

# CURRICULUM

For

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UNDERGRADUATE DEGREE COURSE IN

**BASIC SCIENCES**

**B.Sc. (PCM)**

(Second Year)

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**[Proposed from 2018-19]**



IIMT UNIVERSITY  
MEERUT

**IIMT University, Meerut**

**FIRST YEAR, SEMESTER-III**  
**STUDY & EVALUATION SCHEME**

S. No	Course Code	Subject	Periods			Credit	Evaluation Scheme		
			L	T	P		Internal	External	Total
1	BSM-301	Abstract Algebra	4	1	-	4	30	70	100
2	BSM-302	Vector Calculus, Geometry and Trigonometry	3	-	-	3	25	50	75
3	BSP-301	Electrostatics	4	1	-	4	30	70	100
4	BSP-302	Mechanics and wave motion	3	-	-	3	25	50	75
5	BSC-301	Physical chemistry - I	4	1	-	4	30	70	100
6	BSC-302	Inorganic chemistry -II	3	-	-	3	25	50	75
7	BSP-333	Electricity and Magnetism Lab	-	-	2	2	20	30	50
8	BSC-333	Chemistry Lab-III	-	-	2	2	20	30	50
9	ECC-321/322/323/324	Skill Enhancement Course			2	4	-	100	100
		TOTAL	<b>21</b>	<b>3</b>	<b>6</b>	<b>29</b>	<b>205</b>	<b>520</b>	<b>725</b>

## SECOND YEAR, SEMESTER-IV

## STUDY &amp; EVALUATION SCHEME

S. No	Course Code	Subject	Periods			Credit	Evaluation Scheme		
			L	T	P		Internal	External	Total
1	BSM-401	Real Analysis	4	1	-	4	30	70	100
2	BSM-402	Matrix and Linear Algebra	3	-	-	3	25	50	75
3	BSP-401	Electronics	4	1	-	4	30	70	100
4	BSP-402	Electromagnetic Theory	3	-	-	3	25	50	75
5	BSC-401	Organic chemistry - ii	4	1	-	4	30	70	100
6	BSC-402	Inorganic chemistry - iii	3	-	-	3	25	50	75
7	BSP-444	Electronics Devices & Circuit Theory Lab	-	-	2	2	20	30	50
8	BSC-444	Chemistry Lab-IV	-	-	2	2	20	30	50
9	ECC- 421/422/423/424	Skill Enhancement Course			2	4	-	100	100
		TOTAL	<b>21</b>	<b>3</b>	<b>6</b>	<b>29</b>	<b>205</b>	<b>520</b>	<b>725</b>

**SEMESTER-III**

[L= Lecture, T = Tutorials, P = Practicals&amp; C = Credits]

<b>BSM-301</b>	<b>Abstract Algebra</b>	<b>4L:1T:0P</b>	<b>4Credits</b>
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**UNIT-1****(09 Lectures)**

Algebraic Structures, Definition and examples of groups, elementary properties of groups, permutation groups. Subgroups and examples of subgroups, centralizer, normalizer, center of a group, Product of two subgroups.

**UNIT-2****(09 Lectures)**

Properties of cyclic groups, classification of subgroups of cyclic groups. Cycle notation for permutations, properties of permutations, even and odd permutations,

**UNIT-3****(09 Lectures)**

Alternating group, properties of cosets, Lagrange's theorem and consequences External direct product of a finite number of groups, normal subgroups, factor groups, Cauchy's theorem for finite Abelian groups.

**UNIT-4****(09 Lectures)**

Group homomorphism, properties of homomorphism, Cayley's theorem, properties of isomorphism, First, Second and Third isomorphism theorems

**UNIT-5****(09 Lectures)**

Introduction to rings, subrings, integral domains and fields, Characteristic of a ring, Homomorphism of rings, Ideals, Quotient rings.

**Books Recommended**

1. John B. Fraleigh, A First Course in Abstract Algebra, 7th Ed., Pearson, 2002.
2. M. Artin, Abstract Algebra, 2nd Ed., Pearson, 2011.
3. Joseph A Gallian, Contemporary Abstract Algebra, 4th Ed., Narosa, 1999.
4. George E Andrews, Number Theory, Hindustan Publishing Corporation, 1984.

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<b>BSM-302</b>	<b>Vector Calculus, Geometry and Trigonometry</b>	<b>3L:0T:0P</b>	<b>3 Credits</b>
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**UNIT-1****(09 Lectures)**

Vector differentiation: Introduction of Vector and Scalar quantities, Vector point function. Gradient, divergence and curl of a vector point function and their physical interpretation.

**UNIT-2****(09 Lectures)**

Vector integration: Line, surface and volume integrals, Theorems of Gauss, Green and Stokes theorems and based problems.

**UNIT-3****(09 Lectures)**

General equation of second degree, Tracing of conics, System of conics, Confocal Conics, Polar equation of a conic and its properties, Three dimensional system of co-ordinates, Projection and direction cosines, Plane, Straight line. Sphere, cone and cylinder

**UNIT-4****(09 Lectures)**

Complex functions and separation into real and imaginary parts, Exponential, direct and inverse trigonometric and hyperbolic functions, logarithmic function, Gregory's series, Summation of series.

