and Dirac field, Problem in quantizing electromagnetic field,

Examination Scheme:

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

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

Text & References:
- Quantum Mechanics: L.I. Schiff.
- Modern Quantum Mechanics: J.J. Sakurai.
- Introduction to Quantum Mechanics : C.J. Joachain and B.H. Bransden.
- Introduction of Quantum Mechanics: D.J. Griffiths.
- Principles of Quantum Mechanics: P.A.M.Dirac.
- A text book of quantum mechanics – P.M Mathews and K.Venkatesan, Mc Graw Hill,
- Principles of Quantum Mechanic: R. Shankar.
- Quantum mechanics – J.P.Dicke and R.H.Wittke, Addison Wiley

- Quantum mechanics A. K. Ghatak and Lokanathan, Mc Millan,

NUMERICAL METHODS AND DATA ANALYSIS

Course Code: MAP204 **Credit Units: 04**

Course Objective:
The objective of the present course is to introduce some advanced measurement, numerical methods and data analysis commonly used in research to the post graduate students.

Course Contents:

Module I: Solution of Algebraic and Transcendental Equations
Bisection method, Muller's method, Newton-Raphson method, Solution of simultaneous linear equations: Gauss' Elimination Method, Jacobi iterative method, Gauss-Seidel method.

Module II: Finite difference, Interpolation and Curve fitting
Finite differences, Newton's formula for interpolation, Gauss, Stirling, Bessel's, Everett's formulae, Divided differences, Newton's general interpolation formula, Lagrange's interpolation formula, Method of Least square curve fitting, straight line and quadratic equation fitting, curve fitting by sum of exponentials.

Module III: Numerical Differentiation, Integration and Ordinary Differential Equations
Numerical differentiation, Numerical integration, Trapezoidal rule, Simpson 1/3 and 3/8 rules, Gauss quadrature formula. Numerical solution of ordinary differential equations, Euler, Picard and Runge-Kutta methods.

Module IV: Data Analysis
Data interpretation and analysis: Precision and accuracy, error analysis, propagation of errors, Gaussian distribution, determination of mean value and standard deviation of the continuous Gaussian distribution, graphical representation of functional relationship, linear and nonlinear least square curve fitting, chi-square test for goodness of fit.

Examination Scheme:

Components	CT	HA	S/V/Q	Attendance	EE
Weightage%	10	8	7	5	70

CT – Class Test, S/V/Q – Seminar/Viva/Quiz, HA – Home Assignment, EE – End Semester Examination

Text & References:

- Introductory Methods of Numerical analysis by S.S. Shastri, Pearson education
- Introduction to Numerical Analysis by C.E. Froberg, Addison –Wesley 1981.
- Numerical Analysis by E. Scheid, Mc Graw Hill 1988.
- Numerical methods for scientific & Eng. Computations by Jain, Iyengar, New Age Int., Delhi.
- Elementary Numerical Analysis, K Atkinson, Wiley 1985.

DOMAIN ELECTIVE PAPER (SELECT ANY ONE)

NANOTECHNOLOGY

Course Code: MAP205 **Credit Units: 04**

Course Objective:
The objective of the present course is to introduce Nanoscience and nanotechnology. The course also provides the fundamentals of Nanoscience & nanotechnology and some of its applications. The course further provides the introduction of some of the Synthesis and characterization techniques.

Module I: Introduction to Nanostructures
Emergence of Nanoscience with special reference to Feynman and Drexler; Role of particle size; Spatial and temporal scale; Concept of confinement, strong and weak confinement with suitable example; Development of quantum structures, Basic concept of quantum well, quantum wire and quantum dot, Basic of Nanoparticles, Nanowires, Nanorods, Nanoclusters,

Module II: Applications of Nanomaterials
Details of nanostructured materials, Importance, properties and application of CNT and Fullerenes, Applications in Sensors, clothes, paints, health care, electronics, computers, and other industrial and consumer products

Module III: Synthesis of nanomaterials
Nanoscale fabrication techniques, Molecular self-assembly, wet chemical synthesis, top down and bottom up approaches

Module IV: Instrumentation and Advanced Characterization techniques for nanomaterials
Vacuum & Pumps - Basic Principles and applications

Transmission electron microscope (TEM), Scanning electron microscope (SEM), Scanning Tunneling Microscopy (STM), Atomic Force microscope (AFM), Magnetic Force Microscope (MFM), UV-VIS spectrophotometer : Single beam & double beam including diode array instruments, Infra-red spectrophotometer, Powder method of X-ray diffraction, Fourier Transform Infrared spectroscopy, Fourier transform techniques, Raman spectrometer, Photoelectron spectrometer, NMR spectrometer & ESR spectrometer,

Suggested Books:

1. Edelstein A. A. and Cammarata R.C., "Nanomaterials-Synthesis Properties and Applications", Institute of Physics Publishing, London, 1998.
2. Poole, Jr. CP and Owens, FJ, "Introduction to Nanotechnology", Wiley India, 2006.
3. Shik, A, "Quantum Wells: Physics and Electronics of two-dimensional systems", World Scientific, 1999.
4. Benedek et al G., "Nanostructured Carbon for advanced Applications", Kluwer Academic Publishers, 2001.

5. Harrison, P, “Quantum Wells, Wires, and Dots: Theoretical and Computational Physics”, John Wiley, 2000.
6. Mitin, VV, Kochelap, VA and Stroscio, MA “Quantum Heterostructures: Microelectronics and Optoelectronics”, Cambridge University Press, 1999.
7. Instrumentation, Measurement and Analysis, B C Nakra and K K Chaudhary, Tata McGraw – Hill Publishing House, New Delhi.
8. Modern Techniques of surface science, Woodruf & Delchar, Cambridge, UK.
9. Principles of Instrumental Analysis, Skoog, Holler, Nieman, Thomson Press.

OPTICAL FIBERS AND COMMUNICATIONS

Course Code: MAP206 **Credit Units: 04**

Course Objective:
The objective of the present course is to introduce fundamentals of optical fibers, detectors and amplifiers and their applications in Physics.

Course Contents:

Module I: Optical Fiber Fundamentals
Need for fiber Optic Communication, Optical fibers - their classification,
Light propagation in optical fiber, Acceptance angle and numerical aperture, Losses in optical fiber: absorption loss scattering loss, bending loss, and splice loss. Pulse propagation in dispersive medium, pulse broadening, Intermodal and intramodal dispersion, group velocity dispersion (material and waveguide).

Module II: Modal Analysis of step index multimode and graded index fiber
Characteristics equation of step index multimode fiber, Transverse Electric (TE), Transverse magnetic (TH) and Hybrid modes, linearly polarized modes, V parameter, mode cutoff, Mode field diameter, Modal analysis of graded index fiber.

Module III: Optical Sources, Detectors and Amplifiers
Types of Optical Sources, Light emitting diodes (LED), Edge emitting LEDs, Coupling of LEDs with fibers, Semiconductor Lasers; Detectors: Photoconductors, Photodiodes, Avalanche Photodiodes and Phototransistors, Amplifiers: Semiconductor Laser Amplifiers, characteristics, advantages and drawback, Erbium Doped Fiber Amplifier (EDFA), gain and noise in EDFA and noise figure.

Module IV: Fiber Optical Communication Components and System
Coupling Components- couplers, connectors and splices, Modulators and Modulation methods, Transmitters, Receivers, Repeaters and switches; Transmitter, Receiver and link design, Line codes for optical fiber links, wavelength division multiplexing (WDM) and Optical Division Multiplexing.

