Study & Evaluation Scheme

of

Bachelor of Science (Hons.) (Chemistry)

[Applicable for Academic Session 2018-19]

[Approved by Hon'ble VC dated August 08, 2017]

[With revision approved by VC date July 23, 2018, August 14, 2018, January 23, 2019 & November 29, 2019]

TEERTHANKER MAHAVEER UNIVERSITY

N.H.-24, Delhi Road, Moradabad, Uttar Pradesh-244001

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TEERHANKER MAHAVEER UNIVERSITY

(Established under Govt. of U. P. Act No. 30, 2008)
Delhi Road, Bagarpur, Moradabad (U.P)

Study & Evaluation Scheme
Bachelor of Science (Hons.)
SUMMARY

Programme	:	B.Sc. (Hons.) – Chemistry
Duration	:	Three-year full time (Six Semesters)
Medium	:	English
Minimum Required Attendance	:	75 %
Credit	:	
Maximum Credit	:	144
Minimum credit required for the degree	:	140

Assessment :

Internal	External	Total
40	60	100

Internal Evaluation (Theory Papers) :

Class Test I	Class Test II	Class Test III	Assignment(s)	Attendance	Total
Best two out of three					
10 Marks	10 Marks	10 Marks	10 Marks	10 Marks	40 Marks

Evaluation of Practical :

Internal	External	Total
50	50	100

Evaluation of Seminar/Viva :

Internal	External	Total
50	50	100

Duration of Examination :

External	Internal
3 hrs.	$1\frac{1}{2}$ hrs

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

Question Paper Structure

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

Note 1:

Evaluation Scheme for MOOC, Short Term Courses:

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

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

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

1. There shall be a MOOC co-ordination committee in the College with a faculty at the level of Professor heading the committee and all Heads of the Department being members of the Committee.
2. The Committee will list out courses to be offered during the semester, which could be requested by the department or the students and after deliberating on all courses finalise a list of courses to be offered with credits defined for each course and the mode of credit consideration of the student. The complete process including the approval of the Vice Chancellor shall be obtained by the College before end of June and end of December for Odd and Even semester respectively of the year in which the course is being offered. In case of MOOC course the approval will be valid only for the semester on offer.
3. A student can opt for a maximum of two MOOC courses for credit during the complete duration of the course other than offered under SWAYAM.
4. College can offer upto 20% credit through courses offered by SWAYAM. However, if the college is offering courses on other MOOC platforms, the total credit offered under MOOC will not exceed 20% including those offered under SWAYAM.
5. Students will register for the course and the details of the students enrolling under the course along with the approval of the Vice Chancellor will be forwarded to the Examination department within fifteen days of start of the semester by the Co-ordinator MOOC through the Principal of the College.

6. Where the MOOC course or Add-on on courses are only offering certificate of successful completion, and credit has been assigned to the course, the University examination division will conduct a MCQ examination for the course with 50 MCQ with 100 marks to facilitate inclusion of the courses in CPI computation.
7. College will define whether the credits are regular credits or to be considered only in case a student fails to secure minimum required credits then the additional subject(s) shall be counted for calculating the minimum credits required for the award of degree.
8. In case the College wants the additional course to be shown in the mark sheet as additional course completed by the students the same shall also be mentioned by the College and the student will opt for the same at the time of taking admission to the course.

Study & Evaluation Scheme

Semester I

S. No.	Subject Code	Subject	Periods			Credit	Evaluation Scheme		
			L	T	P		Internal	External	Total
1	BAS111	Inorganic Chemistry-I	4	-	-	4	40	60	100
2	BAS112	Physical Chemistry-I	4	-	-	4	40	60	100
3	BAS113	Elementary mathematics	2	1		3	40	60	100
4	BAS114/ BAS213	Mechanics	4	-	-	4	40	60	100
5	BHM199/ EHM199	English Communication & Soft Skill-I	1	1	2	2	50	50	100
6	BAS164	Inorganic Chemistry-I (Lab)	-	-	3	2	50	50	100
7	BAS165	Physical Chemistry-I (Lab)	-	-	3	2	50	50	100
8	**BAS166/ BAS267**	**Mechanics (Lab)**	-	-	3	2	50	50	100
9	BGP111	Discipline & General Proficiency	-	-	-	-	100	-	100
	Total		**15**	**2**	**11**	**23**	**460**	**440**	**900**

Semester II

S. No.	Subject Code	Subject	Periods			Credit	Evaluation Scheme		
			L	T	P		Internal	External	Total
1	BAS211	Organic Chemistry-I	4	-	-	4	40	60	100
2	BAS212	Physical Chemistry-II	4	-	-	4	40	60	100
3	BAS220	Waves & optics	4	-	-	4	40	60	100
4	TMU201	Environmental Studies	1	2	-	2	40	60	100
5	BHM249/ EHM249	English Communication & Soft Skill-II	1	1	2	2	40	60	100
6	BAS264	Organic Chemistry-I (Lab)	-	-	3	2	50	50	100
7	BAS265	Physical Chemistry-II (Lab)	-	-	3	2	50	50	100
8	**BAS266**	**Waves & Optics (Lab)**	-	-	3	2	50	50	100
9	BGP211	Discipline & General Proficiency	-	-	-	-	100	-	100
	Total		**14**	**3**	**11**	**22**	**450**	**450**	**900**

Semester III

S. No.	*Subject Code*	*Subject*	*Periods*			*Credit*	*Evaluation Scheme*		
			L	*T*	*P*		*Internal*	*External*	*Total*
1	BAS311	Inorganic Chemistry-II	4	-	-	4	40	60	100
2	BAS312	Organic Chemistry-II	4	-	-	4	40	60	100
3	BAS313	Physical Chemistry-III	4	-	-	4	40	60	100
4	BAS314	Elements of Modern Physics	4	-	-	4	40	60	100
5	BHM349/ EHM349/449	English Communication & Soft Skill-III	1	1	2	2	40	60	100
6	BAS361	Inorganic Chemistry-II (Lab)	-	-	3	2	50	50	100
7	BAS362	Organic Chemistry-II (Lab)	-	-	3	2	50	50	100
8	BAS363	Physical Chemistry-III (Lab)	-	-	3	2	50	50	100
9	BGP311	Discipline & General Proficiency	**-**	**-**	**-**	1	100	-	100
	Total		**17**	**1**	**11**	**25**	**450**	**450**	**900**

Semester IV

S. No.	*Subject Code*	*Subject*	*Periods*			*Credit*	*Evaluation Scheme*		
			L	***T***	***P***		***Internal***	***External***	***Total***
1	BAS419	Inorganic Chemistry-III	4	-	-	4	40	60	100
2	BAS412	Organic Chemistry-III	4	-	-	4	40	60	100
3	BAS413	Physical Chemistry-IV	4	-	-	4	40	60	100
4	**BAS466**	**Computer Skills for Chemist Lab**	-	-	4	2	50	50	100
5	BHM499/ EHM599/699	English Communication & Soft Skill-IV	1	1	2	2	50	50	100
6	BAS461	Inorganic Chemistry-III (Lab)	-	-	3	2	50	50	100
7	BAS462	Organic Chemistry-III (Lab)	-	-	3	2	50	50	100
8	BAS465	Physical Chemistry-IV (Lab)	-	-	3	2	50	50	100
9	MOOC12	MOOC Program-I (Mandatory)	-	-	-	1/2	-	100	100
10	BGP411	Discipline & General Proficiency	-	-	-	1	100	-	100
	Total		**13**	**1**	**15**	**24/25**	**470**	**530**	**1000**

Semester V

S. No.	*Subject Code*	*Subject*	*Periods*			*Credit*	*Evaluation Scheme*		
			L	*T*	*P*		*Internal*	*External*	*Total*
1	BAS525	Organic Chemistry-IV	4	-	-	4	40	60	100
2	BAS526	Physical Chemistry-V	4	-	-	4	40	60	100
3	BAS527	Analytical Chemistry	4	-	-	4	40	60	100
4	BAS528	Polymer Chemistry	4	-	-	4	40	60	100
5	BAS561	Organic Chemistry-IV (Lab)	-	-	3	2	50	50	100
6	BAS562	Physical Chemistry-V (Lab)	-	-	3	2	50	50	100
7	BAS563	Analytical Chemistry (Lab)	-	-	3	2	50	50	100
8	BAS564	Polymer Chemistry (Lab)	-	-	3	2	50	50	100
9	MOOC22	MOOC Program-II (Optional)	-	-	-	1/ 2	-	100	100
10	BGP511	Discipline & General Proficiency	-	-	-	1	100	-	100
	Total		**16**	**-**	**12**	**25**	**460**	**440**	**1000**

Semester VI

S. No.	*Subject Code*	*Subject*	*Periods*			*Credit*	*Evaluation Scheme*		
			L	***T***	***P***		***Internal***	***External***	***Total***
1	BAS624	Inorganic Chemistry-IV	4	-	-	4	40	60	100
2	BAS625	Organic Chemistry-V	4	-	-	4	40	60	100
3	**BAS626**	**Green Chemistry**	4	-	-	4	40	60	100
4	**Open Elective**								
	BAS011	Introduction to Statistical Package for Social Sciences	3	-	-	3	40	60	100
	BAS012	Industrial Chemistry							
	BAS013	Introduction to Nano Science and Technology							
5	BAS661	Inorganic Chemistry-IV (Lab)	-	-	3	2	50	50	100
6	BAS662	Organic Chemistry-V (Lab)	-	-	3	2	50	50	100
7	BAS663	Green chemistry (Lab)	-	-	3	2	50	50	100
8	BAS698	Seminar, Viva & Presentation	-	-	4	2	50	50	100
9	BGP611	Discipline & General Proficiency	**-**	**-**	**-**	1	100	-	100
	Total		**15**	**-**	**13**	**24**	**460**	**440**	**900**

Semester-I
Inorganic Chemistry-I

Course Code: BAS111

L	T	P	C
4	0	0	4

Objective:

The students are able to learn about atomic theories, periodicity of elements & chemical bonding.

UNIT I **(Lectures 08)**

Atomic Structure:

Schrödinger's wave equation, significance of ψ and ψ^2. Quantum numbers and their significance. Normalized and orthogonal wave functions. Sign of wave functions. Radial and angular wave functions for hydrogen atom. Radial and angular distribution curves. Shapes of s, p, d and f orbitals.

Pauli's Exclusion Principle, Hund's rule of maximum multiplicity, Aufbau's principle and its limitations.

UNIT II **(Lectures 08)**

Periodicity of Elements:

Effective nuclear charge, shielding or screening effect, Atomic& ionic radii, Ionization enthalpy, Successive ionization enthalpies and factors affecting ionization energy. Applications of ionization enthalpy, Electron gain enthalpy, Electronegativity, trends in periodic table and applications in predicting and explaining the chemical behavior.

UNIT III **(Lectures 08)**

Chemical Bonding - I:

Covalent bond: Valence Bond theory& its limitations. Hybridization& shapes of simple inorganic molecules & ions, Valence shell electron pair repulsion theory (VSEPR), shapes of simple molecules and ions containing lone pairs and bond pairs of electrons, Resonance and resonance energy, Molecular orbital theory & MO diagrams of Homo & heteronuclear (CO, NO) diatomic molecules.

UNIT IV **(Lectures 08)**

Chemical Bonding - II:

Ionic Solids: Covalent character in ionic compounds, polarizing power and polarizability. Fajan's rules and consequences of polarization. Ionic character in covalent compounds: Bond moment and dipole moment. Percentage ionic character from dipole moment and electronegativity difference Ionic structures, radius ratio effect and coordination number, limitation of radius ratio rule, lattice energy and Born-Haber cycle, salvation energy and solubility of ionic solid.

UNIT V **(Lectures 08)**

Metallic bond-free electron, Semiconductors & insulators, valence bond and band theories Weak Chemical Forces: van der Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interactions, Instantaneous dipole-induced dipole interactions. Repulsive forces, Hydrogen bonding, Effects of chemical force, melting and boiling points, solubility & energetics of dissolution process.

Oxidation-Reduction: Redox equations, Standard Electrode Potential and its application to inorganic reactions.

Text & Reference Books:

1. Lee, J.D. Concise Inorganic Chemistry ELBS.
2. Atkins, P.W. & Paula, J. Physical Chemistry, Oxford University Press.
3. Rodger, G.E. Inorganic and Solid-State Chemistry, Cengage Learning India Edition.

*** Latest editions of all the suggested books are recommended**

Semester-I
Physical Chemistry-I

Course Code: BAS112

L	T	P	C
4	0	0	4

Objective: Gaseous state has been studied taking ideal gas equation & modification of the ideal gas equation. Liquefaction of gases and critical temp, pressure & volumes enhances the interest of the student.

Course Contents:

Unit I **(Lectures 08)**

Gaseous state:

Postulates and derivation of the kinetic gas equation; collision frequency; collision diameter; mean free path, including their temperature and pressure dependence.

Behavior of real gases: Deviations from ideal gas behavior, compressibility factor, Z, Causes of deviation from ideal behavior. Vander Waals equation of state, its derivation and application in explaining real gas behavior, virial equation of state; van der Waals equation expressed in virial form and calculation of Boyle temperature.

Unit II **(Lectures 08)**

Liquid state:

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

Unit III **(Lectures 08)**

Solid state:

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

Unit IV **(Lectures 08)**

Ionic equilibria I:

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

Unit V **(Lectures 08)**

Ionic equilibria II:

Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different

salts. Buffer solutions; derivation of Henderson equation and its applications; buffer capacity, buffer range, buffer action and applications of buffers.
Solubility and solubility product of sparingly soluble salts – applications of solubility product principle
Theory of acid–base indicators; selection of indicators and their limitations.