**Books Recommended:**

1. G. B. Thomas and R. L. Finney, Calculus, 9th Ed., Pearson Education, Delhi, 2005.
2. H. Anton, I. Bivens and S. Davis, Calculus, John Wiley and Sons (Asia) P. Ltd. 2002.
3. P. C. Mathew's, Vector Calculus, Springer Verlag London Limited, 1998.
4. Vector Analysis by M.R. Spiegel, Schaum's outline series.

<b>BSP-301</b>	<b>Electrostatics</b>	<b>4L:1T:0P</b>	<b>4 Credits</b>
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**UNIT-I(09Lectures)**

Electric Field: Electric Field and Lines, Electric Flux, Gauss's law, Gauss's law in Differential form. Applications of Gauss's Law: E due to (1) an Infinite Line of Charge, (2) a Charged Cylindrical Conductor, (3) an Infinite Sheet of Charge and Two Parallel Charged Sheets, (4) a Charged Spherical Shell, (5)

**UNIT-II(09Lectures)**

A Charged Conducting Sphere, (6) a Uniformly Charged Sphere, (7) Two Charged Concentric Spherical Shells and (8) a Charged Conductor. Force on the Surface of a Charged Conductor and Electrostatic Energy in the Medium surrounding a Charged Conductor.

**UNIT-III(09Lectures)**

Electric Potential: Line Integral of Electric Field, Electric Potential Difference and Electric Potential V (Line integral), Conservative Nature of Electrostatic Field, Relation between E and V, Electrostatic Potential Energy of a System of Charges. Potential and Electric Field of (1) a Dipole,

(2) a Charged Wire (3) a Charged Disc, Force and Torque on a Dipole, Electrostatic Energy of (1) a Point Charge, (2) a System of Point Charges, (3) a Uniform Sphere, (4) a Capacitor.

**UNIT-IV(09Lectures)**

Dielectrics: Electric Field in Matter, Dielectric Constant, Parallel Plate Capacitor with a Dielectric, Polarization, Polarization Charges and Polarization Vector, Electric Susceptibility, Gauss's law in Dielectrics, Displacement vector D, Relations between the three Electric Vectors. Capacitors filled with Dielectrics.

**UNIT-V(09Lectures)**

Electric Circuits: AC Circuits containing R, L, C, Complex Reactance and Impedance, Phasor diagram for current and voltage in AC circuits, Analysis of AC using operator Series LCR Circuit: Resonance, (2) Power Dissipation and (3) Quality Factor, and (4) Band Width Parallel LCR Circuit.

**Text and Reference Books**

1. Electricity and Magnetism by Edward M. Purcell (McGraw-Hill Education, 1986).
2. Fundamentals of Electricity and Magnetism By Arthur F. Kip (McGraw-Hill, 1968).
3. Electricity and Magnetism by J.H. Fewkes & John Yarwood. Vol. I (Oxford Univ. Press, 1991).
4. Electricity and Magnetism. By D C Tayal (Himalaya Publishing House, 1988).
5. David J. Griffiths, Introduction to Electrodynamics, 3<sup>rd</sup> Edn, (Benjamin Cummings, 1998).

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<b>BSP-302</b>	<b>Mechanics and wave motion</b>	<b>3L:0T:0P</b>	<b>3 Credits</b>
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**UNIT-I(09Lectures)**

Conservation of Energy, Conservative forces, Internal forces and conservation of linear momentum, Centre of mass, systems with variable mass, Space-Vehicle Problem, Conservation of Angular Momentum, Internal torques, Angular Momentum about the Centre of mass, Rotational invariance.

**UNIT-II(09Lectures)**

Equation of motion, angular momentum and kinetic energy of a Rotating Body, Moment of Inertia and Radius of Gyration, Rotation of about fixed axes – time dependence of motion, cylinder on an accelerated rough plane, Behaviour of angular momentum vector, Principal axes and Euler's equations. Elementary Gyroscope, Symmetrical Top.

**UNIT-III(09Lectures)**

Force between a Point Mass and Spherical shell, Force between a Point Mass and Solid Sphere, Gravitational and Electrostatic self-energy. Gravitational energy of the Galaxy and of uniform sphere; Orbits and their eccentricity, two body problem - reduced mass.

**UNIT-VI(09Lectures)**

Simple harmonic motion, differential equation of S. H. M. and its solution, uses of complex notation, damped and forced vibrations, composition of simple harmonic motion.

**Text and Reference Books**

1. Mathematical Methods for Physics and Engineering: K.F. Riley, M.P. Hobson and S.J.Bence (Cambridge University Press),1998.
2. Mechanics (Berkeley) Physics Course I: Charles Kittel, Walter D. Knight, M. Alvin and A.Ruderman (Tata McGraw Hill),1981.
3. Mechanics: H.S. Hans and S.P. Puri (Tata McGraw Hill),2003.
4. Introduction to Classical Mechanics: R.G. Takwale&P.S.Puranik (Tata-McGraw-Hill), 2000.

<b>BSC-301</b>	<b>PHYSICAL CHEMISTRY – I</b>	<b>4L:1T:0P</b>	<b>4 Credits</b>
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**UNIT-I(09Lectures)****Gaseous State**

Postulates of kinetic theory of gases, deviation from ideal behavior, vander Waals equation of state.