Examination Scheme:

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

CT – Class Test, S/V/Q – Seminar/Viva/Quiz, HA – Home Assignment, EE – End Semester Examination

Text & References:

- John. M. Senior, Optical fiber communications: principles and practice, Prentice Hall of India.
- Gerd Keiser, Optical fiber communications, McGraw Hill, 3rd edition.
- D. K. Mynbaev, L. L. Scheiner, Fiber optic communication technology, Pearson Technology.
- Introduction to fiber optics, Ajoy Ghatak and K. Tyagrajan.
- R. P. Khare, Fiber optic and optoelectronics, Oxford University press.
- Light wave Communication Systems: A practical prospective: R Papannareddy, Penrum International Publishing
- Fundamental of photonics, Saleh and Teich, Wiley Interscience, 2nd Edition, 2007.

MATERIAL SCIENCE

Course Code: MAP207 **Credit Units: 04**

Course Objective:
The aim of the present course is to acknowledge the students with various types of material fabrication and their characterizations.

Course Contents:

Module I: Defects, Diffusion and Phase Equilibrium
Crystal defects, Laws of Diffusion, Diffusion coefficient: Temperature dependence, Phase Diagram, Eutectic Point, Gibb's Phase rule, Phase Transformations, Martensitic Phase Transformation, Phase Equilibrium, Homogeneous and Heterogeneous nucleation.

Module II: Electrical and Optical properties of solids
Electrical resistivity of metal, alloys and polycrystalline metal films. Boltzmann transport equation for a thin film Electrical conductivity of ionic crystals and glasses, Concept of dangling bonds, localized and extended states, mobility edge, Complex susceptibility, Time dependent electric polarization, Thermally activated process, Activation energy, Refraction and Absorption, Complex refractive index, Kramers-Kronig Relations, Reflection: Total internal reflection and magneto-optical effect.

Module III: Nanomaterials
Introduction to nanoparticles and nanostructures, Carbon nano particles, Carbon nanotubes, Synthesis techniques, Physical vapour deposition, Chemical vapour deposition, laser ablation. Langmuir Blodgett films, Fabrication of ordered nanostructures: Self assembled monolayer (SAM). Basic characterization techniques for nanomaterials: Secondary ion mass spectrometry Applications of nanotechnology.

Module IV: Applications of Materials in Devices Semiconductor devices: Transferred electron devices, Thyrestors. Semiconductor thermal sensors, Piezoelectricity: Electromechanical devices, Piezoelectric strain gauge, Ultrasonic cleaner, Ultrasonic Imaging, Ferroelectricity, Ferroelectric devices: bimorphs and multilayer actuators, Ceramic capacitors, chip capacitors, Optoelectronic devices: LED, Solar cell. Chemical sensors: Gas sensor, Ferroelectric Liquid Crystals, Liquid crystal display devices.

Examination Scheme:

Components	CT	HA	S/V/Q	Attendance	EE

Weightage (%)	10	8	7	5	70

CT – Class Test, S/V/Q – Seminar/Viva/Quiz, HA – Home Assignment, EE – End Semester Examination

Text & References:

- Materials Science, M S Vijaya and G Rangrajan, Tata McGrawhill, 2011.
- Materials Science and Engineering: An Introduction, W.D. Callister, Wiley India, (2010).
- Solid State Physics: Essential Concepts, D W Snoke, Pearson Education (2009).
- Ferroelectric Devices, K Uchino, Marcel Dekker Inc. (2000).
- Physics of Semiconductor Devices, S M Sze, Wiley (2007).
- Liquid Crystal, Laptops and Life, Michael R. Fisch, Word Scientific (1991).
- Liquid Crystals – Applications and Uses, Volume I, II, III, B. Bahadur (1990).
- Synthesis, Characterization and Application of Smart Materials, R. Rai, Nova Publishers USA (2012).

MAT LAB

Course Code: MAP 221 **Credit Units: 02**

List of Experiment:

List of Experiment:

Theory and pratice of .m files and simulink libraries.

1. Plot the results of certain basic arithmetic operations:

a) addition, multiplication etc.

b) exponential, logarithm etc.

c) trigonometry, complex numbers.

2. Working with arrays of numbers:

a) straight line plots.

b) operation on vectors.

c) matrices, circles.

3. Graph plots:

a) sine plots

b) decaying and growing functions.

c) overlay plots.

4. Programs to understand creation,saving,execution of files.

5. Programs involving matrices,manupilation using linear algebra.

6. Basic 2D and 3D plots:

a) parametric space curve.

b) polygons with vertices.

c) 3D contour lines.

7. Simple graphics problems.

8. Bubble Sort.

9. Simulating a Random Walk.

10. Root Finding:

a) Newton's Method.

b) Bisection Method.

11. Integration

a) Trapezoidal Method.

b) Simpson's Method.

12. Ordinary Differential Equation:

a) Euler Method.

b) Runge-Kutta Method.

Examination Scheme:

	Internal Exam				**End Sem**	
Components	**Attendance**	**PR**	**LR**	**V**	**PR**	**V**
Marks	**5**	**10**	**10**	**5**	**35**	**35**

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

SOLID STATE PHYSICS LAB

Course Code: MAP 220 **Credit Units: 02**

List of Experiment:

1. To study Hall Effect and to determine the Hall coefficient for doped Ge crystal.
2. To determine the energy band gap of Ge crystal using four probe method.
3. To draw B-H Curve of a specimen and determine Hysteresis loss.
4. To determine the magnetic susceptibility of the solution of paramagnetic Substance by Quincke's tube method.
5. To determine the magnetic susceptibility of the solution of diamagnetic substance by Quincke's tube method and compare its susceptibility with paramagnetic substance.
6. To find the speed of ultrasonic waves in liquids by optical diffraction method.
7. To determine the e/m by Thomson method.
8. To plot the variation of magnetic field along the axis of a circular coil using Helmholtz Tangent Galvanometer and find the reduction factor.

Examination Scheme:

Components	**TA**	**V**	**LR**	**Attendance**	**EE**
Weightage (%)	7	10	8	5	70

TA: Teacher Assessment V: Viva LR: Lab Record EE: External Examination

Text & References:

- Charles Kittel, Introduction to Solid State Physics, Wiley Eastern, 5th edition.
- A.J. Dekker, Solid State Physics, Prentice Hall of India (1971).
- N.W. Ashcroft and N.D. Mermin, Solid State Physics, Saunders College Publishing (1976).
- Ali Omar, Elementary Solid State Physics, Narosa Publishing House.
- J.S. Blakemore, Solid State Physics, 2nd edition, Cambridge University Press (1974).

COMMUNICATION SKILLS - II

Course Code: BCS 211 **Credit Units: 01**

Course Objective:
To enrich the understanding of English language and communication, structure, style, usage, and vocabulary for global business purposes.