Text & Reference Books:

- Atkins, P. W. & Paula, J. de Atkin's Physical Chemistry, Oxford universityPress.
- Castellan, G. W. Physical Chemistry, Narosa.
- Mortimer, R. G. Physical Chemistry, Elsevier:
- Engel, T. & Reid, P. Physical Chemistry, Pearson.

*** Latest editions of all the suggested books are recommended**

Semester-I
Elementary Mathematics

Course Code: BAS113 **L T P C**
2 1 0 3

Course Contents:

Unit – I **(Lectures 08)**

Statistics: Meaning of statistics, uses & applications of statistics, classification of data: primary & secondary data, Measures of central tendency: Mean, Median, Mode. Measures of variation-Range, Inter Quartile range, quartile deviations, Mean deviation & standard deviation.

Unit – II **(Lectures 08)**

Probability: Introduction of Probability, Types of probability, dependent & independent events, Addition law of probability & multiplication law of probability.

Unit – III **(Lectures 08)**

Differential and Integral Calculus: Introduction of differentiation, Product rules, Differentiation by first principal, Integration by substitution, Integration of Algebraic, trigonometric, logarithmic, exponential function, Integration by partial fraction. Limit & Continuity.

Unit – IV **(Lectures 08)**

Matrix: Definition of matrix, type of matrix, addition &subtraction, Multiplication, inverse of matrix. Solution of system of algebraic equation, Crammer's rule.

Unit – V **(Lectures 08)**

Vector Calculus: Representation of vectors, Vector addition, multiplication & properties, Triple vector products.

Text & Reference Books:

1. Mathematics for Physical Chemistry DONALD A. MCQUARRIE, University Science Books, 2008

*** Latest editions of all the suggested books are recommended**

Semester-I
Mechanics

Course Code: BAS114/BAS213

L	T	P	C
4	0	0	4

Objective: To understand the fundamentals of physics like Linear Momentum, Rotational Dynamics, Motion under Central Forces, Properties of Matter etc.

Course Contents:

Unit – I **(Lectures 08)**

Rotational Dynamics: Centre of Mass and Laboratory frames. Angular momentum of a particle and system of particles. Torque. Principle of conservation of angular momentum. Rotation about a fixed axis. Moment of Inertia. Calculation of moment of inertia for rectangular, cylindrical and spherical bodies. Kinetic energy of rotation, Motion involving both translation and rotation.

Unit – II **(Lectures 08)**

Fluid Motion: Kinematics of Moving Fluids: Poiseuille's Equation for Flow of a Liquid through a Capillary Tube.

Gravitation and Central Force Motion: Law of gravitation. Gravitational potential energy. Inertial and gravitational mass. Potential and field due to spherical shell and solid sphere.

Non-Inertial Systems: Non-inertial frames and fictitious forces. Uniformly rotating frame. Centrifugal force. Coriolis force.

Unit – III **(Lectures 08)**

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

Central Forces: Motion of a particle under a central force field. Two-body problem and its reduction to one-body problem and its solution. Kepler's Laws. Satellite in circular orbit and applications. Geosynchronous orbits. Weightlessness. Basic idea of global positioning system (GPS).

Unit – IV **(Lectures 08)**

Oscillations: SHM: Simple Harmonic Oscillations. Differential equation of SHM and its solution. Kinetic energy, potential energy, total energy and their time-average values. Damped oscillation. Forced oscillations: Transient and steady states; Resonance, sharpness of resonance; power dissipation and Quality Factor.

Unit – V **(Lectures 08)**

Special Theory of Relativity: Michelson-Morley Experiment and its outcome. Postulates of Special Theory of Relativity. Massless Particles. Lorentz Transformations: Simultaneity, Length contraction, Time dilation, Twin Paradox, Relativistic addition of velocities, Variation of mass with velocity. Mass energy Equivalence.

Text & Reference Books:

1. An introduction to mechanics, D. Kleppner, R. J. Kolenkow, McGraw-Hill.
2. Mechanics, Berkeley Physics, C.Kittel, W.Knight, Tata McGraw-Hill. Physics, Resnick, Halliday and Walker, Wiley.
3. Analytical Mechanics, G.R. Fowles and G.L. Cassiday, Cengage Learning.
4. Feynman Lectures, Vol. I, R. P. Feynman, R. B. Leighton, M. Sands, Pearson Education.
5. Introduction to Special Relativity, R. Resnick, John Wiley and Sons. University Physics, Ronald Lane Reese, Thomson Brooks/Cole.
6. Mechanics, D.S. Mathur, S. Chand and Company Limited, University Physics.
7. J.W. Jewett, R.A. Serway, Cengage Learning Theoretical Mechanics, M.R. Spiegel, Tata McGraw Hill.

*** Latest editions of all the suggested books are recommended**

Semester I
English Communication and Soft Skills – I

[BHM199/EHM199 amended vide approval dt. July 23, 2018 of V.C]

Course Code: BHM199/EHM199

L	T	P	C
1	1	2	2

Objectives:

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

Course Contents:

Unit – I Fear of Failure, Reasons of Fear of Failure & How to overcome it (12 hours)

- Self-Introduction
- Identifying strengths and weakness
- Fear of Failure: Signs of Fear of Failure, Reasons of Fear of Failure, Strategies to overcome Fear of Failure
- Positive Attitude
- Motivation
- Building Self Confidence

Unit – II Confidence, Presentability, Etiquettes & Manners (10 hours)

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

Unit – III Conversation Practice, commonly made mistake & Initiating a conversation (10 hours)

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

Unit – IV Application writing (08 hours)

- Format & Style of Application Writing
- Practice of Application writing on common issues.

Reference Books:

- Mitra, Barun. K. "*Personality Development and Soft skills*" New Delhi: Oxford University Press.
- Kumar, Sanjay. &Pushp Lata. "*Communication Skills"* New Delhi: Oxford University Press.
- Carnegie Dale. "*How to win Friends and Influence People*" New York: Simon & Schuster.
- Harris, Thomas. A. "*I am ok, You are ok*" New York: Harper and Row.
- Coleman, Daniel. "*Emotional Intelligence*" Bantam Book.

Methodology:

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

Note:

- 2 words per class will be taught with meaning, usage & correct pronunciation to ensure progressive learning in sentence formation.
- ***Suggested words are*** : *Abbreviation, Abide, Arbitrary, Assertive, Bran, Chaotic, Coma, Commanding, Communicate, Competent, Confront, Conventional, Convince, Cruel, Demise, Descriptive, Despondent, Determine , Dictatorial, Empathize, Etiquette, Examine, Fierce, Flakes, Gullible, Hostility, Idleness, Immature, Insanity, Insensible, Intent, Isolate, Lad, Lurk, Naïve, Phrase, Preliminary, Realm, Retract ,Sarcasm, Satisfied, Talkative, Typically, Wit , Rectify, Candid, Embellish, Iterate, Netizen, Effigy*
- Class (above 30 students) will be divided in to two groups for effective teaching.
- For effective conversation practice, groups will be changed weekly.

Evaluation Scheme

Internal Evaluation		External Evaluation		Total Marks
50 Marks		50 Marks		100
40 Marks (Progressive Evaluation) After each unit-completion: Assignments /Oral Presentation	10 Marks (Attendance)	25 Marks Midway external assessment (Viva)*	25 Marks (External Viva)**	

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

*Parameters of Midway external assessment (Viva)

Content	Dressing sense & Grooming	Confidence	Pronunciation	Question responsiveness	TOTAL
05 Marks	05 Marks	05 Marks	05 Marks	05 Marks	25 Marks

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

**Parameters of External Viva

Content	Dressing sense & Grooming	Confidence	Pronunciation	Question responsiveness	TOTAL
05 Marks	05 Marks	05 Marks	05 Marks	05 Marks	25 Marks

***Note**: External Viva will be conducted by 3-member committee comprising*

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

Each member will evaluate on a scale of 25 marks and the average of three would be the 25 marks obtained by the students.

Semester-I
Inorganic Chemistry-I (Lab)

Course Code: BAS164

L	T	P	C
0	0	3	2

Objective:

The course content consists of volumetric analysis of acid base titration & oxidation-reduction titration.

(A) Titrimetric Analysis

1. Calibration and use of apparatus
2. Preparation of solutions of different Molarity/Normality of titrants

(B) Acid-Base Titrations

3. Estimation of carbonate and hydroxide present together in mixture.
4. Estimation of carbonate and bicarbonate present together in a mixture.
5. Estimation of free alkali present in different soaps/detergents

(c)Oxidation-Reduction Titrimetry

6. Estimation of Fe(II) and oxalic acid using standardized KMnO4 solution.
7. Estimation of oxalic acid and sodium oxalate in a given mixture.
8. Estimation of Fe(II) with $K_2Cr_2O_7$ using internal (diphenylamine, anthranilic acid) and external indicator.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

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

Evaluation scheme:

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

External Evaluation (50 marks)

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

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

Semester-I
Physical Chemistry-I (Lab)

Course Code: BAS165

L	T	P	C
0	0	3	2

Objective:
This Lab includes experiments based on determination of viscosity, Surface tension & pH determination of solute & solvents.

(A) Surface tension measurements.

1. Determine the surface tension by (i) drop number (ii) drop weight method.

(B) Viscosity measurement using Ostwald's viscometer.

2. Determination of viscosity of aqueous solutions of (i) ethanol and (ii) sugar at room temperature.
3. Study the variation of viscosity of sucrose solution with the concentration of solute.

(C) pH metry

4. Study the effect on pH of addition of HCl/NaOH to solutions of acetic acid, sodium acetate and their mixtures.
5. Preparation of buffer solutions of different pH
- Sodium acetate-acetic acid
- Ammonium chloride-ammonium hydroxide

6. pH metric titration of
- strong acid vs. strong base,
- weak acid vs. strong base.

Text & Reference Books:

1. Khosla, B. D.; Garg, V. C. & Gulati, A. Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi.
2. Garland, C. W.; Nibler, J. W. & Shoemaker, D. P. Experiments in Physical Chemistry; McGraw-Hill: New York.
3. Halpern, A. M. & Mc Bane, G. C. Experimental Physical Chemistry; W.H. Freeman & Co.: New York.

*** Latest editions of all the suggested books are recommended**

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

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

Evaluation scheme:

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

External Evaluation (50 marks)

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

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

Semester-I
Mechanics (Lab)

[BAS166/BAS267 amended vide approval dt. July 23, 2018 of V.C]

Course Code: BAS166/BAS267

L	T	P	C
0	0	3	2

List of Experiments:

Note: Select any ten experiments from the following list.

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

Following experiments are added in session 2018-19:

13. To determine Modulus of Rigidity by using Torsion pendulum.
14. To determine Young's Modulus in case of Cantilever using Pin and Microscope.
15. To determine the frequency of A.C. mains by means of a sonometer.

Text & Reference Books:

1. Advanced Practical Physics for students, B. L. Flint and H.T. Worsnop, Asia Publishing House
2. B.Sc. Practical Physics, C. L. Arora, S. Chand Publishing.
3. B.Sc. Practical Physics, H. Singh & P.S. Hemne, S. Chand Publishing.
4. Engineering Practical Physics, S. Panigrahi & B. Mallick, Cengage Learning India Pvt. Ltd.
5. Practical Physics, G.L. Squires, Cambridge University Press.

*** Latest editions of all the suggested books are recommended**

Evaluation Scheme of Practical Examination:
Internal Evaluation (50 marks)

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

Evaluation scheme:

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

External Evaluation (50 marks)

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

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

Semester I
DISCIPLINE & GENERAL PROFICIENCY

Course Code: BGP111

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

1. Observance of dress code.

2. Participation in Conferences /Workshops / Seminars.

3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

4. Participation in community projects including NSS.

5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

8. General behavior

9. Any extraordinary achievement.

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

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

S No		Enroll No.	Student Name	Dress code	Participation in Conferences /Workshops / Seminars	Participation in guest lectures, invited talks and special technical sessions	Participation in community Services	Participation in Culture & extra curriculum activities, Department Club Activities	Participation in sports/ co-curricular activities	General Behavior	Any Extra Achievement
				(5)	**(15)**	**(20)**	**(10)**	**(20)**	**(20)**	**(5)**	**(5)**
	Responsible for marks			Mentor	Head	Head	Mentor	Cultural Events Coordinator & Department Club Coordinator	Sports Coordinator	Mentor	Director or Principal

Semester-II
Organic Chemistry-I

Course Code: BAS211

L	T	P	C
4	0	0	4

Objective:

It consists of preparation, properties & structure & mechanism of haloalkanes, alcohols, phenols, ether, and epoxides. The name reactions have been taught to the students to clear the concept of reaction mechanism. Carbonyl compounds are of great interest as they show zero oxidation states of metal. Mechanism of named reactions for examples Perkin, canizzaro has been studied. Carboxylic acid & their derivatives have been prepared.

Course Contents:

Unit – I **(08 Lectures)**

Basics of Organic Chemistry I:

Organic Compounds: Classification, and Nomenclature, Hybridization, Shapes of molecules, Influence of hybridization on bond properties.

Electronic Displacements: Inductive, electrometric, resonance and mesmeric effects, hyperconjugation and their applications; Dipole moment; Organic acids and bases; their relative strength.

Unit –II **(08 Lectures)**

Basics of Organic Chemistry II:

Hemolytic and Heterolytic fission. Curly arrow rules, formal charges; Electrophiles and Nucleophiles; Nucleophilicity and basicity; Types, shape and their relative stability of Carbocations, Carbanions, Free radicals and Carbenes.

Introduction to types of organic reactions and their mechanism: Addition, Elimination and Substitution reactions.

Chemistry of alkanes: Formation of alkanes, Wurtz Reaction, Wurtz-Fittig Reactions, Free radical substitutions: Halogenation -relative reactivity and selectivity.

Unit – III **(08 Lectures)**

Chemistry of Carbon-Carbon pi bonds:

Formation of alkenes and alkynes by elimination reactions, Mechanism of E1, E2, E1cb reactions. Saytzeff and Hofmann eliminations.