Critical Phenomena: PV isotherms of real gases, continuity of states, the isotherms of vander Waals constants, the law of corresponding states, reduced equation of state.

Molecular velocities: Root mean square, average and most probable velocities. Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter. Specific heats of gases. Liquefaction of gases (based on Joule-Thomson effect).

**UNIT-II(09Lectures)****Liquid State**

Intermolecular forces, structure of liquids (a qualitative description). Structural differences between solid, liquids and gases. Liquid Crystals: Difference between liquid crystal, solid and liquid. Classification, structure of nematic and cholesteric phases. Thermography and seven segment cell.

**UNIT-III(09Lectures)****Solid State**

Definition of space lattice, unit cell. Laws of crystallography – (i) Law of constancy of interfacial angles (ii) Law of rationality of indices (iii) Law of symmetry. Symmetry elements in crystals.

x-ray diffraction by crystals. Derivation of Bragg's equation. Determination of crystal structure of NaCl, KCl and CsCl (Laue's method and powder method).

**UNIT-IV(09Lectures)****Colloidal State**

Definition of colloids, classification of colloids. Solids in liquids (sols): properties - kinetic, optical and electrical; stability of colloids, protective action, Hardy-Schulze law, gold number, zeta potential. Liquids in liquids (emulsions): types of emulsions, preparation. Emulsifier. Liquids in solids (gels): classification, preparation and properties, inhibition, general applications of colloids. Elementary idea of sol-gel transformation and thixotropy.

**UNIT-V(09Lectures)****Chemical Kinetics and Catalysis**

Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction. Concentration dependence of rates, mathematical characteristics of simple chemical reactions - zero order, first order, second order, third order, nth order, pseudo order, half life and mean life. Determination of the order of reaction - differential method, method of integration, method of half life period and isolation method.

Theories of chemical kinetics: effect of temperature on rate reaction, Arrhenius equation, concept of activation energy. Simple collision theory of unimolecular reaction, transition state theory.



Catalysis, characteristics of catalysed reactions, classification of catalysis, miscellaneous examples of catalysis, acid-base catalysis, enzyme catalysis including its kinetics.

**Text and Reference Books**

1. Physical Chemistry, G.M. Barrow, International Student Edition, McGraw Hill.
2. Basic Programming with Application, V.K. Jain, Tata McGraw Hill.
3. Computers and Common Sense, R. Hunt and Shelly, Prentice Hall.
4. University General Chemistry, C.N.R. Rao, McMillan.
5. Physical Chemistry, R.A. Alberty, Wiley Eastern Ltd.
6. The Elements of Physical Chemistry, P.W. Atkins, Oxford.
7. Physical Chemistry Through Problems, S.K. Dogra and S. Dogra, Wiley Eastern Ltd.

<b>BSC-302</b>	<b>INORGANIC CHEMISTRY – II</b>	<b>3L:0T:0P</b>	<b>3 Credits</b>
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**UNIT-I(09Lectures)****Chemistry of Elements of First Transition Series**

Characteristic properties of d-block elements.

Properties of the elements of the first transition series, their binary compounds and complexes illustrating relative stability of their oxidation states, coordination number and geometry.

**UNIT-II(09Lectures)****Chemistry of Elements of Second and Third Transition Series**

General characteristics, comparative treatment with their 3d-analogues in respect of ionic radii, oxidation states, magnetic behaviour, spectral properties and stereochemistry.

**UNIT-III(09Lectures)****Oxidation and Reduction**

Use of redox potential data – analysis of redox cycle, redox stability in water – Frost, Latimer and Pourbaix diagrams. Principles involved in the extraction of the elements.

**UNIT-IV(09Lectures)****Coordination Compounds**

Werner's coordination theory and its experimental verification, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes and its limitations.

**Text and Reference Books**

1. Basic Inorganic Chemistry, F.A. Cotton, G. Wilkinson and P.L. Gaus, Wiley.
2. Concise Inorganic Chemistry, J.D. Lee, ELBS.
3. Concepts of Models of Inorganic Chemistry, B. Douglas, D. McDaniel and J. Alexander, John Wiley.
4. Inorganic Chemistry, D.E. Shriver, P.W. Atkins and C.H. Langford, Oxford.
5. Inorganic Chemistry, W.W. Porterfield, Addison-Wesley.
6. Inorganic Chemistry, A.G. Sharpe, ELBS.

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<b>BSP-333</b>	<b>ElectricityandMagnetismLab</b>	<b>0L:0T:2P</b>	<b>2 Credits</b>
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**Note: Select any ten experiments from the following list.**

1. A Determine the resistance of a galvanometer using post office box by Kelvin's method.
2. To calibrate the given voltmeter and ammeter by low resistance potentiometer.
3. To determine the hysteresis loss of ferromagnetic materials.
4. To determine a Low Resistance by Carey Foster's Bridge.
5. To determine High Resistance by Leakage of a Capacitor.
6. To determine the (a) Charge Sensitivity and (b) Current Sensitivity of a B.G.
7. To determine the Ratio of Two Capacitances by de Sauty's Bridge.
8. To determine Self Inductance of a Coil by Anderson's Bridge using AC.
9. To determine Self Inductance of a Coil by Rayleigh's Method.
10. To determine the Mutual Inductance of Two Coils by Absolute method using a B.G.
11. To study the response curve of a Series LCR circuit and determine its (a) Resonant Frequency, (b) Impedance at Resonance and (c) Quality Factor Q, and (d) BandWidth.