Course Contents:

Module I: Job Correspondence
Job Applications
Resume & CV
Follow Up Letter

Module II: Dynamics of Group Discussion
Methodology
Guidelines

Module III: Speaking for Employment
Types of Interview (Technical & HR Rounds)
Fundamentals of Facing Interviews
Question Answer on Various Dimensions

Examination Scheme:

CoMSPonents	CT	A	Group Presentation	Group Discussion	End Term Written Exam
Weightage (%)	10	05	15	10	60

Text & References:

- Jones, Working in English, 1st ed. Cambridge, CUP 2001
- Raman Prakash Business Communication, 2nd ed. Delhi OUP 2006
- Comfort , Jermy Speaking Effectively, Jermy, et.al, Cambridge, CUP, 1994
- Soft skills for Everyone, Jeff Butterfield, Cengage Learning. 2011

BEHAVIOURAL SCIENCE - II

Course Code: BSS 211 **Credit Units: 01**

Course Objective:
This course aims at imparting an understanding of:
Process of Behavioural communication
Aspects of interpersonal communication and relationship
Management of individual differences as important dimension of IPR

Course Contents:

Module I: Behavioural Communication
Scope of Behavioural Communication
Process – Personal, Impersonal and Interpersonal Communication
Guidelines for developing Human Communication skills
Relevance of Behavioural Communication in relationship management

Module II: Managing Individual Differences in Relationships
Principles
Types of issues
Approaches
Understanding and importance of self disclosure
Guidelines for effective communication during conflicts

Module III: Communication Climate: Foundation of Interpersonal Relationships

Elements of satisfying relationships
Conforming and Disconfirming Communication
Culturally Relevant Communication
Guideline for Creating and Sustaining Healthy Climate

Module IV: Interpersonal Communication
Imperatives for Interpersonal Communication
Models – Linear, Interaction and Transaction
Patterns – Complementary, Symmetrical and Parallel
Types – Self and Other Oriented
Steps to improve Interpersonal Communication

Module V: Interpersonal Relationship Development
Relationship circle – Peer/ Colleague, Superior and Subordinate
Initiating and establishing IPR
Escalating, maintaining and terminating IPR
Direct and indirect strategies of terminating relationship
Model of ending relationship

Module VI: End-of-Semester Appraisal

Viva based on personal journal
Assessment of Behavioural change as a result of training
Exit Level Rating by Self and Observer

Examination Scheme:

Components	SAP	IWT (CT)	JFS	A	End Term Written Exam
Weightage (%)	10	10	15	05	60

SAP: Social Awareness Progammes; IWT: Internal Written Test; JFS: Journal Success; A: Attendance

Text & References:

- Vangelist L. Anita, Mark N. Knapp, Inter Personal Communication and Human Relationships: Third Edition, Allyn and Bacon
- Julia T. Wood. Interpersonal Communication everyday encounter
- Simons, Christine, Naylor, Belinda: Effective Communication for Managers, 1997 1st Edition Cassell
- Harvard Business School, Effective Communication: United States of America
- Beebe, Beebe and Redmond; Interpersonal Communication, 1996; Allyn and Bacon Publishers.

FRENCH - II

Course Code: FLF211 **Credit Units: 02**

Course Objective:

- To enable the students to overcome the fear of speaking a foreign language and take position as a foreigner speaking French.
- To make them learn the basic rules of French Grammar.

Course Contents:

Module A: pp.38 – 47: Unité 3: Objectif 3, 4, 5. 6

Module B: pp. 47 to 75 Unité 4, 5

Contenu lexical: **Unité 3: Organiser son temps**

1. donner/demander des informations sur un emploi du temps, un horaire SNCF – Imaginer un dialogue
2. rédiger un message/ une lettre pour …
   i) prendre un rendez-vous/ accepter et confirmer/ annuler
   ii) inviter/accepter/refuser
3. Faire un programme d'activités
   imaginer une conversation téléphonique/un dialogue
   Propositions- interroger, répondre

Unité 4: Découvrir son environnement

1. situer un lieu
2. s'orienter, s'informer sur un itinéraire.
3. Chercher, décrire un logement
4. connaître les rythmes de la vie

Unité 5: s'informer

1. demander/donner des informations sur un emploi du temps passé.
2. donner une explication, exprimer le doute ou la certitude.
3. découvrir les relations entre les mots
4. savoir s'informer

Contenu grammatical:

1. Adjectifs démonstratifs
2. Adjectifs possessifs/exprimer la possession à l'aide de:
   i. « de » ii. A+nom/pronom disjoint
3. Conjugaison pronominale – négative, interrogative - construction à l'infinitif
4. Impératif/exprimer l'obligation/l'interdiction à l'aide de « il faut…. »/ «il ne faut pas… »
5. passé composé
6. Questions directes/indirectes

Examination Scheme:

Components	CT	A	Assignment	Class Performance/ Presentation/ Viva	End Term Written Exam
Weightage (%)	10	05	10	15	60

Text & References:

- le livre à suivre: Campus: Tome 1

GERMAN – II

Course Code: FLG211 **Credit Units: 02**

Course Objective:
To enable the students to converse, read and write in the language with the help of the basic rules of grammar, which will later help them to strengthen their language.
To give the students an insight into the culture, geography, political situation and economic opportunities available in Germany. Introduction to Grammar to consolidate the language base learnt in Semester I

Course Contents:
Module I: Everything about Time and Time periods
Time and times of the day.
Weekdays, months, seasons.
Adverbs of time and time related prepositions

Module II: Irregular verbs
Introduction to irregular verbs like to be, and others, to learn the conjugations of the same, (fahren, essen, lessen, schlafen, sprechen und ähnliche).

Module III: Separable verbs
To comprehend the change in meaning that the verbs undergo when used as such
Treatment of such verbs with separable prefixes

Module IV: Reading and comprehension
Reading and deciphering railway schedules/school time table
Usage of separable verbs in the above context

Module V: Accusative case
Accusative case with the relevant articles
Introduction to 2 different kinds of sentences – Nominative and Accusative

Module VI: Accusative personal pronouns
Nominative and accusative in comparison
Emphasizing on the universal applicability of the pronouns to both persons and objects

Module VII: Accusative prepositions
Accusative propositions with their use
Both theoretical and figurative use

Module VIII: Dialogues
Dialogue reading: 'In the market place' & 'At the Hotel'

Examination Scheme:

Components	CT	A	Assignment	Class Performance/ Presentation/ Viva	End Term Written Exam
Weightage (%)	10	05	10	15	60

Text & References:

- Wolfgang Hieber, Lernziel Deutsch
- Hans-Heinrich Wangler, Sprachkurs Deutsch
- Schulz Griesbach, Deutsche Sprachlehre für Ausländer
- P.L Aneja, Deutsch Interessant- 1, 2 & 3
- Rosa-Maria Dallapiazza et al, Tangram Aktuell A1/1,2
- Braun, Nieder, Schmöe, Deutsch als Fremdsprache 1A, Grundkurs

SPANISH – II

Course Code: FLS211 **Credit Units: 02**

Course Objective:
To enable students acquire more vocabulary, grammar, Verbal Phrases to understand simple texts and start describing any person or object in Simple Present Tense.

Course Contents:

Module I
Revision of earlier modules.

Module II
Some more AR/ER/IR verbs. Introduction to root changing and irregular AR/ER/IR ending verbs

Module III
More verbal phrases (eg, Dios Mio, Que lastima etc), adverbs *(bueno/malo, muy, mucho, bastante, poco).*
Simple texts based on grammar and vocabulary done in earlier modules.

Module IV
Possessive pronouns

Module V
Writing/speaking essays like my friend, my house, my school/institution, myself….descriptions of people, objects etc, computer/internet related vocabulary

Examination Scheme:

Components	**CT**	**A**	**Assignment**	**Class Performance/ Presentation/ Viva**	**End Term Written Exam**
Weightage (%)	10	05	10	15	60

Text & References:

- Español, En Directo I A
- Español Sin Fronteras

CHINESE – II

Course Code: FLC 211 **Credit Units: 02**

Course Objective:
Chinese is a tonal language where each syllable in isolation has its definite tone (flat, falling, rising and rising/falling), and same syllables with different tones mean different things. When you say, "ma" with a third tone, it mean horse and "ma" with the first tone is Mother. The course aims at familiarizing the student with the basic aspects of speaking ability of Mandarin, the language of Mainland China. The course aims at training students in practical skills and nurturing them to interact with a Chinese person.

Course Contents:

Module I
Drills
Practice reading aloud
Observe Picture and answer the question.
Tone practice.
Practice using the language both by speaking and by taking notes.
Introduction of basic sentence patterns.
Measure words.
Glad to meet you.