Reactions of alkenes: Electrophilic additions their mechanisms (Markownik off/ Anti-Markownik off addition), hydroboration-oxidation, ozonolysis, reduction (catalytic and chemical). 1,2-and 1,4-addition reactions in conjugated dienes and, Diels-Alder reaction; Allylic brominating and mechanism, e.g. propene, 1-butene.

Reactions of alkynes: Acidity, Electrophilic and Nucleophilic additions. Hydration to form carbonyl compounds, Alkylation of terminal alkynes.

Unit – IV **(08 Lectures)**

Stereochemistry:

Fischer Projection, Newman and Sawhorse Projection formulae and their interconversions; Geometrical isomerism: cis–trans and, syn-anti isomerism E/Z notations with C.I.P rules.

Optical Isomerism: Optical Activity, Specific Rotation, Chirality/Asymmetry, Enantiomers, Molecules with two or more chiral-centers, Di-stereoisomers, meso structures, Racemic mixture and resolution. Relative and absolute configuration: D/L and R/S designations.

Unit – V **(08 Lectures)**

Aromatic Hydrocarbons:

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

Text & Text & Text & Reference Books:

1. Morrison, R. N. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Finar, I. L. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
3. Finar, I. L. Organic Chemistry (Stereochemistry and the Chemistry of Natural Products), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
4. Kalsi, P. S. Stereochemistry Conformation and Mechanism, New Age International.
5. McMurry, J.E. Fundamentals of Organic Chemistry, Cengage Learning India Edition.

*** Latest editions of all the suggested books are recommended**

Semester-II
Physical Chemistry-II

Course Code: BAS212 **L T P C**
4 0 0 4

Objective:

This includes all the fundamental concepts related with the chemical thermodynamics along with its applications in various areas.

Course Contents:

Unit-I **(8 Lectures)**

Chemical Thermodynamics-I:

Intensive and extensive variables; state and path functions; isolated, closed and open systems; zeroth law of thermodynamics.

First law: Concept of heat, q, work, w, internal energy, U, and statement of first law; enthalpy, H, relation between heat capacities, calculations of q, w, U and H for reversible, irreversible and free expansion of gases (ideal and van der Waals) under isothermal and adiabatic conditions.

Unit-II **(8 Lectures)**

Chemical Thermodynamics-II:

Second Law: Concept of entropy; thermodynamic scale of temperature, statement of the second law of thermodynamics; Calculation of entropy change for reversible and irreversible processes.

Free Energy Functions: Gibbs and Helmholtz energy; variation of S, G, A with T, V, P; Free energy change and spontaneity. Relation between Joule-Thomson coefficient and other thermodynamic parameters; inversion temperature; Gibbs-Helmholtz equation; Maxwell relations; thermodynamic equation of state.

Third Law: Statement of third law, concept of residual entropy, calculation of absolute entropy of molecules

Unit-III **(8 Lectures)**

Thermochemistry and Systems of Variable Composition:

Thermochemistry: Heats of reactions: standard states; enthalpy of formation of molecules and ions and enthalpy of combustion and its applications; calculation of bond energy, bond dissociation energy, effect of temperature (Kirchhoff's equations) and pressure on enthalpy of reactions.

Partial molar quantities, Gibbs-Duhem equation, chemical potential of ideal mixtures, change in thermodynamic functions in mixing of ideal gases.

Unit-IV **(8 Lectures)**

Chemical Equilibrium:

Criteria of thermodynamic equilibrium, chemical equilibria in ideal gases. Thermodynamic derivation of relation between Gibbs free energy of reaction and reaction quotient. Equilibrium constants and their quantitative dependence on temperature, pressure and concentration. Free energy of mixing and spontaneity; thermodynamic derivation of relations between the various equilibrium constants Kp, Kc and Kx. Le Chatelier principle.

Unit-V **(8 Lectures)**

Solutions and Colligative Properties:

Dilute solutions; lowering of vapour pressure, Raoult's and Henry's Laws and their applications. Excess thermodynamic functions.

Thermodynamic derivation using chemical potential to derive relations between the four colligative properties [(i) relative lowering of vapour pressure, (ii) elevation of boiling point, (iii) Depression of freezing point, (iv) osmotic pressure].

Text & Reference Books:

1. Castellan, G. W. Physical Chemistry, Narosa.
2. McQuarrie, D. A. & Simon, J. D. Molecular Thermodynamics Viva Books Pvt. Ltd.: New Delhi.
3. Levine, I. N. Physical Chemistry 6th Ed., Tata Mc Graw Hill.
4. Metz, C.R. 2000 solved problems in chemistry, Schaum Series.

*** Latest editions of all the suggested books are recommended**

Semester-II
Waves & optics

Course Code: BAS220

L	T	P	C
4	0	0	4

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

Course Contents:

Unit-I **(8 Lectures)**

Geometrical optics: Fermat's principle, reflection and refraction at plane interface, Application to thick lenses, Ramsden and Huygens eyepiece.

Wave Motion: Plane and Spherical Waves. Longitudinal and Transverse Waves, Plane Progressive (Travelling) Waves. Wave Equation. Particle and Wave Velocities. Differential Equation. Pressure of a Longitudinal Wave. Energy Transport. Intensity of Wave.

Unit-II **(8 Lectures)**

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

Interference: Division of amplitude and wavefront. Young's double slit experiment, Fresnel's Biprism. Interference in Thin Films: parallel and wedge-shaped films. Newton's Rings: Measurement of wavelength and refractive index.

Unit-III **(8 Lectures)**

Wave Optics: Electromagnetic nature of light. Definition and properties of wave front, Huygens's Principle. Temporal and Spatial Coherence. **Interferometer**: Michelson Interferometer-(1) Idea of form of fringes (No theory required), (2) Determination of Wavelength, (3) Wavelength Difference, (4) Refractive Index, and (5) Visibility of Fringes. Fabry-Perot interferometer.

Unit-IV **(8 Lectures)**

Fraunhofer diffraction: Single slit, double slit & nth slits, Diffraction grating. Resolving Power of a telescope Resolving power of grating.

Holography: Principle of Holography. Recording and Reconstruction Method. Theory of Holography as Interference between two Plane Waves.

Unit-V **(8 Lectures)**

Fresnel Diffraction: Fresnel's Assumptions. Fresnel's Half-Period Zones for Plane Wave, Explanation of Rectilinear Propagation of Light. Theory of a Zone Plate: Multiple Foci of a Zone Plate. Fresnel's Integral, Fresnel diffraction pattern of a straight edge, a slit and a wire.

Text & Reference Books:

1. Waves: Berkeley Physics Course, Francis Crawford, Tata McGraw-Hill. Fundamentals of Optics, F.A. Jenkins and H.E. White, McGraw-Hill.
2. Principles of Optics, Max Born and Emil Wolf, Pergamon Press. Optics, Ajoy Ghatak, Tata McGraw Hill.
3. Fundamental of Optics, A. Kumar, H.R. Gulati and D.R. Khanna, 2011, R. Chand Publications

*** Latest editions of all the suggested books are recommended**

Semester II
Environmental Studies

[TMU201 amended vide approval dt. August 14, 2018 of V.C]

Course Code: TMU201 **L T P C**
1 2 0 2

Objective: To create awareness among students about environment protection.

Course Content:

Unit I **(Lectures 08)**

Definition and Scope of environmental studies, multidisciplinary nature of environmental studies, Concept of sustainability & sustainable development.

Ecology and Environment: Concept of an Ecosystem- its structure and functions, Energy Flow in an Ecosystem, Food Chain, Food Web, Ecological Pyramid & Ecological succession, Study of following ecosystems: Forest Ecosystem, Grass land Ecosystem & Aquatic Ecosystem & Desert Ecosystem.

Unit II **(Lectures 08)**

Natural Resources: Renewable & Non-Renewable resources; Land resources and landuse change; Land degradation, Soil erosion & desertification. **Deforestation**: Causes & impacts due to mining, Dam building on forest biodiversity & tribal population. **Energy Resources**: Renewable & Non-Renewable resources, Energy scenario & use of alternate energy sources, Case studies.

Biodiversity: Hot Spots of Biodiversity in India and World, Conservation, Importance and Factors Responsible for Loss of Biodiversity, Biogeographical Classification of India

Unit III **(Lectures 08)**

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

Unit IV **(Lectures 08)**

Environmental policies & practices: Climate change & Global Warming (Greenhouse Effect), Ozone Layer - Its Depletion and Control Measures, Photochemical Smog, Acid Rain Environmental laws: Environment protection Act; air prevention & control of pollution act, Water Prevention & Control of Pollution Act, Wild Life Protection Act, Forest Conservation Acts, International Acts; Montreal & Kyoto Protocols & Convention on biological diversity, Nature reserves, tribal population & Rights & human wild life conflicts in Indian context

Unit V **(Lectures 08)**

Human Communities & Environment:

Human population growth; impacts on environment, human health & welfare, Resettlement & rehabilitation of projects affected person: A case study, Disaster Management; Earthquake, Floods & Droughts, Cyclones & Landslides, Environmental Movements; Chipko, Silent Valley, Vishnoi's of Rajasthan, Environmental Ethics; Role of Indian & other regions & culture in environmental conservation, Environmental communication & public awareness; Case study

Field Work:

1. Visit to an area to document environmental assets; river/forest/flora-fauna etc.
2. Visit to a local polluted site: urban/ rural/industrial/agricultural.
3. Study of common plants, insects, birds & basic principles of identification.
4. Study of simple ecosystem; pond, river etc.

Text Books:

1. "Environmental Chemistry", De, A. K., New Age Publishers Pvt. Ltd.
2. "Introduction to Environmental Engineering and Science", Masters, G. M., Prentice Hall India Pvt. Ltd.
3. "Fundamentals of Ecology", Odem, E. P., W. B. Sannders Co.

Reference Books:

1. "Biodiversity and Conservation", Bryant, P. J., Hypertext Book
2. "Textbook of Environment Studies", Tewari, Khulbe & Tewari, I.K. Publication

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

Semester II

English Communication and Soft Skills-II

[BHM249/EHM249 amended vide approval dt. July 23, 2018 of V.C]

Course Code: BHM249/EHM249 **L T P C**
1 1 2 2

Objectives:

1. To enhance the vocabulary of learners to address competitive exams like GATE
2. To develop ability of sentence construction.
3. To enhance learner's writing ability.
4. To make the learner effective in presenting himself/herself.

Course Contents:

Unit – I Vocabulary & Grammar **(14 hours)**

- Homophones, Homonyms, Synonyms, Antonyms and One-word substitution.
- Parts of Speech, Modals, Tenses and Simple sentence construction.

Unit – II Listening Skills **(05 hours)**

- Difference between listening & hearing, Types of Listening, Process
- Importance and Barriers to listening

Unit – III Writing Skills **(08 hours)**

- Letters and Email writing
- Story Narration

Unit – IV Strategies & Structure of Presentation and Problem Sounds **(13 hours)**

- Managing Time, Audience & Locale, Structure and Organization of Content and 5 W's
- Problem Sounds: S- Sh, J-Z and V-B

Reference Books:

1. Nesfield J.C. "*English Grammar Composition & Usage*" Macmillan Publishers
2. Sood Madan "*The Business letters"* Goodwill Publishing House, New Delhi
3. Kumar Sanjay &Pushplata "*Communication Skills*" Oxford University Press, New Delhi.

Methodologies:

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

Note:

- 2 words per class will be taught with meaning, usage & correct pronunciation to ensure progressive learning in sentence formation.
- ***Suggested words are*** : *Collateral, Default, Accord, Evident, Commit, Establish, Scarce, Apparent, Circumstances, Constitute, Render, Appeal, Campaign, League, Dwell, Yield, Wander, Convince, Inspire, Venture, Intimate, Assert, Scheme, Liberal, Despair, Manifest, Notion, Persist, Contempt, Attribute, Exert, Oppress, Contend, Stake, Perish, Notwithstanding, Heed, Esteem, Ascertain, Frontier, Flourish, Conspicuous, Sanction, Proceeding, Commendable, Equivocal, Juvenile,Onus, Unsolicited, Abstain*
- Class (above 30 students) will be divided in to two groups for effective teaching.
- For effective conversation practice, groups will be changed weekly.
- Repeated practice of sound.

Evaluation Scheme

Internal Evaluation		External Evaluation		Total Marks
40 Marks		60 Marks		100
30 Marks (Progressive Evaluation) After each unit-completion: Assignments /Oral Presentation	10 Marks (Attendance)	20 Marks Midway external assessment (Viva) *	40 Marks (Written Examination)	

*Parameters of Midway external assessment (Viva)

Content	Pronunciation	Body Language & Dressing Sense	Question responsiveness	TOTAL
05 Marks	05 Marks	05 Marks	05 Marks	20 Marks

Note:

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

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

Semester-II
Organic Chemistry-I (Lab)

Course Code: BAS264

L	T	P	C
0	0	3	2

Objective: The course content is of great interest to learn about purification of compounds by crystallization, determination of melting point & chromatographic separation of organic compounds.

List of Experiments:

1. Checking the calibration of the thermometer
2. Purification of organic compounds by crystallization using the following solvents:
   - **a.** Water
   - **b.** Alcohol
   - **c.** Alcohol-Water
3. Determination of the melting points of above compounds and unknown organic compounds (Electrically heated melting point apparatus)
4. Effect of impurities on the melting point – mixed melting point of two unknown organic compounds
5. Chromatography
   - **a.** Separation of a mixture of two ink mixture by paper chromatography
   - **b.** Separation of a mixture of o-and p-nitrophenol or o-and p-aminophenol by thin layer chromatography (TLC)

Text & Reference Books:

1. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education.
2. Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. Practical Organic Chemistry, Pearson.