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<b>BSC-333</b>	<b>Chemistry Lab – III</b>	<b>0L:0T:2P</b>	<b>2 Credits</b>
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**Chemical Kinetics**

1. To determine the specific reaction rate of the hydrolysis of methyl acetate/ ethyl acetate catalysed by hydrogen ions at room temperature.
2. To compare the strengths of HCl and H<sub>2</sub>SO<sub>4</sub> by studying the kinetics of hydrolysis of ethyl acetate.
3. To study the effect of acid strength on the hydrolysis of an ester.
4. To study kinetically the reaction rate of decomposition of iodide by H<sub>2</sub>O<sub>2</sub>.

**Colloids:**

1. To prepare arsenious sulphide sol and compare the precipitating power of mono-, bi- and trivalent anions.

**Distribution Law:**

1. To study the distribution of iodine between water and CCl<sub>4</sub>.
2. To study the distribution between benzene and water.

**Inorganic Chemistry**

1. Estimation of the amount of nickel present in a given solution as bis (dimethylglyoximate) nickel(II) or aluminium as oxinate in a given solution gravimetrically.
2. Estimation of (i) Mg<sup>2+</sup> or (ii) Zn<sup>2+</sup> by complexometric titrations using EDTA.

**Oxidation-Reduction Titrimetry**

- (i) Estimation of Fe(II) and oxalic acid using standardized KMnO<sub>4</sub> solution
- (ii) Estimation of oxalic acid and sodium oxalate in a given mixture.
- (iii) Estimation of Fe(II) with K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> using internal indicator (diphenylamine, N-phenylanthranilic acid) and discussion of external indicator.

## **Skill Enhancement Course**

Once upon a time, people thought it was possible to qualify for a job and then just do that job forever without having to learn more. This was probably never really true...but it is DEFINITELY NOT true now! The technical skills and knowledge needed for work are changing all the time now and everyone need to be learning throughout their careers to stay relevant and competitive.

Learning is skills enhancement – and skills enhancement will help you to get employed and stay employed. Skills Enhancement is all about getting the skills you need to succeed in the work you want to do. Some jobs require specific technical skills and specific education, accreditation or licensing – you will need to know what is required for kind of work you want.

At IIMTU the student will go through the following Skill Enhancement course structure,

S. No.	Course Name	Course Code	Max. marks
1.	Industrial Visits/ Seminars or Presentation on The Reports of The Visits.	ECC-111	25
2.	University Social Responsibility(USR)	ECC-112	25
3.	Spoken Tutorial Certification	ECC-113	25
4.	MOOCS(Swayam)	ECC-114	25

### **1. Industrial Visits/ Seminars or Presentation on the reports of the visits;**

In this section the presentation skills on the basis of observation and learning will be developed and evaluated. Student will be expected to give presentation in the department interpreting the report of his/her industrial visit organized by his department during semester. Participation in the seminars organized in the department will also be considered and evaluated in this section.

### **2. University Social Responsibility(USR);**

Social responsibility describes the way we are making a difference to the social and economic well-being of our communities through our teaching, research, and public events and activities.

We strive to make a positive difference to the life and future of our region by taking socially responsible decisions that have real, beneficial, measurable impacts on the people and the world around us.

The aim of USR should be;

- Increasing the university's impact within society and contributing to tackling societal challenges increasing public understanding of the university's research
- Increasing cooperation with industry or public bodies
- Increasing the impact of university research on the social and cultural life of the local
- Community promoting university participation in policy-making
- Potential helping to align the university with trends in policy and funding

To meet the mentioned challenges a variety of activities can be carried out. Some of the points are listed below.

- Collaboration with companies, public services or NGOs in social projects to help the disadvantaged
- Sensitizing, educational campaigns on social responsibility in areas of influence which are close to the university
- Collaboration with public services and NGOs in sustainable initiatives
- Sensitizing educational campaigns on environmental protection in areas of influence which are close to the university
- Organization and sponsoring of performances committed to both local and regional socioeconomic development
- Organization of volunteering programs for students, professors and staff
- Scientific research on social problems and the knowledge generation
- Application of scientific knowledge to the development of new environment-friendly products, technologies and processes
- Integrating values such as respecting individual and social
- Education in environmental values
- University awareness of environmental problems and Vocational training to solve environmental problems

In this section the performance of the student will be evaluated on the basis of his/her participation and work carried out towards USR.