Module II
Where do you live?
Learning different colors.
Tones of "bu"
Buying things and how muchit costs?
Dialogue on change of Money.
More sentence patterns on Days and Weekdays.
How to tell time. Saying the units of time in Chinese. Learning to say useful phrases like – 8:00, 11:25, 10:30 P.M. everyday, afternoon, evening, night, morning 3:58, one hour, to begin, to end ….. etc.
Morning, Afternoon, Evening, Night.

Module III
Use of words of location like-li, wais hang, xia
Furniture – table, chair, bed, bookshelf,.. etc.
Description of room, house or hostel room.. eg what is placed where and how many things are there in it?
Review Lessons – Preview Lessons.
Expression 'yao", "xiang" and "yaoshi" (if).
Days of week, months in a year etc.
I am learning Chinese. Is Chinese difficult?

Module IV
Counting from 1-1000
Use of "chang-chang".
Making an Inquiry – What time is it now? Where is the Post Office?
Days of the week. Months in a year.
Use of Preposition – "zai", "gen".
Use of interrogative pronoun – "duoshao" and "ji".
"Whose"??? Sweater etc is it?
Different Games and going out for exercise in the morning.

Module V
The verb "qu"
Going to the library issuing a book from the library
Going to the cinema hall, buying tickets
Going to the post office, buying stamps
Going to the market to buy things.. etc
Going to the buy clothes …. Etc.
Hobby. I also like swimming.
Comprehension and answer questions based on it.

Examination Scheme:

Components	**CT**	**A**	**Assignment**	**Class Performance/ Presentation/ Viva**	**End Term Written Exam**
Weightage (%)	10	05	10	15	60

Text & References:

- "Elementary Chinese Reader Part I" Lesson 11-20

SEMINAR

Course Code: MSP255 **Credit Units: 04**

Guidelines for Seminar

f) Choosing the topic
g) Finding relevant materials
h) Presentation
i) Response to queries
j) Submission of the write up

Presentation of the seminar will be of 1 HOUR maximum (40 min presentation and rest question answer session)

Examination Scheme:

Components	**Weightage**
Content	30
Presentation	40
Response to the queries	20
Write up	10

Syllabus- Third Semester

ATOMIC AND MOLECULAR PHYSICS

Course Code: MAP301 **Credit Units: 04**

Course Objective:
The aim of this course is to give the basic ideas about the structure of atoms and molecules, electronic structure, interaction of radiation and external fields with atoms and molecules.

Course Contents:

Module I
Quantum states of one electron atoms, Hydrogen spectrum, Larmor's theorem, Magnetic moment and Bohr magnetron, Spin orbit interaction, hydrogen fine structure, Vector atom model , two electron systems, LS and jj Coupling schemes, spectroscopic terms, equivalent and non equivalent atoms, Helium atom spectrum, spectra of alkali atoms, Nuclear spin, magnetic moment, isotopic effect and Hyperfine structure, Normal and anomalous Zeeman effect, Paschen Back effect, Stark effect.

Module II
Rotational spectra of diatomic molecules as a rigid rotor and non rigid rotor, intensity of rotational lines, Diatomic molecule as a simple harmonic oscillator, vibrational energy of diatomic molecule, Anharmonicity, Vibrational-rotational spectra, Raman effect,quantum theory of Raman effect, rotational Raman spectra, vibrational Raman spectra .

Module III
Electronic band spectra, electronic energy and total energy, vibrational structure of electronic transitions, rotational structure of electronic bands, The branches(P,Q,R) of band, Band head formation. Intensities in electronic bands, Frank-Condon principle, Fortrat diagram.

Module IV
Interaction of atoms in the formation of molecules, covalent, ionic bonding and vander Waal's interactions, concept of molecular potential, Born-oppenheimer approximation, Electronic states of diatomic molecules, Electronic angular momenta, The LCAO approach, states for hydrogen molecular ion, Coulomb, exchange, overlap integral, symmetries of electronic wavefunctions .Term symbols for simple molecules.

Examination Scheme:

Components	CT	HA	S/V/Q	Attendance	EE

Weightage (%)	10	8	7	5	70

CT – Class Test, S/V/Q – Seminar/Viva/Quiz, HA – Home Assignment, EE – End Semester Examination

Text & References:

- Arthur Beiser, Concepts of Modern Physics, 6th edition, Tata McGraw-Hill, New Delhi (2003).
- G. Aruldhas, Molecular Structure and Spectroscopy, Prientice Hall of India, NewDelhi (2002). I, Chapmen
- B.P. Straughan, Spectro& S. Walker scopy: Vol. and Hall (1976).
- G.M Barrow, Introduction to Molecular Spectroscopy, McGraw Hill Ltd., Singapore (1986).
- Introduction to Atomic Spectra, H. E. White, McGraw-Hill

NUCLEAR PHYSICS

Course Code: MAP302 **Credit Units: 04**

Course Objective:
The aim of the course is to introduce the concept of nuclear structure, nuclear forces and nuclear reactions for a clear understanding of recent intricate theories of nuclear physics.

Course Contents:

Module I: Two-Body Problems and Nuclear Forces
Properties of deuteron, Schrödinger equation for the deuteron and the ground state; rms radius, spin dependence of nuclear forces, electromagnetic moment of deuteron and the necessity of tensor forces. Nucleon-nucleon scattering, experimental n-p scattering data, partial wave analysis of n-p scattering, phase shifts, singlet and triplet potentials, effective range theory, low energy p-p scattering, meson theory of nuclear forces, Charge independence and charge symmetry; spin dependence, S-wave effective range theory; central and tensor forces, dipole and quadruple moments of deuteron.

Module II: Nuclear Reactions
Compound nucleus and Direct reactions (elastic, inelastic, transfer, break-up), Nuclear fusion, Laser induced fusion, Quantum mechanical theory, Resonance scattering and reactions, Dispersion relation, Nuclear fission: experimental features, spontaneous fission, barrier penetration, statistical model.

Module III: Nuclear Structure
Liquid drop model, Shell model (extreme single particle), magnetic moment, quadruple moment; Collective models; concept of unified model (vibrational states, deformed nuclei, rotational states).

Module IV: Elementary Particle Physics Elementary particles (quarks, baryons, mesons, leptons), spin and parity assignments, Isospin strangeness, Gellmann Nishijima formula, C, P and T invariance and applications of symmetry arguments to particle reactions.

Examination Scheme:

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

CT – Class Test, S/V/Q – Seminar/Viva/Quiz, HA – Home Assignment, EE – End Semester Examination

Text & References:

- J. M Blatt and V.E. Weisskipf: Theoretical Nuclear Physics
- B.K. Agrawal : Nuclear Physics, Lokbharti Pub, Allahabad. 1989
- RR Roy and B.P.Nigam, Nuclear Physics, Willey-Easter, 1979
- M.A. Preston & RK Bhaduri-Structure of the Nucleus, Addision Wesley, 1975
- RD. Evans-The Atomic Nucleus(McGraw-Hills, 1955)
- B.L. Cohen - Concept of Nuclear Physics Tata Mc-Graw Hills, 1988
- Kenneth S. Krane, Introductory Nuclear Physics, Willey-Easter

LASERS AND THEIR APPLICATIONS

Course Code: MAP303 **Credit Units: 04**

Course Objective:
The aim of the present course is to acknowledge the students with different types of lasers and its applications.

Course Contents:

Module I
Stimulated Absorption, Stimulated Emission and spontaneous Emission :Absorption and Gain Coefficient. Radiative Lifetime and Spontaneous Transition Probabilities. Saturation: Saturation of Absorption. Gain Saturation. Widths and Profiles of Spectral Lines: Homogeneous and Inhomogeneous Broadening. Natural Linewidth. Doppler Width. Collision Broadening of Spectral Lines.