*** Latest editions of all the suggested books are recommended**

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

Evaluation scheme:

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

External Evaluation (50 marks)

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

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

Semester-I
Physical Chemistry-II (Lab)

Course Code: BAS265

L	T	P	C
0	0	3	2

Objective:

This syllabus consists of determination of heat capacity, calculation of enthalpy of ionization, enthalpy of hydration & solubility of benzoic acid in water has been studied**.**

List of Experiments:

Thermochemistry

1. Determination of heat capacity of the calorimeter and enthalpy of neutralization of hydrochloric acid with sodium hydroxide.
2. Calculation of the enthalpy of ionization of ethanoic acid.
3. Determination of heat capacity of the calorimeter and integral enthalpy (endothermic and exothermic) solution of salts.
4. Determination of enthalpy of hydration of copper sulphate.
5. Study of the solubility of benzoic acid in water and determination of ΔH.

Text & Reference Books:

1. Khosla, B. D.; Garg, V. C. & Gulati, A., Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi.
2. Athawale, V. D. & Mathur, P. Experimental Physical Chemistry New Age International: New Delhi.

*** Latest editions of all the suggested books are recommended**

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

Evaluation scheme:

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

External Evaluation (50 marks)

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

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

Semester-II
Waves & Optics (Lab)

[BAS266 amended vide approval dt. July 23, 2018 & January 23, 2019 of V.C]

Course Code: BAS266

L	T	P	C
0	0	3	2

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

List of Experiments:

Note: Select any ten experiments from the following list.

1. To determine the frequency of an electric tuning fork by Melde's experiment and verify λ^2 –T law.
2. To investigate the motion of coupled oscillators.
3. To study Lissajous Figures.
4. Familiarization with: Schuster`s focusing; determination of angle of prism.
5. To determine refractive index of the Material of a prism using sodium source.
6. To determine the dispersive power and Cauchy constants of the material of a prism using mercury source.
7. To determine the wavelength of sodium source using Michelson's interferometer.
8. To determine wavelength of sodium light using Fresnel Bi-prism.
9. To determine wavelength of sodium light using Newton's Rings.
10. To determine the thickness of a thin paper by measuring the width of the interference fringes produced by a wedge-shaped Film.
11. To determine wavelength of (1) Na source or (2) spectral lines of Hg source using plane diffraction grating.
12. To determine dispersive power and resolving power of a plane diffraction grating.

Following experiments are added in session 2018-19:

13. To find the equivalent focal length of a lens system by nodal slide assembly.
14. To determine ordinary and extra ordinary refractive indices for calcite or quartz crystal.
15. To determine Resolving power of a telescope.
16. To determine the focal length of a convex and concave lens.
17. To determine the focal length of a convex and concave mirror.

Reference Books

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

2. B.Sc. Practical Physics, H. Singh & P.S. Hemne, S. Chand Publishing, 2011.
3. B.Sc. Practical Physics, C. L. Arora, S. Chand Publishing, 2015.
4. A Laboratory Manual of Physics for undergraduate classes, D.P. Khandelwal, Vani Pub.

Evaluation Scheme of Practical Examination:

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

Evaluation scheme:

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

External Evaluation (50 marks)

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

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

Semester II
DISCIPLINE & GENERAL PROFICIENCY

Course Code: BGP211

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

1. Observance of dress code.

2. Participation in Conferences /Workshops / Seminars.

3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

4. Participation in community projects including NSS.

5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

8. General behavior

9. Any extraordinary achievement.

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

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

S No		Enroll No.	Student Name	Dress code	Participation in Conferences /Workshops / Seminars	Participation in guest lectures, invited talks and special technical sessions	Participation in community Services	Participation in Culture & extra curriculum activities, Department Club Activities	Participation in sports/ co-curricular activities	General Behavior	Any Extra Achievement
				(5)	**(15)**	**(20)**	**(10)**	**(20)**	**(20)**	**(5)**	**(5)**
	Responsible for marks			Mentor	Head	Head	Mentor	Cultural Events Coordinator & Department Club Coordinator	Sports Coordinator	Mentor	Director or Principal

Semester-III
Inorganic Chemistry-II

Course Code: BAS311 **L T P C**
4 0 0 4

Objective:
The syllabus consists of chemistry of S& P block elements along with the specific properties like inert pair effect etc. This part of the syllabus also contains the preparation, properties, structure & uses of some important inorganic compounds like boric acid, interhalogen compounds etc. The chemistry of 18 group elements and their compound formation by noble gases. Inorganic polymers their synthesis & application are of great importance.

Course Contents:

Unit-I **(08 Lectures)**

Acids and Bases: Brönsted-Lowry concept of acid-base reactions, solvated proton, relative strength of acids, types of acid-base reactions, levelling solvents, Lewis acid-base concept, Classification of Lewis acids, Hard and Soft Acids and Bases (HSAB) Application of HSAB principle.

Unit- II **(08 Lectures)**

Chemistry of s and p Block Elements I : Inert pair effect, Relative stability of different oxidation states, diagonal relationship and anomalous behavior of first member of each group. Allotropy and catenation. Complex formation tendency of s and p block elements.
Hydrides and their classification ionic, covalent and interstitial.

Unit – III **(08 Lectures)**

Chemistry of s and p Block Elements II: Structure, bonding, preparation, properties and uses of Boric acid and borates, boron nitrides, borohydrides (diborane) carboranes and graphitic compounds, silanes, Oxides and oxoacids of nitrogen, Phosphorus and chlorine. Peroxo acids of sulphur, interhalogen compounds, polyhalide ions, pseudohalogens and basic properties of halogens.

Unit – IV **(08 Lectures)**

Noble Gases: Occurrence and uses, rationalization of inertness of noble gases, Clathrates; preparation and properties of XeF2, XeF4 and XeF6; Nature of bonding in noble gas compounds (Valence bond treatment and MO treatment for XeF2). Molecular shapes of noble gas compounds (VSEPR theory).

Unit – V **(08 Lectures)**

Inorganic Polymers:

Types of inorganic polymers, comparison with organic polymers, synthesis, structural aspects and applications of silicones and siloxanes. Borazines, silicates and phosphazenes, and polysulphates.

Text & Reference Books:

1. Lee, J. D. Concise Inorganic Chemistry, ELBS.
2. Douglas, B.E; Mc Daniel, D.H. & Alexander, J.J. Concepts & Models of Inorganic Chemistry, John Wiley Sons, N.Y.
3. Greenwood, N.N. & Earnshaw. Chemistry of the Elements, Butterworth-Heinemann.
4. Cotton, F.A. & Wilkinson, G. Advanced Inorganic Chemistry, Wiley, VCH.

*** Latest editions of all the suggested books are recommended**

Semester-III
Organic Chemistry-II

Course Code: BAS312 **L T P C**
4 0 0 4

Objective:

- To give a basic idea to students regarding nomenclature, synthesis & structure of Aromatic Nitro Compounds, Poly-nuclear aromatic Hydrocarbons, Heterocyclic aromatic Hydrocarbons & Alkaloids.
- To teach students regarding the preparation of derivatives of few compounds of above mentioned group.

Course Contents:

Unit – I **(08 Lectures)**

Chemistry of Halogenated Hydrocarbons:

Alkyl halides: Methods of preparation, nucleophilic substitution reactions – SN1, SN2 and SNi mechanisms with stereochemical aspects and effect of solvent etc.; nucleophilic substitution vs. elimination.

Aryl halides: Preparation, including preparation from diazonium salts. nucleophilic aromatic substitution; SNAr, Benzyne mechanism.

Relative reactivity of alkyl, allyl/benzyl, vinyl and aryl halides towards nucleophilic substitution reactions.

Unit – II **(08 Lectures)**

Alcohols, Phenols, Ethers and Epoxides:

Alcohols: preparation, properties and relative reactivity of 1°, 2°, 3° alcohols, Preparation and properties of glycols: Oxidation by periodic acid and lead tetraacetate, Pinacol-Pinacolone rearrangement;

Phenols: Preparation and properties; Acidity and factors effecting it, Ring substitution reactions, Reimer–Tiemann and Kolbe's–Schmidt Reactions, Fries and Claisen rearrangements with mechanism;

Unit – III **(08 Lectures)**

Ethers and Epoxides& Sulphur containing compounds:

Ethers and Epoxides: Preparation and reactions with acids. Reactions of epoxides with alcohols, ammonia derivatives and LiAlH4

Sulphur containing compounds: Preparation and reactions of thiols, thioethers and sulphonic acids.

Unit – IV (**08 Lectures)**

Carbonyl Compounds:

Structure, reactivity and preparation; Nucleophilic additions, Nucleophilic addition-elimination reactions with ammonia derivatives with mechanism; Mechanisms of Aldol and Benzoin condensation, Knoevenagel condensation, Claisen-Schmidt, Perkin, Cannizzaro and Wittig reaction, Beckmann and Benzil-Benzilic acid rearrangements, haloform reaction and Baeyer Villiger oxidation, oxidations and reductions (Clemmensen, Wolff-Kishner, LiAlH4, NaBH4,)

Unit – V **(08 Lectures)**

Carboxylic Acids and their Derivatives:

Preparation, physical properties and reactions of monocarboxylic acids: Typical reactions of dicarboxylic acids, hydroxy acids and unsaturated acids: succinic/phthalic, lactic, malic, tartaric, citric, maleic and fumaric acids;

Preparation and reactions of acid chlorides, anhydrides, esters and amides; Comparative study of nucleophilic substitution at acyl group -Mechanism of acidic and alkaline hydrolysis of esters.

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Text & Reference Books:

1. Morrison, R. T. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
3. Graham Solomons, T.W. Organic Chemistry, John Wiley & Sons, Inc.
4. McMurry, J.E. Fundamentals of Organic Chemistry, Cengage Learning India Edition.

*** Latest editions of all the suggested books are recommended**

Semester-III
Physical Chemistry-III

Course Code: BAS313 **L T P C**
4 0 0 4

Objective:

This consists of concept of phases & application of Clausius-claperon equation & its application to solid-liquid, liquid-vapor & solid-vapor equilibria. Nernst Distribution laws has been applied in the determination of degree of dissociation, association & complex ion formation. Electrochemistry is of great importance in industry for the formation of chemical cells & their applications have been highlighted in our daily life as well as in industry. Arrhenius theory of electrolytic dissociation has been discussed. A difference between week & strong electrolyte has been highlighted for better understanding of students.

Course Contents:

Unit - I **(08 Lectures)**

Phase Equilibria I:

Concept of phases, components and degrees of freedom, Clausius-Clapeyron equation and its applications to solid-liquid, liquid-vapour and solid-vapour equilibria, phase diagram for one component systems, with applications.

Three component systems, water-chloroform-acetic acid system, triangular plots.

Unit - II **(08 Lectures)**

Phase Equilibria II:

Binary solutions: Gibbs-Duhem-Margules equation, its derivation and applications to fractional distillation of binary miscible liquids (ideal and nonideal), azeotropes, lever rule, partial miscibility of liquids, CST, miscible pairs, steam distillation. Nernst distribution law: its derivation and applications.

Unit – III **(08 Lectures)**

Chemical Kinetics I:

Order and molecularity of a reaction, rate laws in terms of the advancement of a reaction, differential and integrated form of rate expressions up to second order reactions, experimental methods of the determination of rate laws, kinetics of complex reactions (integrated rate expressions up to first order only): (i) Opposing reactions (ii) parallel reactions and (iii) consecutive reactions and their differential rate equations (steady-state approximation in reaction mechanisms) (iv) chain reactions.

Unit – IV **(08 Lectures)**

Chemical Kinetics II:

Temperature dependence of reaction rates; Arrhenius equation; activation energy. Collision theory of reaction rates, Lindemann mechanism, qualitative treatment of the theory of absolute reaction rates.

Unit –V **(08 Lectures)**

Catalysis and Surface chemistry:

Types of catalyst, specificity and selectivity, mechanisms of catalyzed reactions at solid surfaces; Enzyme catalysis, Michaelis-Menten mechanism, acid-base catalysis.
Physical adsorption, chemisorption, adsorption isotherms. nature of adsorbed state.

Text & Reference Books:

1. Peter Atkins & Julio De Paula, Physical Chemistry, Oxford University Press.
2. Castellan, G. W. Physical Chemistry, Narosa.
3. McQuarrie, D. A. & Simon, J. D., Molecular Thermodynamics, Viva Books Pvt. Ltd.: New Delhi.
4. Engel, T. & Reid, P. Physical Chemistry, Prentice-Hall.
5. Ball, D. W. Physical Chemistry Cengage India..

*** Latest editions of all the suggested books are recommended**

Semester-III
Elements of Modern Physics

Course Code: BAS314 **L T P C**
4 0 0 4

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

Course Contents:

Unit-I **(08 Lectures)**

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

Unit-II **(08 Lectures)**

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

Unit-III **(08 Lectures)**

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

Unit-IV **(08 Lectures)**

Fission and fusion: Mass deficit, relativity and generation of energy; Fission - nature of fragments and emission of neutrons. Fusion and thermonuclear reactions driving stellar energy.

Unit-V **(08 Lectures)**

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

Reference Books:

1. Concepts of Modern Physics, Arthur Beiser, McGraw-Hill.
2. Introduction to Quantum Mechanics, David J. Griffith, Pearson Education.

3. Physics for scientists and Engineers with Modern Physics, Jewett and Serway, Cengage Learning.
4. Modern Physics, G.Kaur and G.R. Pickrell, McGraw Hill.
5. Quantum Mechanics: Theory & Applications, A.K.Ghatak & S.Lokanathan, Macmillan.
6. Theory and Problems of Modern Physics, Schaum`s outline, R. Gautreau and W. Savin, Tata McGraw-Hill Publishing Co. Ltd.
7. Six Ideas that Shaped Physics: Particle Behave like Waves, T. A. Moore, McGraw Hill.