### **3. Spoken Tutorial Certification;**

Salient features of the Spoken Tutorial project are

- Spoken Tutorial is a 10 minute audio-video tutorial on IT topics.
- The objective of the Spoken Tutorial project is to improve the employment potential of our students by teaching them IT skills

- The Spoken Tutorial project is funded by the National Mission on Education through ICT, MHRD.
- There are about 630 original spoken tutorials, created in English
- Spoken Tutorials cover many useful IT topics, such as Basic IT Literacy, Tux Typing, KTurtle, C, C++, Java, PHP, Linux, Scilab, Python, OpenFOAM, PERL, Ruby, LibreOffice, Blender, GeoGebra, Jmol, GChemPaint and Inkscape.
- These videos are dubbed into all 22 Indian languages. In each of the following languages, we have more than 100 tutorials: Assamese, Bengali, Gujarati, Hindi, Kannada, Malayalam, Marathi, Nepali, Punjabi, Sanskrit, Tamil, Telugu and urdu. Including the dubbed tutorials, there is a total of 4200 videos.
- Spoken Tutorials are created for self learning - achieved through novice check of the script.
- The usage of language dubbed Spoken Tutorials is increasing, with the large scale acceptance of this method by ITIs, who entered our fold about six months ago. We have already trained more than 4,00,000 ITI students through this methodology. The local language use is expected to increase further when the Government Schools start using this methodology.

#### 4. MOOCS (Massive Open Online courses);

A massive open online course (MOOC) is an online course aimed at unlimited participation and open access via the web. In addition to traditional course materials such as filmed lectures, readings, and problem sets, many MOOCs provide interactive courses with user forums to support community interactions among students, professors, and teaching assistants (TAs) as well as immediate feedback to quick quizzes and assignments.

The certification courses recommended are tabulated below;

PHP, My SQL / Perl	Engg. (Degree & Diploma) (CS & IT), BCA, MCA, B.Sc. (CS)
C/C++, Java, Netbeans & Python	CS / IT - Engg., BCA, MCA, B.Sc. (CS)
Linux	Diploma - CS / IT, BCA, B.Sc (CS)
Science Lab. & OSCAD (Free EDA)	B.Tech. & Poly. (EC, EE, CE, ME)
Latex & Firefox	B.Ed & BTC B.Sc. Nursing B.Sc. Home Science B.Sc. (All Streams) B.Com.
GIMP, Q - CAD	B.Arch. / BFT ( <b>Proposed (2018-2019)</b> )
Cell Designer	B.Sc. Biotech. B.Sc. Microbiology

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G. Chem. Paint & J Mol app	B.Sc. Chem. B. Pharma M. Pharma M.Sc. Chem.
Inks cape & Blender	BJMC
Java Business app.	Librarians
Math	B.Sc. (Maths)



## SEMESTER-IV

[L= Lecture, T = Tutorials, P = Practicals &amp; C = Credits]

<b>BSM-401</b>	<b>Real Analysis</b>	<b>4L:1T:0P</b>	<b>4 Credits</b>
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**UNIT-1****(09 Lectures)**

Axiomatic study of real numbers, Completeness property in Real numbers, Archimedean property, Countable and uncountable sets, Neighborhood, Interior points, Limit points, Open and closed sets, Derived sets, dense sets, Perfect sets, Bolzano-Weierstrass theorem.

**UNIT-2****(09 Lectures)**

Sequences of real numbers, Subsequences, Bounded and monotonic sequences, Convergent sequences, Cauchy's theorems on limit, Cauchy sequence, Cauchy's general principle of convergence, Uniform convergence of sequences and series of functions, Weierstrass M-test, Abel's and Dirichlet's tests.

**UNIT-3****(09 Lectures)**

Sequential continuity, Boundedness and intermediate value properties of continuous functions, Uniform continuity, Meaning of sign of derivative, Darboux theorem.

**UNIT-4****(09 Lectures)**

Riemann integral, Integrability of continuous and monotonic functions, Fundamental theorem of integral calculus, Mean value theorems of integral calculus, Improper integrals and their convergence, Comparison test,  $\mu$ -test, Abel's test, Dirichlet's test, Integral as a function of a parameter and its differentiability and integrability.

**UNIT-5****(09 Lectures)**

Definition and examples of metric spaces, Neighborhoods, Interior points, Limit points, Open and closed sets, Subspaces, Convergent and Cauchy sequences, Completeness, Cantor's intersection theorem.

**Books Recommended**

1. T. M. Apostol, Calculus (Vol. I), John Wiley and Sons (Asia) P. Ltd., 2002.
2. R.G. Bartle and D. R Sherbert, Introduction to Real Analysis, John Wiley and Sons (Asia) P. Ltd., 2000.
3. K.A. Ross, Elementary Analysis- The Theory of Calculus Series- Undergraduate Texts in Mathematics, Springer Verlag, 2003.

<b>BSM-402</b>	<b>Matrix and Linear Algebra</b>	<b>3L:0T:0P</b>	<b>3 Credits</b>
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**Unit 1****(09 Lectures)**

Symmetric and skew-symmetric matrices, Hermitian and skew-Hermitian matrices, Orthogonal and unitary matrices, Triangular and diagonal matrices, Rank of a matrix, Elementary transformations, Echelon and normal forms, Inverse of a matrix by elementary transformations.

**Unit 2****(09 Lectures)**

Characteristic equation, Eigen values and Eigen vectors of a matrix, Cayley-Hamilton's theorem and its use in finding inverse of a matrix, Application of matrices to solve a system of linear (both homogeneous and non-homogeneous) equations, Consistency and general solution, Diagonalization of square matrices with distinct eigen values.

**Linear Algebra****Unit 3****(09 Lectures)**

Vector spaces and their elementary properties, Subspaces, Linear dependence and independence, Basis and dimension, Direct sum, Quotient space.