Module II
Basic principles of LASERS Laser Amplification. Laser Oscillation.Optical and Electrical Pumping. Optical Resonators. Optimization of Favourable Losses in Resonators. Resonance Frequencies of Optical Resonators. Laser Modes. Rate Equations for Three-Level and Four-Level Lasers. Steady State Output. CW and Transient Laser Behaviour. Single-Mode Operation. Q-Switching. Mode Locking.

Module III
Types of Lasers. Solis State lasers (Ruby laser, Semiconductor laser, Nd: YAG laser), Gas lasers (He-Ne laser, Excimer laser), Liquid (organic dye) lasers.

Module IV
Doppler limited Absorption and Fluorescence Spectroscopy with lasers, Fluorescence Excitation Spectroscopy and LIF. Non- linear Spectroscopy. Doppler- Free Techniques in Spectroscopy. Laser Raman Spectroscopy, Time-Resolved Laser Spectroscopy. Properties of Lasers, Applications of Lasers.

Examination Scheme:

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

CT – Class Test, S/V/Q – Seminar/Viva/Quiz, HA – Home Assignment, EE – End Semester Examination

Text & References:

- K.Shimoda : Introduction to Laser Physics; (Springer-Verlag)

- O. Svelto : Principles of Lasers (plenum Press)
- 3. D.C. OShea, W.R. Callen & W.T. Rhodes. Introduction to Lasers and their Applications (Addison-Wesley)
- W Demtrder. Laser Spectroscopy A Basic Concepts and Instrumentation (SpringerVerlag)
- A. Corney : Atomic and Laser Spectroscopy (Clarendon Press)
- Thyagarajan and Ghatak : Lasers- Theory and Applications

LASER AND FIBRE OPTICS LAB

Course Code: MAP320 **Credit Units: 02**

List of Experiments

1. To determine wavelength of a given laser source.
2. To determine the Diameter, Divergence and Focus Spot Size of a Laser Beam.
3. To measure the degree of polarization using laser.
4. To study Propagation loss & bending loss using Optical Fiber.
5. To study the characteristics of LED & Detector using Fiber Optic.
6. To determine the numerical aperture of a given optical fiber.
7. To study the frequency modulation & demodulation by using Fiber Optic Link.
8. To study the modulation & demodulation of light source by Pulse Width Modulation (PWM) and Pulse Position Modulation (PPM) techniques.
9. To determine the band width of an optical receiver and to calculate the signal to noise ratio (SNR) using Fiber Optic.

Examination Scheme:

Components	**TA**	**V**	**LR**	**Attendance**	**EE**
Weightage (%)	7	10	8	5	70

TA: Teacher Assessment, V: Viva, LR: Lab Record EE: External Examination

Text & Reference:

- John. M. Senior, Optical fiber communications: principles and practice, Prentice Hall of India.
- Gerd Keiser, Optical fiber communications, McGraw Hill, 3rd edition.
- D. K. Mynbaev, L. L. Scheiner, Fiber optic communication technology, Pearson Technology.
- Introduction to fiber optics, Ajoy Ghatak and K. Tyagrajan..

OPTICS LAB

Course Code: MAP321 **Credit Units: 02**

List of Experiment:

1. To determine the mean wavelength of sodium light and to measure the wavelength difference ($\Delta\lambda$) using Michelson interferometer.
2. To study the spectral characteristics of the incident beam using Fabry Perot Interferometer.
3. To find the intensity distribution of single, double and multiple slit by using Fraunhofer diffraction pattern.
4. To measure the grating element of grating by Fraunhofer diffraction pattern.
5. To determine the thickness of a thin transparent sheet using Michelson Interferometer.
6. To verify the Fresnel's formula for reflection and refraction by using a plane refracting surface using Spectrometer.
7. To determine the effect of magnetic field on the polarization state in dispersive medium (Faraday Experiment).
8. To determine the Planck's constant using photocell

Examination Scheme:

CoMSPonents	**TA**	**V**	**LR**	**Attendance**	**EE**
Weightage (%)	7	10	8	5	70

TA: Teacher Assessment V: Viva LR: Lab Record EE: External Examination

Text & References:

- Optics, A. Ghatak, Tata Mc Graw Hill.
- Jenkins and White, Fundamentals of optics, Mc Graw Hill.
- S.P. Singh, Advanced practical physics Volume I,II, Pragati Prakashan.

DOMAIN ELECTIVE PAPER (SELECT ANY ONE)

DIGITAL ELECTRONICS AND MICROPROCESSORS

Course Code: MAP306 **Credit Units: 04**

Course Objective:
The main aim of the course is to give concept of Digital Electronics and Microprocessor which is useful for research and industrial application.

Course Contents:

Module I: Boolean Algebra
Truth tables Logic gates: OR, AND, Inverter gates, The Universal NOR and NAND gates, XOR and XNOR gates, De-Morgan's Theorem, Reduction Technique Karnaugh MP simplification. Parity check. The half adder, the Full adder, Parallel binary adder, half and full subtractors.

Sequential Logic: Latches, R.S. Flip/Flop, The D.Flip/Flop, T.Flip/Flop, J.K. Flip/flop, Master/ slave flip/flop, Race Problem, Binary Ripple counter, modified counters using Negative feedback.

Module II: Shift Registers and Counters
Universal Shift Register, shift counter, Ring Counter, D/A converter and A/D converter. Simultaneous and Counter method of A/D converter, Successive Approximation method, Seven segment LED display, BCD to seven segment decoder.

Logic Families: Transistor as a Switch, TTL integrated circuits, CMOS integrated circuit. Logic families and their characteristics, comparing Logic families, Interfacing. Introduction to VHDL and Programming techniques.

Module III: **Introduction to Microprocessor**
Microprocessor 8085: PIN Out and Signals, Internal architecture, Flags, Program counter. Introduction to 8085 Instruction Set: Data Transfer, Arithmetic & Logical Instruction, Branch and machine Code, OP-Code Format, Addressing Mode Timing Diagram. M **(10)**achine Cycle.

Module IV: Microprocessor: **- Programming and Interfacing**
Subroutine and Sub programming, CALL and RETURN, STACK, PUSH & POP, 8085 Interrupts, RST Code; SID, SOD, RIM and SIM; Delay Program Calculation, Memory Organization. (RAM, EPROM, ROM, PROM, DRAM.) Introduction to 8086 and registers. Addressing and Interfacing, Basic Interfacing Concept, Introduction to I/O and Memory MPped Techniques, Handshaking, Interfacing I/O devices, Display, Keyboard, Generating Control Signals, De Multiplexing of address Bus, Programming Technique, Interfacing 8155, Programmable I/O Ports and Timer IC, Programmable Peripheral Interface 8255 with 8085. Interfacing of A/D and D/A converters, Study of 8279, 8253.

Examination Scheme:

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

CT – Class Test, S/V/Q – Seminar/Viva/Quiz, HA – Home Assignment, EE – End Semester Examination

Text & References:

- D. V. Hall, Microprocessors and Interfacing- Programming and Hardware, Tata McGraw Hill (1999)
- 3.Microprocessor Architecture Programming and applicationsa by R.S Gaonkar
- Digital Electronics by Malvino and Leach.
- 5.Digital Electronics by V.K.Jain.
- B. Brey, The Intel Microprocessors- Architecture, Programming and Interfacing, Pearson Education (2003)

NON–CONVENTIONAL ENERGY SOURCES

Course Code: MAP307 **Credit Units: 04**

Course Objective:
A detailed exposition of the course for the student, opting for physics is so vitally important for a clear understanding of recent intricate theories of non-conventional sources of energy.