*** Latest editions of all the suggested books are recommended**

Semester-III
English Communication and Soft Skills-III

[BHM349/EHM349/449 amended vide approval dt. July 23, 2018 & January 23, 2019 of V.C]

Course Code: BHM349/EHM349/449 **L T P C**
1 1 2 2

Objectives:

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

Course Contents:

Unit – I Grammar & Vocabulary **(14 hours)**

- Correction of Common Errors (with recap of English Grammar with its usage in practical context.)
- Transformation of sentences
- Commonly used Idiom & Phrases (Progressive learning whole semester)

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

- Listening short conversation/ recording (TED talks / Speeches by eminent personalities)

Critical Review of these abovementioned

- Voice Modulation: Five P's - Pace, Power, Pronunciation, Pause, and Pitch.
- Impromptu
- Power Point Presentation (PPt) Skills**:** Nuances of presenting PPTs

Unit – III Reading and Comprehension Skills **(08 hours)**

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

Unit – IV Writing Skills **(06 hours)**

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

Reference Books:

1. Allen, W. *"Living English Structure*" Pearson Education, New Delhi.
2. Joseph, Dr C.J. & Myall E.G. "*A Comprehensive Grammar of Current English*" Inter University Press, Delhi
3. Wren & Martin "*High School English Grammar and Composition*" S.Chand & Co.Ltd., New Delhi.
4. Norman Lewis "*Word Power Made Easy*" Goyal Publications & Distributers, New Delhi.
5. Chaudhary, Sarla "Basic Concept of Professional Communication" Dhanpat Rai Publication, New Delhi.
6. Kumar Sanjay & Pushplata "*Communication Skills*" Oxford University Press, New Delhi.
7. Agrawal, Malti "*Professional Communication*" Krishana Prakashan Media (P) Ltd. Meerut.

Methodologies:

1. Idiom & Phrases and exercises, usage in sentences.
2. Sentence transformation on daily activities and conversations.
3. Power Point presentation.
4. Newspaper reading, short articles from newspaper to comprehend and short movies.
5. https://youtu.be/j_mMowcN0Fs

Note:

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

Evaluation Scheme

Internal Evaluation		External Evaluation		Total Marks
40 Marks		60 Marks		100
30 Marks (Progressive Evaluation) After each unit-completion: Assignments / PPt Presentation *(Best three assignments)*	10 Marks (Attendance)	20 Marks Midway external assessment (viva) *	40 Marks (Written Examination)	

Note: *Midway external assessment of 20 marks will be submitted and consider with external evaluation with a total of 60 marks.*

*** Parameters of Midway external assessment Viva**

Content	Voice Modulation	Body Language	Question responsiveness	TOTAL
05 Marks	05 Marks	05 Marks	05 Marks	20 Marks

Note:

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

Written Examination*: There will be questions only from Unit-I, III & IV*

Semester-III
Inorganic Chemistry-II (Lab)

Course Code: BAS361 **L T P C**
0 0 3 2

Objective: The course content provides an idea to the student for the estimation & preparation of inorganic compounds in the laboratory.

List of Experiments:

1. Estimation of Cu(II) and K2Cr2O7 using sodium thiosulphate solution (Iodimetrically).
2. Estimation of (i) arsenite and (ii) antimony in tartar-emetic iodimetrically.
3. Estimation of available chlorine in bleaching powder iodometrically.
4. Preparation of Manganese(III) phosphate, MnPO4.H2O
5. Preparation of Aluminum potassium sulphate KAl(SO4)2.12H2O (Potash alum) or Chrome alum.

Text & Reference Books:

1. Mendham, J., A. I. Vogel's Quantitative Chemical Analysis, Pearson.

*** Latest editions of all the suggested books are recommended**

Evaluation Scheme of Practical Examination:

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

Evaluation scheme:

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

External Evaluation (50 marks)
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

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

Semester-III
Organic Chemistry-II (Lab)

Course Code: BAS362

L	T	P	C
0	0	3	2

Objective: The course contents provide an idea to identify the organic compounds of different functional groups & preparation of few organic compounds.

List of Experiments:

1. Functional group tests for alcohols, phenols, carbonyl and carboxylic acid group.
2. Organic preparations:
   - **i.** Acetylation of one of the following compounds: amines (aniline, o-, m-, p-toluidines and o-, m-, p-anisidine) and phenols (β-naphthol, salicylic acid) by any one method:
     - **a.** Using conventional method.
     - **b.** Using green approach
   - **ii.** Benzolyation of one of the following amines (aniline, o-, m-, p- toluidines and o-, m, p-anisidine) and one of the following phenols (β-naphthol, resorcinol, p-cresol) by Schotten-Baumann reaction.
   - **iii.** Nitration of any one of the following:
     - **a.** Acetanilide/nitrobenzene by conventional method
     - **b.** Salicylic acid by green approach (using ceric ammonium nitrate).
   - **iv.** Selective reduction of meta dinitrobenzene to m-nitroaniline.
   - **v.** Reduction of p-nitro benzaldehyde by sodium borohydride.
   - **vi.** Hydrolysis of amides and esters.
   - **vii.** Semicarbazone of any one of the following compounds: acetone, ethyl methyl ketone, cyclohexanone, benzaldehyde.
   - **viii.** Benzil-Benzilic acid rearrangement.

The above derivatives should be prepared using 0.5-1g of the organic compound. The solid samples must be collected and may be used for recrystallization, melting point and TLC.

Text & Reference Books:

1. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education.
2. Furniss, B.S., Hannaford, A.J., Smith, P.W.G. & Tatchell, A.R. Practical Organic Chemistry, Pearson.
3. Ahluwalia, V.K. & Aggarwal, R. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, University Press.
4. Ahluwalia, V.K. & Dhingra, S. Comprehensive Practical Organic Chemistry: Qualitative Analysis, University Press.

*** Latest editions of all the suggested books are recommended**

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

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

Evaluation scheme:

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

External Evaluation (50 marks)

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

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

Semester-III
Physical Chemistry-III (Lab)

Course Code: BAS363 **L T P C**
0 0 3 2

Objective: This lab is designed to study the equilibrium & potentiometric titrations using acids & bases, determination of critical solution temperature & composition of phenol-water system & impact of impurities on it.

List of Experiments:

1. Determination of critical solution temperature and composition of the phenol-water system and to study the effect of impurities on it.
2. Phase equilibria: Construction of the phase diagram using cooling curves or ignition tube method:
   a) simple eutectic and
   b) congruently melting systems.
3. Distribution of acetic/ benzoic acid between water and cyclohexane.
4. Study the equilibrium of at least one of the following reactions by the distribution method:

   i. $I_2(aq) + I^- \rightarrow I_3^-(aq)^{2+}$

   ii. $Cu^{2+}(aq) + nNH_3 \rightarrow Cu(NH_3)_n$

5. Study the kinetics of the following reactions.
6. Initial rate method: Iodide-persulphate reaction
7. Integrated rate method:
   i. Acid hydrolysis of methyl acetate with hydrochloric acid.
   ii. Saponification of ethyl acetate.
8. Compare the strengths of HCl and H2SO4 by studying kinetics of hydrolysis of methyl acetate.
9. Adsorption
10. Verify the Freundlich and Langmuir isotherms for adsorption of acetic acid on activated charcoal.

Text & Reference Books:

1. Khosla, B. D.; Garg, V. C. & Gulati, A. Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi.
2. Garland, C. W.; Nibler, J. W. & Shoemaker, D. P. Experiments in Physical Chemistry; McGraw-Hill: New York.
3. Halpern, A. M. & McBane, G. C. Experimental Physical Chemistry; W.H. Freeman & Co.: New York.

*** Latest editions of all the suggested books are recommended**

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

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

Evaluation scheme:

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

External Evaluation (50 marks)

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

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

Semester III

DISCIPLINE & GENERAL PROFICIENCY

Course Code: BGP311 **C-1**

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

1. Observance of dress code.

2. Participation in Conferences /Workshops / Seminars.

3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

4. Participation in community projects including NSS.

5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

8. General behavior

9. Any extraordinary achievement.

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

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

S No		Enroll No.	Student Name	Dress code	Participation in Conferences /Workshops / Seminars	Participation in guest lectures, invited talks and special technical sessions	Participation in community Services	Participation in Culture & extra curriculum activities, Department Club Activities	Participation in sports/ co-curricular activities	General Behavior	Any Extra Achievement
				(5)	**(15)**	**(20)**	**(10)**	**(20)**	**(20)**	**(5)**	**(5)**
	Responsible for marks			Mentor	Head	Head	Mentor	Cultural Events Coordinator & Department Club Coordinator	Sports Coordinator	Mentor	Director or Principal

Semester-IV
Inorganic Chemistry-III

Course Code: BAS419

L	T	P	C
4	0	0	4

Objective:

The course contents are interesting & include coordination chemistry. Justification of complexes by different theories for example Werner's theory, VBT, MOT & CFT. The nomenclature of complexes is of great interest for the knowledge of the student. The general & special properties of transition elements have been discussed in detail. The metallurgy of few elements is also included. a simple discussion on lanthanides & actinides has been given for knowledge & understanding.

Course Contents:

Unit I **(Lectures 08)**

Coordination Chemistry I:

Werner's theory, valence bond theory (inner and outer orbital complexes), Crystal field theory, measurement of 10 Dq (o), CFSE in weak and strong fields, pairing energies, factors affecting the magnitude of 10 Dq (o, t). Octahedral vs. tetrahedral coordination, tetragonal distortions from octahedral geometry Jahn-Teller theorem, square planar geometry.

Unit II **(Lectures 08)**

Coordination Chemistry II:

Qualitative aspect of Ligand field and MO Theory, IUPAC nomenclature of coordination compounds, isomerism in coordination compounds. Stereochemistry of complexes with 4 and 6 coordination numbers. Chelate effect, polynuclear complexes, Labile and inert complexes.

Unit III **(Lectures 08)**

Transition Elements:

General group trends with special reference to electronic configuration, colour, variable valency, magnetic and catalytic properties, ability to form complexes. Stability of various oxidation states and e.m.f. (Latimer & Bsworth diagrams). Difference between the first, second and third transition series.

Unit IV **(Lectures 08)**

Lanthanoids and Actinoids:

Electronic configuration, oxidation states, colour, spectral and magnetic properties, lanthanide contraction, separation of lanthanides (ion-exchange method only).

Unit V **(Lectures 08)**

Bioinorganic Chemistry:

Metal ions present in biological systems, classification of elements according to their action in biological system. Geochemical effect on the distribution of metals. Sodium / K-pump,

carbonic anhydrase and carboxypeptidase. Excess and deficiency of some trace metals. Toxicity of metal ions (Hg, Pb, Cd and As), reasons for toxicity, Use of chelating agents in medicine. Iron and its application in bio-systems, Hemoglobin; Storage and transfer of iron.

Text & Reference Books:

1. Purcell, K.F & Kotz, J.C. Inorganic Chemistry W.B. Saunders Co.
2. Huheey, J.E., Inorganic Chemistry, Prentice Hall.
3. Lippard, S.J. & Berg, J.M. Principles of Bioinorganic Chemistry Panima Publishing Company.
4. Cotton, F.A. & Wilkinson, G, Advanced Inorganic Chemistry Wiley-VCH.
5. Basolo, F, and Pearson, R.C. Mechanisms of Inorganic Chemistry, John Wiley & Sons, NY.
6. Greenwood, N.N. & Earnshaw A. Chemistry of the Elements, Butterworth-Heine

*** Latest editions of all the suggested books are recommended**

Semester-IV
Organic Chemistry-III

Course Code: BAS412 **L T P C**
4 0 0 4

Objective:

- To give a basic idea to students regarding nomenclature, synthesis & structure of Aromatic Nitro Compounds, Poly-nuclear aromatic Hydrocarbons, Heterocyclic aromatic Hydrocarbons & Alkaloids.
- To extract & isolate the naturally occurring alkaloids from their parent materials by chemical methods

Course Contents:

Unit –I **(08 Lectures)**

Nitrogen Containing Functional Groups:

Preparation and important reactions of nitro compounds, nitriles and isonitriles

Amines: Effect of substituent and solvent on basicity; Preparation and properties: Gabriel phthalimide synthesis, Carbylamine reaction, Mannich reaction, Hoffmann's exhaustive methylation, Hofmann-elimination reaction; Distinction between 1°, 2° and 3° amines with Hinsberg reagent and nitrous acid.

Diazonium Salts: Preparation and their synthetic applications.

Unit –II **(08 Lectures)**

Polynuclear Hydrocarbons:

Reactions of naphthalene phenanthrene and anthracene Structure, Preparation and structure elucidation and important derivatives of naphthalene and anthracene; Polynuclear hydrocarbons.

Unit –III **(08 Lectures)**

Heterocyclic Compounds I:

Classification and nomenclature, Structure, aromaticity in 5-numbered and 6-membered rings containing one heteroatom; Synthesis, reactions and mechanism of substitution reactions of: Furan, Pyrrole (Paal-Knorr synthesis, Knorr pyrrole synthesis, Hantzsch synthesis), Thiophene

Unit –IV **(08 Lectures)**

Heterocyclic Compounds II:

Pyridine (Hantzsch synthesis), Pyrimidine, Structure elucidation of indole, Fischer indole synthesis and Madelung synthesis), Structure elucidation of quinoline and isoquinoline, Skraup synthesis, Friedlander's synthesis, Knorr quinoline synthesis, Doebner-Miller synthesis, Bischler-Napieralski reaction, Pictet-Spengler reaction, Pomeranz-Fritsch reaction.

Unit –V **(08 Lectures)**

Alkaloids& Terpenes:

Natural occurrence, General structural features, Isolation and their physiological action Hoffmann's exhaustive methylation, Emde's modification, Structure elucidation and synthesis of Hygrine and Nicotine. Medicinal importance of Nicotine, Hygrine, Quinine, Cocaine, and Reserpine. Occurrence, classification, isoprene rule; Elucidation of structure and synthesis of Citral, Neral and α-terpineol.