**Unit 4****(09 Lectures)**

Linear transformations and their algebra, Range and null space, Rank and nullity, Matrix representation of linear transformations, Change of basis. Linear functional, Dual space, Bi-dual space, Natural isomorphism, Annihilators, Bilinear and quadratic forms.

**Books Recommended**

1. A.I. Kostrikin, Introduction to Algebra, Springer Verlag, 1984.
2. S. H. Friedberg, A. L. Insel and L. E. Spence, Linear Algebra, Prentice Hall of India Pvt. Ltd., New Delhi, 2004.
3. Richard Bronson, Theory and Problems of Matrix Operations, Tata McGraw Hill, 1989.
4. Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence, Linear Algebra, 4th Ed., Prentice-Hall of India Pvt. Ltd., New Delhi, 2004.
5. David C. Lay, Linear Algebra and its Applications, 3rd Ed., Pearson Education Asia, Indian Reprint, 2007.
6. S. Lang, Introduction to Linear Algebra, 2nd Ed., Springer, 2005.
7. Gilbert Strang, Linear Algebra and its Applications, Thomson, 2007.

<b>BSP-401</b>	<b>Electronics</b>	<b>4L:1T:0P</b>	<b>4 Credits</b>
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**UNIT - 1****(09Lectures)**

Solid-State devices and their associated circuits: Introduction of Semiconductor and type of semiconductor, P type and N type semiconductor, p-n junction diode, Half-wave rectifier circuits, Full wave rectifier circuits, Voltage Multiplier circuits, Zener diode, Photo-diode, Light emitting diode, and Solar cell. The bi-polar transistor, Base bias, Voltage divider bias, Emitter bias, Collector feedback bias, Thermal runaway and Heat Sink.

**UNIT - 2****(09Lectures)**

Amplifier: Concept of amplifier, the common-base amplifier relation between input and output phase voltages, Gain in common base amplifier, Common-emitter amplifier, Relation between input and output phase voltages, Gain in common emitter Amplifier, Transistor as an Oscillator.

**UNIT - 3****(09Lectures)**

Operational Amplifiers: Introduction, Block diagram of a OP-AMP Schematic Symbol, Ideal OP-Amp with feedback equivalent circuit of an Op-Amp, Inverting Amplifier, Non-Inverting Amplifier, The voltage follower, The summing Amplifier, Subtracting Amplifier, Differential Amplifier, Integrator, differentiator.

**UNIT - 4****(09Lectures)**

Digital Electronics: Introduction, Analog and Digital Signals, Binary Number System, Counting in Decimal and Binary Systems, Place value Decimal to Binary conversion, Binary to Decimal conversion, Binary addition, Subtraction Multiplication, Hexadecimal Number System, Logic Gates, with Boolean expression, Combination of Basic Logic Gates, Universal Gate, Encoders and Decoders, Boolean Algebra and Boolean Theorems, De Morgan's Theorems, Octal Number System.

**UNIT - 5****(09Lectures)**

Electronic Instruments and communication systems: Introduction, Voltmeters, Digital Voltmeters, Digital Multimeters, Applications of Multimeter, Cathode Ray Oscilloscope, Application of CRO, Principles of Communication, Transmitter, Receiver Satellite Communication (Introductory) (10).

Text and Reference Books

1. Principle of electronics by V K Mehto (S. Chand).
2. OP-AMPS and Linear inteoxated circuit by pub PHI.
3. Electronics by Gupta & Kumar (Gayakwad Praoati Prakashan).
4. Transistor Physics and Circuit Design by DC Sarkar, S Chand & Co (P) Ltd.
5. Electronic Devices and Circuit Theory by Robert Boylestad, Lovis Nashelsky, pub : (PHI).

<b>BSP-402</b>	<b>Electromagnetic Theory</b>	<b>3L:0T:0P</b>	<b>3 Credits</b>
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**UNIT – I****(09 Lectures)**

Maxwell's Equations: Maxwell Equations, Displacement Current, Vector and Scalar Potentials, Gauge Transformations: Lorentz and Coulomb Gauge, Boundary Conditions at Interface between Different Media, Wave Equations, Plane Waves in Dielectric Media, Poynting Theorem and Poynting Vector, Electromagnetic Energy Density, Physical Concept of Electromagnetic Field.

**UNIT – II****(09 Lectures)**

Reflection and Refraction of Electromagnetic Waves: Reflection and Refraction of a Plane Wave at a Plane Interface between Dielectrics, Fresnel Formulae, Total Internal Reflection, Brewster's Angle, Waves in Conducting Media, Metallic Reflection (Normal Incidence), Skin Depth, Maxwell's Equations in Microscopic Media (Plasma), Characteristic Plasma Frequency, Refractive Index, Conductivity of an Ionized Gas, Propagation of e.m. Waves in Ionosphere.

**UNIT – III****(09 Lectures)**

Polarization of Electromagnetic Waves: Description of Linear, Circular and Elliptical Polarization, Double Refraction, Polarization by Double Refraction, Nicol Prism, Ordinary and Extraordinary Refractive Indices, Production and Detection of Plane, Circularly and Elliptically Polarized Light, Phase Retardation Plates: Quarter-Wave and Half-Wave Plates.