Course Contents:

Module I: Solar Energy
Heat Transfer in Renewable Energy Systems - conduction, convection and radiation, Heat transfer and engineering concepts to the renewable energy systems Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, Spectral distribution, the solar constant, radiation on titled surface / earth, instruments for measuring solar radiation.
Application of solar energy and solar photovoltaic system

Module II: Bio-Gas
Raw materials, Properties/ characteristics of bio gas, Principles of Bio-Conversion; Photosynthesis, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion, Transportation of bio gas, bio gas plant technology & status, Biomass cogeneration Energy recovery from urban waste, Power generation from liquid waste, Bio gas applications,

Module III: Geothermal and Wind Energy
Structure of earth's interior, earthquakes & volcanoes, Geothermal resources, Hot springs, Steam ejection, Principal of working, Types of geothermal station with schematic representation, Applications.
Properties of wind, Availability of wind energy in India, wind velocity, Wind machine fundamentals; types of wind machines and their characteristics, Horizontal and Vertical axis wind mills, Elementary design principles, Coefficient of performance of a wind mill rotor, Aerodynamic considerations in wind mill design, Recent development and applications

Module IV: Ocean and Hydrogen Energy
Principle of ocean thermal energy conversion (OTEC), setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Fundamentals of tidal power, Potential and conversion techniques, mini-hydel power plants. Use of tidal energy, Limitations of tidal energy conversion systems.
Properties of hydrogen in respect of it's use as source of renewable energy, Sources of hydrogen, Production of hydrogen; electrolysis of water, thermal decomposition of water, thermo chemical production bio-chemical production. Applications of hydrogen energy.

Examination Scheme:

Components	CT	HA	S/V/Q	Attendance	EE

Weightage (%)	10	8	7	5	70

CT – Class Test, S/V/Q – Seminar/Viva/Quiz, HA – Home Assignment, EE – End Semester Examination

Text & References:

- Bansal Keemann, Meliss," Renewable energy sources and conversion technology", Tata Mc Graw Hill.
- Kothari D.P., “Renewable energy resources and emerging technologies”, Prentice Hall of India Pvt. Ltd.
- Rai G.D, "Non-Conventional energy Sources", Khanna Publishers.
- .Ashok V. Desai, "Nonconventional Energy", New Age International Publishers Ltd.
- Tiwari and Ghosal, “Renewable energy resources” Narosa Publication.
- Twidell & Weir, “Renewable Energy Sources”
- K Mittal “Non-Conventional Energy Systems” , Wheeler Publication
- Ramesh & Kumar, “Renewable Energy Technologies”, Narosa Publications.

ASTROPHYSICS

Course Code: MAP 312 **Credit Units: 04**

Course Objective:
A quantitative approach to astronomy and astrophysics. Treatment of stars, the interstellar medium, galaxies, and cosmology. At the end students should be able to handle research problems in Astronomy.

Course Contents:
Module I: Overview and Basics of Astronomy
Coordinate systems, precession, time, heliocentric corrections, methods of observation, spectrum of EM radiation, and observation in different wavelength bands.
Overview of major contents of universe, Black body radiation, specific intensity, flux density, luminosity, Basics of radiative transfer (Emission/absorption coefficients, source functions). Magnitudes, distance modulus, various distance scales in Astronomy, various methods of distance measurement.

Module II: Stellar Structure and Evolution
Introduction to stars: HR diagram, a discussion on the variety of stellar phenomena, Stellar structure, stellar polytropes, Energy Generation in Stars, Thermonuclear reactions, pp and CNO cycle. Various stages of evolution: Main Sequence stars, various phases of evolution eg. He-burning, C-burning, Si-burning, photo-dissociation.
Stellar degeneracy and Equations of State: Stellar degeneracy, Chandrasekhar mass, EoS of matter at near-nuclear and nuclear densities. Final stages of stellar evolution: Supernovae (a basic understanding of the core-collapse process and the structure of the progenitor) and neutron stars - a basic knowledge of NS structure.

ModuleIII: Galactic and Extragalactic Astronomy
Galactic structure: Local and large scale distribution of stars and interstellar matter, the spiral structure, the Galactic centre, Galactic dynamics, stellar relaxation, dynamical friction, star clusters, density wave theory of galactic spiral structure (qualitative), chemical evolution in the galaxy, stellar populations, galaxies, morphological classification of galaxies, clusters of galaxies, interactions of galaxies, dark matter, evolution of galaxies.

Module IV: Cosmology
Introduction, assumptions and early scientific cosmologies. Observing the Universe: Large scale structure of the Universe, isotropy and homogeneity, darkness at night, expansion of the Universe, redshift, particles in the Universe. Dynamics of the Universe: Curved space, general relativity concepts, horizon, Friedmann equation of state, fluid and acceleration equations, cosmological

constant. Expansion rate, cosmological distance ladder, density and deceleration parameters, age of the Universe. Radiation, visible matter, dark matter, gravitational lensing. The early Universe: Big Bang, baryogenesis, inflation, nucleosynthesis, recombination, last scattering surface, Cosmic Microwave Background.

Examination Scheme:

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

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

Text & References:

- The Physical Universe: An introduction to Astronomy by Frank H. Shu
- Astrophysical concepts by Harwit Martin
- Astrophysics for Physicists by Arnab Rai Choudhuri
- An Introduction to modern Astrophysics by Bradley W. Carroll and Dale Ostile, Pearson Addison-Wesley
- http://www.iucaa.ernet.in/~dipankar/ph217/
- http://nptel.iitm.ac.in/courses/115105046/

COMMUNICATION SKILLS – III

Course Code: BCS311 **Credit Units: 01**

Course Objective:
To initiate the learners with the basic mechanics of writing skills and facilitate them with the core skills required for communication in the professional world.

Course Contents:

Module I: Non Verbal Communication
Principles & Significance (Uses of Slides wherever necessary)
Kinesics, Occulics, Proxemics,, Para Linguistics, Artifacts, Chroenemics, Tactilics

Module II: Developing Writing Skills
Business Letter/Official Correspondence
Social Correspondence
Emails & Netiquette

Module III: Business Presentations
Planning, design and layout of presentation
Contents: Information Packaging & Delivery

Examination Scheme:

Components	CT	A	Group Presentation	Group Discussion	End Term Written Exam
Weightage (%)	10	05	15	10	60

Text & References:

- Jones, Working in English, 1st ed. Cambridge, CUP 2001
- Raman Prakash Business Communication, 2nd ed. Delhi OUP 2006
- Comfort , Jermy Speaking Effectively, Jermy, et.al, Cambridge, CUP, 1994
- Soft skills for everyone, Jeff Butterfield, Cengage Learning. 2011

BEHAVIORAL SCIENCE – III

Course Code: BSS311 **Credit Units: 01**

Course Objective:
This course aims to enable students to:
Understand the concept and building of teams
Manage conflict and stress within team
Facilitate better team management and organizational effectiveness through universal human values.

Course Contents:

Module I: Teams: An Overview
Team Design Features: team vs. group
Effective Team Mission and Vision
Life Cycle of a Project Team
Rationale of a Team, Goal Analysis and Team Roles

Module II: Team & Sociometry
Patterns of Interaction in a Team
Sociometry: Method of studying attractions and repulsions in groups
Construction of sociogram for studying interpersonal relations in a Team

Module III: Team Building
Types and Development of Team Building
Stages of team growth
Team performance curve
Profiling your Team: Internal & External Dynamics
Team Strategies for organizational vision
Team communication

Module IV: Team Leadership & Conflict Management
Leadership styles in organizations
Self Authorized team leadership
Causes of team conflict
Conflict management strategies
Stress and Coping in teams

Module V: Global Teams and Universal Values
Management by values
Pragmatic spirituality in life and organization
Building global teams through universal human values
Learning based on project work on Scriptures like Ramayana, Mahabharata, Gita etc.