Text & Reference Books:

1. Morrison, R. T. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
3. Finar, I. L. Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Products), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
4. Graham Solomons, T.W. Organic Chemistry, John Wiley & Sons, Inc.
5. SKalsi, P. S. Textbook of Organic Chemistry 1st Ed., New Age International (P) Ltd. Pub.
6. Clayden, J.; Greeves, N.; Warren, S.; Wothers, P.; Organic Chemistry, Oxford University

*** Latest editions of all the suggested books are recommended**

Semester-IV
Physical Chemistry-IV

Course Code: BAS413 **L T P C**
4 0 0 4

Objective: The present syllabus consists of electrolytic dissociation, study of conductivity measurements for the determination of degree of dissociation of weak electrolyte, ionic product of water etc.

Course Contents:

Unit –I **(08 Lectures)**

Conductance I:

Arrhenius theory of electrolytic dissociation. Conductivity, equivalent and molar conductivity and their variation with dilution for weak and strong electrolytes. Molar conductivity at infinite dilution. Kohlrausch law of independent migration of ions. Debye-Hückel-Onsager equation, Walden's rules.

Unit –II **(08 Lectures)**

Conductance II:

Ionic velocities, mobilities and their determinations, transference numbers and their relation to ionic mobilities, determination of transference numbers using Hittorf and Moving Boundary methods. Applications of conductance measurement: (i) degree of dissociation of weak electrolytes, (ii) ionic product of water (iii) solubility and solubility product of sparingly soluble salts, (iv) conductometric titrations, and (v) hydrolysis constants of salts.

Unit –III **(08 Lectures)**

Electrochemistry I:

Chemical cells, reversible and irreversible cells with examples. Electromotive force of a cell and its measurement, Nernst equation; Standard electrode (reduction) potential and its application to different kinds of half-cells. Rules of oxidation/reduction of ions based on half-cell potentials

Quantitative aspects of Faraday's laws of electrolysis, applications of electrolysis in metallurgy and industry.

Unit –IV **(08 Lectures)**

Electrochemistry II:

Application of EMF measurements in determining

(i) free energy, enthalpy and entropy of a cell reaction, (ii) equilibrium constants, and (iii) pH values, using hydrogen, quinone-hydroquinone electrodes. Concentration cells with and without transference, liquid junction potential; determination of activity coefficients and transference numbers. Qualitative discussion of potentiometric titrations (acid-base, redox, precipitation).

Unit – V **(08 Lectures)**

Basic ideas of electrostatics, Electrostatics of dielectric media, Clausius-Mosotti equation, Lorenz-Laurentz equation, Dipole moment and molecular polarizabilities and their measurements. Diamagnetism, Para magnetism, magnetic susceptibility and its measurement, molecular interpretation.

.

Text & Reference Books:

1. Atkins, P.W & Paula, J.D. Physical Chemistry, Oxford University Press.
2. Castellan, G. W. Physical Chemistry, Narosa.
3. Barrow, G. M., Physical Chemistry, Tata McGraw Hill: New Delhi.

*** Latest editions of all the suggested books are recommended**

Semester-IV
Computer Skills for Chemist Lab

[BAS466 amended vide approval dt. July 23, 2018 of V.C]

Course Code: BAS466

L	T	P	C
0	0	4	2

Objectives:

Understanding versatile application of computer and digital graphics in Chemistry; learning the techniques and methods of use of computer and various software digital drafting and presentations.

Module 1 & 2 are prerequisite for experiment hence needs to be explained before commencement of experiments.

Module 1:

Introduction to computers hardware and software components; Operating System; Usage of Internet and Intranet; protocols and their importance; networking; Internet Browsing: Net Surfing, Search Engine, Email.

Module 2:

Introduction to MS office: Word, Power point, Excel, Short cut Keys, Mail Merge, Watermarking, Animation in presentation.

LIST OF EXPERIMENTS:

1. Fundamentals of computer system, with its functional components.
2. Create a formatted WORD document.
3. Create a WORD document using different fonts.
4. Create a table & perform operations in it.
5. Create a WORD document, using the functions page set up, & page preview, and then print that document.
6. Implement Mail Merge.
7. Collect the information of any company & perform the below operation in it:

(a) Insert the data into Row/Column of Excel, worksheet

(b) Create a worksheet in Excel, perform alignment, text wrapping & sort the data.

8. Collect the information of any company & perform the below operation in it:

(a) Generate the graph in Excel.

(b) Create a Hyperlink to a word document.

(c) Create a worksheet using the functions- page set up, print preview & then print the worksheet.

9. Create, save & print the power point presentation
10. Create a power point presentation using clipart, Word art gallery & then add transition & Animation effects.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

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

Evaluation scheme:

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

External Evaluation (50 marks)

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

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

Semester IV

English Communication and Soft Skills – IV

[BHM499/EHM599/699 amended vide approval dt. July 23, 2018 of V.C]

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

Objectives:

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

Course Contents:

Unit – I: Job Oriented Skills **(10 Hours)**

- Cover Letter
- Preparing Resume and Curriculum-Vitae
- Writing Joining Report

Unit – II: Technical Communication **(12 Hours)**

- Technical description of engineering objects
- Data Interpretation: Tables, Charts, & Graphs
- Preparing Agenda & Minutes of the Meeting
- Technical Proposal: Types, Significance, Structure & AIDA
- Report Writing: Types, Structure& Steps towards Report writing

Unit- III: Interview Skills **(10 Hours)**

- Branding yourself
- Interview: Types of Interview, Tips for preparing for Interview and Mock Interview
- Group Discussion: Do's and Don'ts of Group Discussion
- Negotiation skills

Unit – IV: Corporate Skills **(8 Hours)**

- Corporate Expectation
- Service mindset: Selling a product - Ad made shows
- Goal setting
- Team Building & Leadership
- Professional Ethics

Reference Books:

- Raman Meenakshi & Sharma Sangeeta, *"Technical Communication-Principles & Practice"* Oxford University Press, New Delhi.
- Mohan K. & Sharma R.C., "*Business Correspondence of Report Writing",* TMH, New Delhi.
- Chaudhary, Sarla "Basic Concept of Professional Communication" Dhanpat Rai Publication, New Delhi.
- Kumar Sanjay & Pushplata "*Communication Skills*" Oxford University Press, New Delhi.
- Agrawal, Malti "*Professional Communication*" Krishana Prakashan Media (P) Ltd. Meerut.

Methodology:

1. The content will be conveyed through Real life situations, Pair Conversation, Group Talk and Class Discussion.
2. Conversational Practice will be effectively carried out by Face to Face & Via Media (Audio-Video Clips)
3. Modern Teaching tools (PPT Presentation & Motivational videos with sub-titles) will be utilized.

Note:

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

Evaluation Scheme

Internal Evaluation		External Evaluation		Total Marks
50 Marks		50 Marks		100
40 Marks (Progressive Evaluation) After each unit-completion: Assignments /Oral Presentation	10 Marks (Attendance)	25 Marks Midway external assessment (Viva) *	25 Marks (External Viva)* *	

Note: 1. *Midway external assessment of 25 marks will be submitted and considered with external evaluation with a total of 50 marks.*
2. Assignments & Oral Presentation (Progressive Evaluation) will be designed to test learning outcomes unit wise.

*Parameters of Midway external assessment (Viva)

Knowledge of frequently asked questions	Body Language	Communication skills	Confidence	Voice Modulation	TOTAL
05 Marks	05 Marks	05 Marks	05 Marks	05 Marks	25 Marks

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

**Parameters of External Viva

Knowledge of frequently asked questions	Body Language	Communication skills	Confidence	Voice Modulation	TOTAL
05 Marks	05 Marks	05 Marks	05 Marks	05 Marks	25 Marks

Note: *External Viva will be conducted by 3-member committee comprising*

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

Each member will evaluate on a scale of 25 marks and the average of three would be the 25 marks obtained by the students.

Semester-IV
Inorganic Chemistry-III (Lab)

Course Code: BAS461

L	T	P	C
0	0	3	2

Objectives: This course content consists of Gravimetric estimation, Inorganic preparation purification of metal ions by paper chromatography.

List of Experiments:

Gravimetric Analysis:

1. Estimation of nickel (II) using Dimethylglyoxime (DMG).
2. Estimation of copper as CuSCN
3. Estimation of iron as Fe_2O_3 by precipitating iron as $Fe(OH)_3$.

Inorganic Preparations:

4. Tetraamminecopper (II) sulphate, [Cu(NH3)4]SO4.H2O
5. Cis K[Cr(C2O4)2. (H2O)2] Potassium dioxalatodiaquachromate (III)
6. Tetraamminecarbonatocobalt (III) ion
7. Potassium tris(oxalate)ferrate(III)

Chromatography of metal ions

8. Principle involved in chromatographic separations. Paper chromatographic separation of following metal ions:
   - **a)** Ni (II) and Co (II)
   - **b)** Fe (III) and Al (III)

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Text & Reference Book:

1. Mendham, J., A. I. Vogel's Quantitative Chemical Analysis, Pearson.

*** Latest editions of all the suggested books are recommended**

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

Evaluation scheme:

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

External Evaluation (50 marks)

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

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

Semester-IV
Organic Chemistry-III (Lab)

Course Code: BAS462

L	T	P	C
0	0	3	2

Objectives: Emphasis is given for the detection of elements present in the inorganic compound, functional group identification & confirmation of organic compounds.

List of Experiments:

1. Detection of extra elements.
2. Functional group test for nitro, amine and amide groups.
3. Qualitative analysis of unknown organic compounds containing simple functional groups (alcohols, carboxylic acids, phenols and carbonyl compounds)

Text & Reference Books:

1. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education.
2. Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. Practical Organic Chemistry, Pearson.
3. Ahluwalia, V.K. & Aggarwal, R. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, University Press.
4. Ahluwalia, V. K. & Dhingra, S. Comprehensive Practical Organic Chemistry: Qualitative Analysis, University Press.

*** Latest editions of all the suggested books are recommended**

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

Evaluation scheme:

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

External Evaluation (50 marks)

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

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

Semester-IV
Physical Chemistry-IV (Lab)

Course Code: BAS465

L	T	P	C
0	0	3	2

Objective: The course content consists of conductance of weak & strong acids and kinetics of the chemical reactions. The acid hydrolysis of the ethyl acetate is carried out with HCl & it is determined conductometrically. Saponification of ethyl acetate is also included to enhance the interest of the student.

List of Experiments:

Conductometry:

1. Determination of cell constant
2. Determination of equivalent conductance, degree of dissociation and dissociation constant of a weak acid.
3. Perform the following conductometric titrations:
   - **a)** Strong acid vs. strong base
   - **b)** Weak acid vs. strong base
   - **c)** Mixture of strong acid and weak acid vs. strong base
   - **d)** Strong acid vs. weak base

Potentiometry:

1. Perform the following potentiometric titrations:
   - **a)** Strong acid vs. strong base
   - **b)** Weak acid vs. strong base
   - **c)** Dibasic acid vs. strong base
   - **d)** Potassium dichromate vs. Mohr's salt

.

Text & Reference Books:

1. Khosla, B. D.; Garg, V. C. & Gulati, A. Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi.
2. Garland, C. W.; Nibler, J. W. & Shoemaker, D. P. Experiments in Physical Chemistry; McGraw-Hill: New York.
3. Halpern, A. M. & McBane, G. C. Experimental Physical Chemistry; W.H. Freeman & Co.: New York.

*** Latest editions of all the suggested books are recommended**

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

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

Evaluation scheme:

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

External Evaluation (50 marks)

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

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

Semester IV
DISCIPLINE & GENERAL PROFICIENCY

Course Code: BGP411 **C-1**

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

1. Observance of dress code.

2. Participation in Conferences /Workshops / Seminars.

3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

4. Participation in community projects including NSS.

5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

8. General behavior

9. Any extraordinary achievement.

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

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

S No		Enroll No.	Student Name	Dress code	Participation in Conferences /Workshops / Seminars	Participation in guest lectures, invited talks and special technical sessions	Participation in community Services	Participation in Culture & extra curriculum activities, Department Club Activities	Participation in sports/ co-curricular activities	General Behavior	Any Extra Achievement
				(5)	**(15)**	**(20)**	**(10)**	**(20)**	**(20)**	**(5)**	**(5)**
	Responsible for marks			Mentor	Head	Head	Mentor	Cultural Events Coordinator & Department Club Coordinator	Sports Coordinator	Mentor	Director or Principal

Semester-V
Organic Chemistry-IV

Course Code: BAS525

L	T	P	C
4	0	0	4

Objective: The course content consists of types of carbohydrate and their structures. The disaccharides & polysaccharides are of great use in our daily life. It also consists of emphasis on amino acids, RNA & DNA, Amino acids, proteins & peptide bond formation.

Course Contents:

Unit I **(Lectures 08)**

Carbohydrates:

Monosaccharides: Constitution and absolute configuration of glucose and fructose, epimers and anomers, mutarotation, determination of ring size of glucose and fructose, Haworth projections and conformational structures; Interconversions of aldoses and ketoses; Killiani-Fischer synthesis and Ruff degradation;

Disaccharides – Structure elucidation of maltose, lactose and sucrose.

Polysaccharides – Elementary treatment of starch, cellulose and glycogen.

Unit II **(Lectures 08)**

Amino Acids, Peptides and Proteins:

Amino acids, Peptides and their classification.

α-Amino Acids - Synthesis, ionic properties and reactions. Zwitterions, pKa values, isoelectric point and electrophoresis; Study of peptides: determination of their primary structures-end group analysis, methods of peptide synthesis. Synthesis of peptides using N-protecting, C-protecting and C-activating groups.