**UNIT – IV****(09 Lectures)**

Rotatory Polarization: Optical Rotation, Biot's Laws for Rotatory Polarization, Fresnel's Theory of Optical Rotation, Calculation of Angle of Rotation, Experimental Verification of Fresnel's Theory, Specific Rotation. Laurent's half-Shadow Polarimeter and Bi-quartz Polarimeter.

**Text and Reference Books**

1. Introduction to Electrodynamics by A.Z.Capri & P.V.Panat.(New Delhi: Narosa Pub.House).
2. Electromagnetics by Joseph A.Edminister 2nd ed.(New Delhi: Tata Mc Graw Hill, 2006).
3. Fundamentals of electromagnetics by M.A.W.Miah.(Tata Mc Graw Hill,1992)
4. Applied electromagnetism By Liang Chi Shen, Jin Au Kong (PWS Pub. Co., 1995)
5. David J. Griffiths, Introduction to Electrodynamics, 3<sup>rd</sup> edition, (Benjamin Cummings 1998).
6. J. D. Jackson, Classical Electrodynamics, 3<sup>rd</sup> edition, (Wiley, New York 1998).
7. M. Lifshitz and L. D. Landau, Classical Theory of Fields (Course of Theoretical Physics), 2<sup>nd</sup> Edition, (Pergamon Pr; 1981).

<b>BSC-401</b>	<b>ORGANIC CHEMISTRY – II</b>	<b>4L:1T:0P</b>	<b>4 Credits</b>
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**UNIT – 1****(09 Lectures)****Alcohols**

Classification and nomenclature. Monohydric alcohols: nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters. Hydrogen bonding. Acidic nature. Dihydric alcohols: nomenclature, methods of formation, chemical reactions of vicinal glycols, oxidative cleavage and pinacol-pinacolone rearrangement. Trihydric alcohols: nomenclature and methods and structure of formation, chemical reaction of glycerol.

**UNIT – 2****(09 Lectures)****Phenols**

Nomenclature, structure and bonding, Preparation of phenols, physical properties and acidic character. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols - electrophilic aromatic substitution, acylation and carboxylation. Mechanisms of Fries rearrangement, Claisen rearrangement and Reimer - Tiemann reaction.

**Ethers and Epoxides**

Nomenclature of ethers and methods of their formation, physical properties, Chemical reactions—cleavage and autoxidation, Ziesel's method. Synthesis of epoxides, Acid and base-catalyzed ring opening of epoxides, orientation of epoxide ring opening reactions of Grignard and organolithium reagents with epoxides.

**UNIT – 3****(09 Lectures)****Aldehydes and Ketones**

Nomenclature and structure of the carbonyl group, Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1, 3-dithianes, synthesis of ketones from nitriles and from carboxylic acids, properties. Benzaldehyde, salicyl aldehyde and Acetophenone.

Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives. Wittig reaction. Mannich reaction, Cannizzaro reaction. Clemmensen and Wolff-Kishner reduction. An introduction to  $\alpha$ ,  $\beta$  unsaturated aldehydes and ketones.

**UNIT – 4****(09 Lectures)****Carboxylic acids**

Nomenclature, structure and bonding, physical properties, acidity of carboxylic acids, Preparation of carboxylic acids. Reactions of carboxylic acids. Hell-Volhard-Zelinsky reaction. Synthesis of acid chlorides, esters and amides. Reduction of carboxylic acids. Mechanism of decarboxylation. Methods of formation and chemical reactions of halo acids. Hydroxy acids: malic, tartaric and citric acids. Benzoic acid, Salicylic acid, Anthranilic acid. Methods of formation and chemical reactions of unsaturated monocarboxylic acids, Acrylic acid, Crotonic acid, cinnamic acid. Dicarboxylic acids: succinic acid, malonic acid and phthalic acid.

**Carboxylic Acid Derivatives**

Structure and nomenclature of acid chlorides, esters, amides (urea) and acid anhydrides. Relative stability of acyl derivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution.

Preparation of carboxylic acid derivatives. Chemical reactions. Mechanisms of esterification and hydrolysis (acidic and basic).

**UNIT - 5****(09 Lectures)****Organic compounds of Nitrogen**

Preparation of nitroalkanes and nitroarenes. Chemical reactions of nitroalkanes. Mechanisms of nucleophilic substitution in nitroarenes and their reductions in acidic, neutral and alkaline media.

Halonitroarenes: reactivity, Structure and nomenclature, physical properties. Separation of a mixture of primary, secondary and tertiary amines. Structural features effecting basicity of amines. Preparation of alkyl and aryl amines (reduction of nitro compounds nitriles), reductive amination of aldehydic and ketonic compounds. Gabriel phthalimide reaction. Hofmann bromamide reaction. Reactions of amines, electrophilic aromatic substitution in aryl & amines, reactions of amines with nitro acid, Synthetic transformations of aryl diazonium salts, azo coupling.

**Text and Reference Books**

1. Organic Chemistry, Morrison and Boyd, Prentice Hall.
2. Organic Chemistry, L.G. Wade jr., Prentice Hall.
3. Fundamentals of Organic Chemistry, Solomons, John-Wiley.
4. Organic Chemistry Vol. I, II & III, S.M. Mukherji, S.P. Singh and R.P. Kapoor, Wiley Eastern Ltd., (New Age International).
5. Organic Chemistry, F.A. Carey, McGraw Hill, Inc.