Module VI: End-of-Semester Appraisal
Viva based on personal journal

Assessment of Behavioural change as a result of training
Exit Level Rating by Self and Observer

Examination Scheme:

Components	SAP	IWT (CT)	JFS	A	End Term Written Exam
Weightage (%)	10	10	15	05	60

SAP: Social Awareness Progammes; IWT: Internal Written Test; JFS: Journal Success; A: Attendance

Text & References:

- **Organizational Behaviour, Davis, K.**
- Hoover, Judhith D. Effective Small Group and Team Communication, 2002,Harcourt College Publishers
- LaFasto and Larson: When Teams Work Best, 2001, Response Books (Sage), New Delhi
- Dick, Mc Cann & Margerison, Charles: Team Management, 1992 Edition, viva books
- J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 2, Group (1996); Pfeiffer & Company
- Smither Robert D.; The Psychology of Work and Human Performance, 1994, Harper Collins College Publishers

FRENCH - III

Course Code: FLF311 **Credit Units: 02**

Course Objective:

To provide the students with the know-how

- To master the current social communication skills in oral and in written.
- To enrich the formulations, the linguistic tools and vary the sentence construction without repetition.

Course Contents:

Module B: pp. 76 – 88 Unité 6

Module C: pp. 89 to103 Unité 7

Contenu lexical: Unité 6: se faire plaisir

1. acheter: exprimer ses choix, décrire un objet (forme, dimension, poids et matières) payer
2. parler de la nourriture, deux façons d'exprimer la quantité, commander un repas au restaurant
3. parler des différentes occasions de faire la fête

Unité 7: Cultiver ses relations

1. maîtriser les actes de la communication sociale courante (Salutations, présentations, invitations, remerciements)
2. annoncer un événement, exprimer un souhait, remercier, s'excuser par écrit.
3. caractériser une personne (aspect physique et caractère)

Contenu grammatical:

1. accord des adjectifs qualificatifs
2. articles partitifs
3. Négations avec de, ne…rien/personne/plus
4. Questions avec combien, quel…
5. expressions de la quantité
6. ne…plus/toujours - encore
7. pronoms compléments directs et indirects
8. accord du participe passé (auxiliaire « avoir ») avec l'objet direct
9. Impératif avec un pronom complément direct ou indirect
10. construction avec « que » - Je crois que/ Je pense que/ Je sais que

Examination Scheme:

Components	CT	A	Assignment	Class Performance/ Presentation/ Viva	End Term Written Exam

Weightage (%)	10	05	10	15	60

Text & References:

- le livre à suivre: Campus: Tome 1

GERMAN - III

Course Code: FLG311 **Credit Units: 02**

Course Objective:
To enable the students to converse, read and write in the language with the help of the basic rules of grammar, which will later help them to strengthen their language.
To give the students an insight into the culture, geography, political situation and economic opportunities available in Germany

Course Contents:

Module I: Modal verbs
Modal verbs with conjugations and usage
Imparting the finer nuances of the language

Module II: Information about Germany (ongoing)
Information about Germany in the form of presentations or "Referat"– neighbors, states and capitals, important cities and towns and characteristic features of the same, and also a few other topics related to Germany.

Module III: Dative case
Dative case, comparison with accusative case
Dative case with the relevant articles
Introduction to 3 different kinds of sentences – nominative, accusative and dative

Module IV: Dative personal pronouns
Nominative, accusative and dative pronouns in comparison

Module V: Dative prepositions
Dative preposition with their usage both theoretical and figurative use

Module VI: Dialogues
In the Restaurant,
At the Tourist Information Office,
A telephone conversation

Module VII: Directions
Names of the directions
Asking and telling the directions with the help of a roadMP

Module VIII: Conjunctions
To assimilate the knowledge of the conjunctions learnt indirectly so far

Examination Scheme:

Components	CT	A	Assignment	Class Performance/ Presentation/ Viva	End Term Written Exam
Weightage (%)	10	05	10	15	60

Text & References:

- Wolfgang Hieber, Lernziel Deutsch
- Hans-Heinrich Wangler, Sprachkurs Deutsch
- Schulz Griesbach, Deutsche Sprachlehre für Ausländer
- P.L Aneja, Deutsch Interessant- 1, 2 & 3
- Rosa-Maria Dallapiazza et al, Tangram Aktuell A1/1,2
- Braun, Nieder, Schmöe, Deutsch als Fremdsprache 1A, Grundkurs

SPANISH – III

Course Code: FLS311 **Credit Units: 02**

Course Objective:
To enable students acquire knowledge of the Set/definite expressions (idiomatic expressions) in Spanish language and to handle some Spanish situations with ease.

Course Contents:

Module I
Revision of earlier semester modules
Set expressions (idiomatic expressions) with the verb *Tener*, *Poner, Ir….*
Weather

Module II
Introduction to *Gustar*…and all its forms. Revision of *Gustar* and usage of it

Module III
Translation of Spanish-English; English-Spanish. Practice sentences.
How to ask for directions (using estar)
Introduction to IR + A + INFINITIVE FORM OF A VERB

Module IV
Simple conversation with help of texts and vocabulary
En el restaurante
En el instituto
En el aeropuerto

Module V
Reflexives

Examination Scheme:

Components	CT	A	Assignment	Class Performance/ Presentation/ Viva	End Term Written Exam
Weightage (%)	10	05	10	15	60

Text & References:

- Español, En Directo I A
- Español Sin Fronteras -Nivel Elemental

CHINESE – III

Course Code: FLC311 **Credit Units: 02**

Course Objective:
Foreign words are usually imported by translating the concept into Chinese, the emphasis is on the meaning rather than the sound. But the system runs into a problem because the underlying name of personal name is often obscure so they are almost always transcribed according to their pronciation alone. The course aims at familiarizing the student with the basic aspects of speaking ability of Mandarin, the language of Mainland China. The course aims at training students in practical skills and nurturing them to interact with a Chinese person.

Course Contents:

Module I
Drills
Dialogue practice
Observe picture and answer the question.
Introduction of written characters.
Practice reading aloud
Practice using the language both by speaking and by taking notes.
Character writing and stroke order

Module II
Measure words
Position words e.g. inside, outside, middle, in front, behind, top, bottom, side, left, right, straight.
Directional words – beibian, xibian, nanbian, dongbian, zhongjian.
Our school and its different building locations.
What game do you like?
Difference between “hii” and “neng”, “keyi”.

Module III
Changing affirmative sentences to negative ones and vice versa
Human body parts.
Not feeling well words e.g.; fever, cold, stomach ache, head ache.
Use of the modal particle “le”
Making a telephone call
Use of “jiu” and “cal” (Grammar portion)
Automobiles e.g. Bus, train, boat, car, bike etc.
Traveling, by train, by airplane, by bus, on the bike, by boat.. etc.

Module IV
The ordinal number “di”
“Mei” the demonstrative pronoun e.g. mei tian, mei nian etc.
use of to enter to exit
Structural particle “de” (Compliment of degree).
Going to the Park.

Description about class schedule during a week in school.
Grammar use of “li” and “cong”.
Comprehension reading followed by questions.

Module V
Persuasion-Please don’t smoke.
Please speak slowly
Praise – This pictorial is very beautiful
Opposites e.g. Clean-Dirty, Little-More, Old-New, Young-Old, Easy-Difficult, Boy-Girl, Black-White, Big-Small, Slow-Fast … etc.
Talking about studies and classmates
Use of “it doesn’t matter”
Enquiring about a student, description about study method.
Grammar: Negation of a sentence with a verbal predicate.