Unit III **(Lectures 08)**

Nucleic Acids:

Components of nucleic acids, Nucleosides and nucleotides; Structure, synthesis and reactions of: Adenine, Guanine, Cytosine, Uracil and Thymine.

Unit IV **(Lectures 08)**

Enzymes:

Introduction, classification and characteristics of enzymes. Salient features of active site Tof enzymes. Mechanism of enzyme action, factors affecting enzyme action, coenzymes and cofactors and their role in biological reactions, specificity of enzyme action, enzyme inhibitors and their importance, phenomenon of inhibition.

Unit – V **(08 Lectures)**

Concept of Energy in Biosystems:

Introduction to metabolism (catabolism, anabolism). ATP: The universal currency of cellular energy, ATP hydrolysis and free energy change. Agents for transfer of electrons in biological redox systems: NAD^+, FAD. Conversion of food to energy: Outline of catabolic pathways of carbohydrate- glycolysis, fermentation, Krebs cycle. Overview of catabolic pathways of fat and protein. Interrelationship in the metabolic pathways of protein, fat and carbohydrate

Unit - V

Text & Reference Books:

1. Berg, J.M., Tymoczko, J.L. & Stryer, L. Biochemistry, W.H. Freeman and Co.
2. Nelson, D.L., Cox, M.M. & Lehninger, A.L., Principles of Biochemistry, W.H. Freeman and Co.
3. Murray, R. K., Granner, D.K., Mayes, P.A. & Rodwell, V.W., Harper's Illustrated Biochemistry, Lange Medical Books/ McGraw-Hill.

*** Latest editions of all the suggested books are recommended**

Semester-V
Physical Chemistry-V

Course Code: BAS526 **L T P C**
4 0 0 4

Objective: The syllabus consists of chemical bonding namely VBT, MOT to explain the structure of homonuclear & heteronuclear diatomic molecules. Molecular, vibrational, Raman and NMR spectroscopy have been taught with special reference to their principles & their applications to find out the structure of the compound.

Course Contents:

Unit – I **(08 Lectures)**

Rotational spectroscopy:

Interaction of electromagnetic radiation with molecules and various types of spectra; Born-Oppenheimer approximation.

Rotation spectroscopy: Selection rules, intensities of spectral lines, determination of bond lengths of diatomic and linear triatomic molecules, isotopic substitution.

Unit – II **(08 Lectures)**

Vibrational Spectroscopy:

Vibrational spectroscopy: Classical equation of vibration, computation of force constant, amplitude of diatomic molecular vibrations, anharmonicity, Morse potential, dissociation energies, fundamental frequencies, overtones, hot bands, degrees of freedom for polyatomic molecules, modes of vibration, concept of group frequencies. Vibration-rotation spectroscopy: diatomic vibrating rotator, P, Q, R branches.

Unit – III **(08 Lectures)**

Raman and electronic spectroscopy:

Qualitative treatment of Rotational Raman effect; Effect of nuclear spin, Vibrational Raman spectra, Stokes and anti-Stokes lines; their intensity difference, rule of mutual exclusion. Application of IR and Raman spectroscopy.

Franck-Condon principle, electronic transitions, singlet and triplet states, fluorescence and phosphorescence, dissociation and predissociation.

Unit – IV **(08 Lectures)**

NMR and ESR Spectroscopy:

Nuclear Magnetic Resonance (NMR) spectroscopy: Principles of NMR spectroscopy, Larmor precession, chemical shift and low-resolution spectra, different scales, spin-spin coupling and high-resolution spectra, interpretation of PMR spectra of organic molecules.

Electron Spin Resonance (ESR) spectroscopy: Its principle, hyperfine structure, ESR of simple radicals.

Unit – V **(08 Lectures)**

Photochemistry:

Characteristics of electromagnetic radiation, Lambert-Beer's law and its limitations, physical significance of absorption coefficients. Laws, of photochemistry, quantum yield, actinometry, examples of low and high quantum yields, photochemical equilibrium and the differential rate of photochemical reactions, photosensitized reactions, quenching. Role of photochemical reactions in biochemical processes (PHOTOSYNTHESIS), photo stationary states, chemiluminescence.

Text & Reference Books:

1. Banwell, C. N. & Mc. Cash, E. M. Fundamentals of Molecular Spectroscopy, Tata McGraw-Hill: New Delhi.

*** Latest editions of all the suggested books are recommended**

Semester-V
Analytical Chemistry

Course Code: BAS527 **L T P C**
4 0 0 4

Objective: Analytical Chemistry is unique experimental science where better methods of analysis adopted with the sophisticated instruments. The entire syllabus is useful for knowledge of basic concepts to the students for studying UV-Vis, IR Spectroscopy. Chromatography has great qualitative and quantitative aspects of analysis in various field of chemistry.

Course Contents:

Unit – I **(08 Lectures)**

Qualitative and quantitative aspects of analysis:

Sampling, evaluation of analytical data, errors, accuracy and precision, methods of their expression, normal law of distribution if indeterminate errors, statistical test of data; F, Q and t test, rejection of data, and confidence intervals.

Unit – II **(08 Lectures)**

Optical methods of analysis:

Origin of spectra, interaction of radiation with matter, fundamental laws of spectroscopy and selection rules, validity of Beer-Lambert's law.

UV-Visible Spectrometry: Basic principles of instrumentation (choice of source, monochromator and detector) for single and double beam instrument;

Infrared Spectrometry: Basic principles of instrumentation (choice of source, monochromator& detector) for single and double beam instrument; sampling techniques, Effect and importance of isotope substitution.

Flame Atomic Absorption and Emission Spectrometry: Basic principles of instrumentation (choice of source, monochromator, detector, choice of flame and Burner designs. Techniques of atomization and sample introduction.

Unit – III **(08 Lectures)**

Thermal and Electroanalytical methods of analysis:

Theory of thermogravimetry (TG), basic principle of instrumentation. Techniques for quantitative estimation of Ca and Mg from their mixture.

Classification of electroanalytical methods, basic principle of pH metric, potentiometric and conductometric titrations. Techniques used for the determination of equivalence points. Techniques used for the determination of pKa values.

Unit – IV **(08 Lectures)**

Separation techniques I:

Solvent extraction: Classification, principle and efficiency of the technique. Mechanism of

extraction: extraction by solvation and chelation. Technique of extraction: batch, continuous and counter current extractions. Qualitative and quantitative aspects of solvent extraction: extraction of metal ions from aqueous solution, extraction of organic species from the aqueous and non-aqueous media.

Unit – V **(08 Lectures)**

Separation techniques II:

Chromatography: Classification, principle and efficiency of the technique. Mechanism of separation: adsorption, partition & ion exchange. Development of chromatograms: frontal, elution and displacement methods. Qualitative and quantitative aspects of chromatographic methods of analysis: IC, GLC, GPC, TLC and HPLC.

Text & Reference Books:

1. Mendham, J., A. I. Vogel's Quantitative Chemical Analysis, Pearson.
2. Willard, H.H. et al.: Instrumental Methods of Analysis, Wardsworth Publishing Company, Belmont, California, USA.
3. Christian, G.D. Analytical Chemistry, John Wiley & Sons, New York.
4. Harris, D.C.: Exploring Chemical Analysis, New York, W.H. Freeman.
5. Khopkar, S.M. Basic Concepts of Analytical Chemistry. New Age International Publisher.
6. Skoog, D.A. Holler F.J. & Nieman, T.A. Principles of Instrumental Analysis, Cengage Learning India Ed.

*** Latest editions of all the suggested books are recommended**

Semester-V
Polymer Chemistry

Course Code: BAS528 **L T P C**
4 0 0 4

Objective: The course content provides an idea to the students about the basic concepts and kinetics of the polymers along with structural identification and uses in the industries.

Course Contents:

Unit – I **(08 Lectures)**

Basic Concepts:

Classification – Nomenclature and isomerism – functionality – Molecular forces and chemical bonding in polymers – Molecular weight – Linear, branched and cross-linked polymers. Thermoplastic and thermosetting polymers – Elastomers, Fibers and resins. Techniques of polymerization–emulsion, bulk, solution and suspension.

Unit – II **(08 Lectures)**

Kinetics and Mechanism:

Kinetics and Mechanism of polymerization – free radical, cationic, anionic and co-ordination polymerization (Ziegler - Natta Catalyst). Copolymerization – Kinetics (Detailed Study). General characterization–Kinetic chain length–degree of polymerization, chain transfer - initiators – inhibitors – retarders.

Unit – III **(08 Lectures)**

A) Structure and Properties

Structure - property relationship – Mechanical properties, Thermal properties – Glass transition temperature – Factors affecting Glass transition temperature – crystallinity and melting point – related to structure.

B) Polymer characterization and analysis

Crystalline nature – X-Ray diffraction – Differential Scanning Calorimetry (DSC) – Thermo Gravimetric Analysis – molecular weight determination – Osmometry (membrane), Viscosity, Ultra centrifuge and Gel Permeation Chromatography.

Unit – IV **(08 Lectures)**

Industrial Natural Polymers:

Important industrial polymers – preparation and application of polyethylene, poly vinyl chloride, poly urethanes, polytetrafluro ethylene (TEFLON), Nafion and ion – exchange resins. Importance of natural polymers – application and structures of starch, cellulose and chitosin derivatives.

Unit – V **(08 Lectures)**

Specialty Polymers:

Bio polymers – biodegradable polymers – biomedical polymers – poly electrolytes - conducting polymers – high temperature and fire-retardant polymers - polymer blend – polymer composites – polymer nanocomposites – IPN inter penetrating network polymers – Electroluminescent polymers.

Text & Reference Books:

1. F.W. Bill Meyer. Text book of polymer science, John Wiley and sons, New York. P. J. Flory. Principles of Polymer Chemistry, Cornell Press.
2. V. R. Gowarikar, B. Viswanathan, J. Sridhar, Polymer Science – Wiley eastern.
3. G. S. Misra – Introduction to Polymer Chemistry, Wiley Eastern Ltd.,
4. P. Bahadur, N. V. Sastry, Principles of Polymer Science, Narosa Publishing House.
5. G. Odian, Principles of Polymerization, McGraw Hill Book Company, New York.

*** Latest editions of all the suggested books are recommended**

Semester-V
Organic Chemistry-IV (Lab)

Course Code: BAS561

L	T	P	C
0	0	3	2

Objective: The course content is of great interest in which the students are taught for the estimation of amino acids & proteins by standard methods.

List of Experiments:

1. Estimation of glycine by Sorenson's formalin method.
2. Estimation of proteins by Lowry's method.
3. Study of the action of salivary amylase on starch at optimum conditions.
4. Effect of temperature on the action of salivary amylase.
5. Saponification value of oil or a fat.
6. Determination of Iodine number of an oil/ fat.

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Text & Reference Books:

1. Manual of Biochemistry Workshop, Department of Chemistry, University of Delhi.
2. Arthur, I. V. Quantitative Organic Analysis, Pearson.

*** Latest editions of all the suggested books are recommended**

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

Evaluation scheme:

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

External Evaluation (50 marks)
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

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

Semester-V
Physical Chemistry-V (Lab)

Course Code: BAS562 **L T P C**
0 0 3 2

Objective: Adsorption, Determination of heat of solution, relative strength of acids, kinetic studies of acetone & iodine & molecular rate determination have been included.

List of Experiments:
UV/Visible spectroscopy:

i. Study the 200-500 nm absorbance spectra of KMnO4 and K2Cr2O7 (in 0.1 M H2SO4) and determine the λmax values. Calculate the energies of the two transitions in different units (J molecule^{-1}, kJ mol^{-1}, cm^{-1}, eV).
ii. Study the pH-dependence of the UV-Vis spectrum (200-500 nm) of K2Cr2O7.
iii. Record the 200-350 nm UV spectra of the given compounds (acetone, acetaldehyde, 2-propanol, acetic acid) in water. Comment on the effect of structure on the UV spectra of organic compounds.

Colourimetry:

i. Verify Lambert-Beer's law and determine the concentration of CuSO4/KMnO4/K2Cr2O7 in a solution of unknown concentration
ii. Determine the concentrations of KMnO4 and K2Cr2O7 in a mixture.
iii. Study the kinetics of iodination of propanone in acidic medium.
iv. Determine the amount of iron present in a sample using 1,10-phenathroline.
v. Determine the dissociation constant of an indicator (phenolphthalein).
vi. Study the kinetics of interaction of crystal violet/ phenolphthalein with sodium hydroxide.

Text & Reference Books

1. Khosla, B. D.; Garg, V. C. & Gulati, A., Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi.

2. Garland, C. W.; Nibler, J. W. & Shoemaker, D. P. Experiments in Physical Chemistry; McGraw-Hill: New York.
3. Halpern, A. M. & Mc. Bane, G. C. Experimental Physical Chemistry; W.H. Freeman & Co.: New York.

*** Latest editions of all the suggested books are recommended**

Evaluation Scheme of Practical Examination:

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

Evaluation scheme:

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

External Evaluation (50 marks)

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

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

Semester-V
Analytical Chemistry (Lab)

Course Code: BAS563 **L T P C**

0 0 3 2

Objective: The course content is of great importance for the student to learn the separation of mixtures by chromatographic, solvent extraction methods & the compounds are identified by Spectrophotometric method.

List of Experiments:

I. Separation Techniques:

1. Chromatography:

(a) Separation of mixtures

i. Paper chromatographic separation of Fe^{3+}, Al^{3+}, and Cr^{3+}.

ii. Separation and identification of the monosaccharides present in the given mixture (glucose & fructose) by paper chromatography. Reporting the Rf values.

(b) Separate a mixture of Sudan yellow and Sudan Red by TLC technique and identify them on the basis of their Rf values.

(c) Chromatographic separation of the active ingredients of plants, flowers and juices by TLC

II. Solvent Extractions:

2. To separate a mixture of Ni^{2+} & Fe^{2+} by complexation with DMG and extracting the Ni^{2+}-DMG complex in chloroform, and determine its concentration by spectrophotometry.

i. Solvent extraction of zisconium with amberliti LA-1, separation from a mixture of irons and gallium.