<b>BSC-402</b>	<b>INORGANIC CHEMISTRY - III</b>	<b>3L:0T:0P</b>	<b>3 Credits</b>
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**UNIT - I (09 Lectures)**

**Chemistry of Lanthanide Elements**

Electronic structure, oxidation states and ionic radii and Lanthanide contraction, complex formation, magnetic properties, separation of lanthanides.

**Chemistry of Actinides Elements**

General features and chemistry of actinides, Actinide contraction, chemistry of extraction of uranium, similarities between the later actinides and the later lanthanides.

**UNIT - II (09 Lectures)**

**Acid and Base:**

Arrhenius, Bronsted and Lowry, Lewis concept of acid and base

**Hard and Soft Acids and Bases (HSAB)**

Classification of acids and bases as hard and soft. Pearson's HSAB concept, acid-base strength and hardness and softness. Symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness.

**UNIT - III (09 Lectures)**

**Non aqueous solvents**

Physical properties of a solvent, types of solvents and their general characteristics, reactions in non - aqueous solvents with reference to liquid NH<sub>3</sub> and liquid SO<sub>2</sub>

**UNIT - IV (09 Lectures)**

**Radioactivity**

Disintegration theory, Group displacement law, rate of disintegration, Half life period, Average life period, Disintegration series, Radioactive equilibrium, Artificial radioactivity, Types of nuclear reactions, Nuclear fission and fusion, Applications of radioactivity.

**Text and Reference Books**

1. Basic Inorganic Chemistry, F.A. Cotton, G. Wilkinson and P.L. Gaus, Wiley.
2. Concise Inorganic Chemistry, J.D. Lee, ELBS.
3. Concepts of Models of Inorganic Chemistry, B. Douglas, D. McDaniel and J. Alexander, John Wiley.
4. Inorganic Chemistry, D.E. Shriver, P.W. Atkins and C.H. Langford, Oxford.
5. Inorganic Chemistry, W.W. Porterfield, Addison-Wesley.
6. Inorganic Chemistry, A.G. Sharpe, ELBS.

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<b>BSP-444</b>	<b>Electronics Devices &amp; Circuit Theory Lab</b>	<b>0L:0T:2P</b>	<b>2 Credits</b>
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**Note: Select any ten experiments from the following list:**

1. To verify the Thevenin, Norton, Superposition, and Maximum Power Transfer Theorem.
2. To measure the Input and Output Impedance of an Unknown Network and to convert it into Equivalent T and  $\pi$  Circuits.
3. To study (a) Half-wave Rectifier and (b) Full-wave Bridge Rectifier and investigate the effect of C, L and  $\pi$  filters.
4. To design a Semiconductor Power Supply of given rating using (a) Half wave, (b) Full wave or (c) Bridge rectifier and investigate the effect of C-filter.
5. To study the Forward and Reverse characteristics of a Zener Diode and to study its use as a Voltage Regulator.
6. To investigate simple regulation and stabilization circuits using Voltage Regulator ICs.
7. To determine the Characteristics of p-n junction of a Solar Cell.
8. To study the logic gate circuit with truth table.
9. To verify high gain audio amplifier 1213.
10. To study the CE Characteristics of a Transistor.
11. To study the various Transistor Biasing Configurations.
12. To design a CE Amplifier of a given gain (mid-gain) using Voltage Divider Bias.
13. To study the Frequency Response of Voltage Gain of a RC-Coupled Amplifier.
14. To design an Oscillator of given specifications using Transistors.



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BSC-444	CHEMISTRY LAB- IV	0L:0T:2P	2 Credits
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**Note: Select any ten experiments from the following list:**

1. Detection of extra elements (N, S and halogens) and functional groups (phenolic, carboxylic, carbonyl, esters, carbohydrates, amines, amides, nitro and anilide) in simple organic compounds.
2. Functional group tests for alcohols, phenols, carbonyl and carboxylic acid group.
3. Organic preparations:
  - (i) Acetylation of one of the following compounds: amines (aniline, o-, m-, p- toluidines and o-, m-, p-anisidine) and phenols ( $\beta$ -naphthol, vanillin, salicylic acid) by any one method:
    - a. Using conventional method.
    - b. Using green approach
      - ii. Benzoylation of one of the following amines (aniline, o-, m-, p- toluidines and o-,m-, p- anisidine) and one of the following phenols ( $\beta$ -naphthol, resorcinol, p-cresol) by Schotten-Baumann reaction.
      - iii. Oxidation of ethanol/ isopropanol (Iodoform reaction).
      - iv. Selective reduction of m-dinitrobenzene to m-nitroaniline.
      - v. Hydrolysis of amides and esters.
      - vi. Semicarbazone of any one of the following compounds: acetone, ethyl methyl ketone, cyclohexanone, benzaldehyde.
      - vii. S-Benzylisothiuronium salt of one each of water soluble and water insoluble acids (benzoic acid, oxalic acid, phenyl acetic acid and phthalic acid).
      - viii. Aldol condensation using either conventional or green method.