Examination Scheme:

Components	**CT**	**A**	**Assignment**	**Class Performance/ Presentation/ Viva**	**End Term Written Exam**
Weightage (%)	10	05	10	15	60

Text & References:

- “Elementary Chinese Reader Part I, Part-2” Lesson 21-30

SUMMER INTERNSHIP

Course Code: MSP 355 **Credit Units: 09**

Methodology:

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

Examination Scheme

Feedback from Industry:	20
Training Report:	40
Viva:	15
Presentation:	25
Total	**100**

Syllabus- Fourth Semester

RESEARCH WORK PROJECT BASED

Course Code: MAP460 **Credit Units: 30**

GUIDELINES FOR PROJECT FILE AND PROJECT REPORT

Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation.
Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student.

Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critically analyzed by the faculty guide and corrected by the student at each stage.

PROJECT FILE
The Project File may be a very useful tool for undertaking an assignment along-with a normal semester, an exploratory study, sponsored projects, a project undertaken during summer period or any other period as per curriculae where the researcher is working with a company/organization. The project/ assignment may also be a part of the bigger research agenda being pursued by a faculty/ institution/ department
The Project File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation. This file may be considered in continuous assessment.

In general, the File should be comprehensive and include:
- A short account of the activities that were undertaken as part of the project;
- A statement about the extent to which the project has achieved its stated objectives;
- A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project;
- Any activities planned but not yet completed as part of the project, or as a future initiative directly resulting from the project;
- Any problems that have arisen and may be useful to document for future reference.

PROJECT REPORT
The Project Report is the final research report that the student prepares on the project assigned to him. In case of sponsored project the lay out of the project could be as prescribed by the sponsoring organization. However, in other cases the following components should be included in the project report:

- **Title or Cover Page**

The title page should contain Project Title; Student's Name; Programme; Year and Semester and Name of the Faculty Guide.

- **Acknowledgement(s)**

Acknowledgment to any advisory or financial assistance received in the course of work may be given. It is incomplete without student's signature.

- **Abstract**

A good "Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project. It should not exceed more than 1000 words.

- **Table of Contents**

Titles and subtitles are to correspond exactly with those in the text.

- **Introduction**

Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

- **Materials and Methods**

This section should aim at experimental designs, materials used (wherever applicable). Methodology should be mentioned in details including modifications undertaken, if any. It includes organization site(s), sample, instruments used with its validation, procedures followed and precautions.

- **Results and Discussion**

Present results, discuss and compare these with those from other workers, etc. In writing this section, emphasis should be laid on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

Note that in writing the various secions, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary, do not write in "point" form.

While presenting the results, write at length about the the various statistical tools used in the data interpretation. The result interpretation should be simple but full of data and statistical analysis. This data interpretation should be in congruence with the written objectives and the inferences should be drawn on data and not on impression. Avoid writing straight forward conclusion rather, it should lead to generalization of data on the chosen sample.

Results and its discussion should be supporting/contradicting with the previous research work in the given area. Usually one should not use more than two researches in either case of supporing or contradicting the present case of research.

- **Conclusion(s) & Recommendations**

A conclusion should be the final section in which the outcome of the work is mentioned briefly.
Check that your work answers the following questions:

- Did the research project meet its aims (check back to introduction for stated aims)?
- What are the main findings of the research?
- Are there any recommendations?
- Do you have any conclusion on the research process itself?

➢ **Implications for Future Research**

This should bring out further prospects for the study either thrown open by the present work or with the purpose of making it more comprehensive.

➢ **Appendices**

The Appendices contain material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

➢ **References**

References should include papers, books etc. referred to in the body of the report. These should be written in the alphabetical order of the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

Examples:

For research article:

Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic *Escherichia coli* O157: H7. *Clin Microbiol Infect* , **8** (suppl 1): 116–117.

For book:

Kowalski,M.(1976) Transduction of effectiveness in *Rhizobium meliloti*. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), **7**: 63-67

The Layout Guidelines for the Project File & Project Report:

- A4 size Paper
- Font: Arial (10 points) or Times New Roman (12 points)
- Line spacing: 1.5
- Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

ASSESSMENT OF THE PROJECT FILE AND THE PROJECT REPORT

Essentially, the assessment will be based on the quality of the report, the technical merit of the project and the project execution. Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project. Project execution is concerned with assessing how much work has been put in.

The Project should fulfill the following ***assessment objectives:***

- Range of Research Methods used to obtain information
- Execution of Research
- Data Analysis (Analyze Quantitative/ Qualitative information)
- Quality Control

- Conclusions

Assessment Scheme:

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

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

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

Open Elective from department

BASICS OF NANO-TECHNOLOGY

Course Code: MAP 001 **Credit Units: 03**

Course Objective:
This course aims at students to get acquainted with introductory knowledge of Nanotechnology.

Course Contents:

Module I: Introduction
Nanoscience and Nanotechnology, Classification of nanostructured materials, Nanoparticles, Quantum wire,Quantum well ,Quantum dots, Carbon nanotubes, Graphene, Nanowires, Ultra thin films-multilayered materials, Length scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Technological advantages of Nano materials

Module II: Preparation Methods
Bottom-up synthesis, Top-down approach: Mechanical milling, Sputtering, Evaporation.Material processing by Sol – Gel method, Chemical Vapour deposition and Physical Vapour deposition ,Microwave Synthesis of materials, Principles of SEM, TEM and AFM.

Module III: Characterization Techniques
X-ray diffraction technique, Scanning Electron Microscopy, Tunneling Electron Microscopy, Surface Analysis Techniques- AFM, SPM STM, ESCA.

Examination Scheme:

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

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

Text & References:

- T. Pradeep, NANO The Essential, understanding Nanoscience and Nanotechnology, Tata McGraw-Hil Publishing Company Limited, 2007.
- Charles P.Poole Jr., Introduction to Nanotechnology, John Willey & Sons, 2003.
- Nanotechnology by Mark Ratner and Daniel Ratner, Pearson Education.
- Nanomaterials by A.K. Bandyopadhyay; New Age International Publishers.

BASICS OF MODERN PHYSICS

Course Code: MSP 002 **Credit Units: 03**

Course Objective:

Aim of this course is to introduce the students to fundamentals of modern physics which form the basis of all applied science and engineering

Course Contents:

Module I: Special Theory of Relativity

Michelson-Morley experiment, Importance of negative result, Inertial & non-inertial frames of reference, Einstein's postulates of Special theory of Relativity, Space-time coordinate system, Relativistic Space Time transformation (Lorentz transformation equation), Length contraction and Time dilation, Mass-energy equivalence (Einstein's energy mass relation) .

Module II: Wave Mechanics

Wave particle duality, De-Broglie matter waves, phase and group velocity, Heisenberg uncertainty principle, wave function and its physical interpretation, Schrödinger wave equation for free & bound states, square well potential (rigid wall).

Module III: Atomic Physics

Vector atom model, Zeeman effect (normal & anomalous), Paschen-Bach effect, X-ray spectra, Lasers – conditions for light amplification, population inversion, optical pumping, three level and four level lasers, He-Ne and Ruby laser, Properties and applications of lasers.

Module IV: Solid State Physics

Sommerfield's free electron theory of metals, Fermi energy, Introduction to periodic potential & Kronig-Penny model (Qualitative) Band Theory of Solids, Semi-conductors: Intrinsics and Extrinsic Semiconductors, photoconductivity and photovotaics, Basic aspects of Superconductivity, Meissner effect.

Examination Scheme:

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

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

Text & References:

- Concept of Modern Physics, A. Beiser
- Applied Physics II, Agarawal & Goel
- Solid State Physics, S. O. Pallai
- Physics of Atom, Wehr & Richards