3. Determine the pH of the given aerated drinks fruit juices, shampoos and soaps.

4. Determination of Na, Ca, Li in cola drinks and fruit juices using fame photometric techniques.

5. Analysis of soil:

i. Determination of pH of soil.

ii. Total soluble salt

iii. Estimation of calcium, magnesium, phosphate, nitrate

6. Ion exchange:

i. Determination of exchange capacity of cation exchange resins and anion exchange resins.

III Spectrophotometry:

7. Determination of pKa values of indicator using spectrophotometry.

8. Structural characterization of compounds by infrared spectroscopy.

Text & Reference Books:

1. Mendham, J., A. I. Vogel's Quantitative Chemical Analysis, Pearson.
2. Willard, H.H. et al.: Instrumental Methods of Analysis, Wardsworth Publishing Company, Belmont, California, USA.
3. Christian, G.D. Analytical Chemistry, John Wiley & Sons, New York.
4. Harris, D.C. Exploring Chemical Analysis, New York, W.H. Freeman.
5. Khopkar, S.M. Basic Concepts of Analytical Chemistry. New Age International Publisher.
6. Skoog, D.A. Holler F.J. and Nieman, T.A. Principles of Instrumental Analysis, Cengage Learning India Edition.

*** Latest editions of all the suggested books are recommended**

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

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

Evaluation scheme:

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

External Evaluation (50 marks)

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

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

Semester-V
Polymer Chemistry (Lab)

Course Code: BAS564

L	T	P	C
0	0	3	2

Objective: The course content consists of preparation, molecular weight determination, mechanical properties & hydroxyl number.

List of Experiments:

Polymer synthesis:

1. Free radical solution polymerization of styrene (St) / Methyl Methacrylate (MMA) / Methyl Acrylate (MA) / Acrylic acid (AA).
   - **a)** Purification of monomer
   - **b)** Polymerization using benzoyl peroxide (BPO) / 2,2'-azo-bis-isobutylonitrile (AIBN)
2. Preparation of nylon 66/6
3. Precipitation polymerization of acrylonitrile
4. Preparation of urea-formaldehyde resin
5. Preparations of novalac resin/ resold resin.
6. Microscale Emulsion Polymerization of Poly(methylacrylate).

Polymer characterization:

1. Determination of molecular weight by viscometry:
   - **a.** Polyacrylamide-aq. $NaNO_2$ solution
   - **b.** (Poly vinyl proplylidine (PVP) in water
2. Determination of the viscosity-average molecular weight of poly(vinyl alcohol) (PVOH) and the fraction of "head-to-head" monomer linkages in the polymer.
3. Determination of molecular weight by end group analysis: Polyethylene glycol (PEG) (OH group).
4. Testing of mechanical properties of polymers.
5. Determination of hydroxyl number of a polymer using colorimetric method.

Polymer analysis:

1. Estimation of the amount of HCHO in the given solution by sodium sulphite method

Text & Reference Books:

1. M.P. Stevens, Polymer Chemistry: An Introduction, Oxford University Press.
2. H.R. Allcock, F.W. Lampe & J.E. Mark, Contemporary Polymer Chemistry, Prentice-Hall.
3. F.W. Billmeyer, Textbook of Polymer Science, Wiley-Inter-science.
4. J.R. Fried, Polymer Science and Technology, Prentice-Hall.
5. M.P. Stevens, Polymer Chemistry: An Introduction, Oxford University Press.

*** Latest editions of all the suggested books are recommended**

Evaluation Scheme of Practical Examination:
Internal Evaluation (50 marks)

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

Evaluation scheme:

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

External Evaluation (50 marks)

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

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

Semester V
DISCIPLINE & GENERAL PROFICIENCY

Course Code: BGP511 **C-1**

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

1. Observance of dress code.

2. Participation in Conferences /Workshops / Seminars.

3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

4. Participation in community projects including NSS.

5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

8. General behavior

9. Any extraordinary achievement.

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

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

S No		Enroll No.	Student Name	Dress code	Participation in Conferences /Workshops / Seminars	Participation in guest lectures, invited talks and special technical sessions	Participation in community Services	Participation in Culture & extra curriculum activities, Department Club Activities	Participation in sports/ co-curricular activities	General Behavior	Any Extra Achievement
				(5)	**(15)**	**(20)**	**(10)**	**(20)**	**(20)**	**(5)**	**(5)**
	Responsible for marks			Mentor	Head	Head	Mentor	Cultural Events Coordinator & Department Club Coordinator	Sports Coordinator	Mentor	Director or Principal

Semester-VI
Inorganic Chemistry-IV

Course Code: BAS624 **L T P C**
4 0 0 4

Objective: It consists of theoretical principals in qualitative analysis of mixture including two basic radicals & two acidic radicals, synthesis, structure & bonding of organometallic compounds & metal carbonyls. Catalytic process plays an important role in industry.

Course Contents:

Unit – I **(08 Lectures)**

Theoretical Principles in Qualitative Analysis:
Basic principles involved in analysis of cations and anions, solubility products, common ion effect. Principals involved in separation of cations into groups and choice of group reagents. Interfering anions (fluoride, borate, oxalate and phosphate

Unit – II **(08 Lectures)**

Organometallic Compounds I:
Definition and classification of organometallic compounds, hapticity of organic ligands, 18 electron rules in metal carbonyls.
General methods of preparation of mono and binuclear carbonyls of 3d series.
Structures of mononuclear and binuclear carbonyls of Cr, Mn, Fe, Co and Ni using VBT.
acceptor behaviour of CO (MO diagram of CO to be discussed), synergic effect.
Zeise's salt: Preparation and structure, evidences of synergic effect.

Unit – III **(08 Lectures)**

Organometallic Compounds II:
Metal Alkyls: Important structural features of methyl lithium (tetramer) and trialkyl aluminium (dimer), concept of multicentre bonding in these compounds. Role of triethylaluminium in polymerisation of ethene (Ziegler – Natta Catalyst).
Ferrocene: Preparation and reactions (acetylation, alkylation, metallation, Mannich Condensation). Structure and aromaticity. Comparison of aromaticity and reactivity with that of benzene.

Unit – IV **(08 Lectures)**

Reaction Kinetics and Mechanism:
Introduction to inorganic reaction mechanisms. Substitution reactions in square planar complexes, Trans- effect, theories of trans effect, Mechanism of nucleophilic substitution in square planar complexes, Thermodynamic and Kinetic stability, Kinetics of octahedral substitution, Ligand field effects and reaction rates, Mechanism of substitution in octahedral complexes.

Unit – V **(08 Lectures)**

Catalysis by Organometallic Compounds:
General principles, properties and types of catalysts; Role of catalyst in industrial processes:

Alkene hydrogenation (Wilkinsons Catalyst), Hydroformylation (Co salts), Wacker Process, Synthetic gasoline (Fischer Tropsch reaction), Synthesis gas by metal carbonyl complexes Deactivation or regeneration of catalysts. Phase transfer catalysts,

Text & Reference Books:

1. Svehla, G. Vogel's Qualitative Inorganic Analysis, Prentice Hall.
2. Cotton, F.A.G.; Wilkinson & Gaus, P.L. Basic Inorganic Chemistry; Wiley India,
3. Huheey, J. E.; Keiter, E.A. & Keiter, R.L. Inorganic Chemistry, Principles of Structure and Reactivity, Harper Collins.
4. Sharpe, A.G. Inorganic Chemistry, Pearson Education.
5. Lee, J.D. Concise Inorganic Chemistry, John Wiley and sons.
6. Powell, P. Principles of Organometallic Chemistry, Chapman and Hall.

*** Latest editions of all the suggested books are recommended**

Semester-VI
Organic Chemistry-V

Course Code: BAS625 **L T P C**
4 0 0 4

Objective: To tell Students deeply regarding the different Spectral techniques like: UV-Vis, Infra-Red & NMR as well as its application in characterization of an organic molecule.
A brief study of dyes, its constituents & their application. Preparation, Properties & application of polymers.

Course Contents:

Unit – I **(08 Lectures)**

UV Spectroscopy: General principles Introduction to absorption and emission spectroscopy Types of electronic transitions, λmax, Chromophores and Auxochromes, Bathochromic and Hypsochromic shifts, Intensity of absorption; Application of Woodward Rules for calculation of λmax for the following systems: α,β unsaturated aldehydes, ketones, carboxylic acids and esters; Conjugated dienes: alicyclic, homoannular and heteroannular; Extended conjugated systems (aldehydes, ketones and dienes); distinction between cis and trans isomers.

Unit – II **(08 Lectures)**

IR Spectroscopy: Fundamental and non-fundamental molecular vibrations; IR absorptionpositions of O, N and S containing functional groups; Effect of H-bonding, conjugation, resonance and ring size on IR absorptions; Fingerprint region and its significance; application in functional group analysis.

Unit – III **(08 Lectures)**

NMR Spectroscopy**:** Basic principles of Proton Magnetic Resonance, chemical shift andfactors influencing it; Spin – Spin coupling and coupling constant; Anisotropic effects in alkene, alkyne, aldehydes and aromatics, Interpretation of NMR spectra of simple compounds.
Applications of IR, UV and NMR for identification of simple organic molecules.

Unit – IV **(08 Lectures)**

Dyes: Classification, Colour and constitution; Mordant and Vat Dyes; Chemistry of dyeing; Synthesis and applications of: Azo dyes – Methyl Orange and Congo Red (mechanism of Diazo Coupling); Triphenyl Methane Dyes -Malachite Green, Rosaniline and Crystal Violet; Phthalein Dyes – Phenolphthalein and Fluorescein; Natural dyes –structure elucidation and synthesis of Alizarin and Indigotin; Edible Dyes with examples.

Unit V **(08 Lectures)**

Polymers:

Introduction and classification, Number average molecular weight, Weight average molecular weight, Degree of polymerization, Addition and condensation -Mechanism of cationic, anionic and free radical addition polymerization; Ziegler-Natta polymerisation of alkenes;

Preparation and applications of plastics – thermosetting (phenol-formaldehyde, Polyurethanes) and thermosoftening (PVC, polythene);
Fabrics – natural and synthetic (acrylic, polyamido, polyester); Rubbers – natural and synthetic: Buna-S, Chloroprene and Neoprene; Vulcanization.

Text & Reference Books:

1. Kalsi, P. S. Textbook of Organic Chemistry, New Age International (P) Ltd. Pub.
2. Morrison, R. T. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
3. Billmeyer, F. W. Textbook of Polymer Science, John Wiley & Sons, Inc.
4. Gowariker, V. R.; Viswanathan, N. V. & Sreedhar, J. Polymer Science, New Age International (P) Ltd. Pub.
5. Finar, I. L. Organic Chemistry, Stereochemistry and the Chemistry of Natural Products), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
6. Graham Solomons, T.W. Organic Chemistry, John Wiley & Sons, Inc.
7. McMurry, J.E. Fundamentals of Organic Chemistry, Cengage Learning India Edition.
8. Clayden, J.; Greeves, N.; Warren, S.; Wothers, P.; Organic Chemistry, Oxford University Press.
9. Kemp, W. Organic Spectroscopy, Palgrave.

*** Latest editions of all the suggested books are recommended**

Semester-VI
Green Chemistry

[BAS626 amended vide approval dt. July 23, 2018 of V.C]

Course Code: BAS626 **L T P C**
4 0 0 4

Objective:

- To make the students aware of the impact of Chemistry on environment and imbibe the concept of sustainable developments
- To educate the students with respect to skills and knowledge to practice chemistry in ways that are benign to health and environment

Course Contents:

UNIT- I **(08 Lectures)**

Principles & Concept of Green Chemistry: Introduction–Concept and Principles - development of Green Chemistry- Atom economy reactions–rearrangement reactions, addition reactions- atom uneconomic-sublimation-elimination-Wittig reactions-toxicity measures- Need of Green Chemistry in our day to day life.

UNIT- II **(08 Lectures)**

Measuring and Controlling Environmental Performance- Importance of measurement – lactic acid production-safer Gasoline – introduction to life cycle assessment-four stages of Life Cycle Assessment (LCA) –Carbon foot printing-green process Matrics-eco labels - Integrated Pollution and Prevention and Control(IPPC)-REACH (Registration, Evaluation, Authorization of Chemicals)

UNIT- III **(08 Lectures)**

Emerging Green Technology and Alternative Energy Sources- Design for Energy efficiency-Photochemical reactions- Advantages-Challenge faced by photochemical process. Microwave technology on Chemistry- Microwave heating –Microwave assisted reactions-Sono chemistry and Green Chemistry –Electrochemical Synthesis-Examples of Electrochemical synthesis.

UNIT- IV **(08 Lectures)**

Renewable Resources-Biomass –Renewable energy – Fossil fuels-Energy from Biomass-Solar Power- Other forms of renewable energy-Fuel Cells-Alternative economics-Syngas economy- hydrogen economy-Bio refinery chemicals from fatty acids-Polymer from Renewable Resources –Some other natural chemical resources.

UNIT- V **(08 Lectures)**

Industrial Case Studies- Methyl Methacrylate (MMA)-Greening of Acetic acid manufacture-Vitamin C-Leather manufacture –Types of Leather –Difference between Hide and Skin-Tanning –Reverse tanning – Vegetable tanning –Chrome tanning-Fat liquoring – Dyeing –Application-Polyethylene- Ziegler Natta Catalysis-Metallocene Catalysis-Eco friendly Pesticides-Insecticides.

Text Books:

1. T.E Graedel, Streamlined Life cycle Assessment, Prentice Hall, New Jersey.
2. V.K. Ahluwalia, Green Chemistry, Environmentally Benign Reaction
3. Mike Lancaster, Green Chemistry and Introductory text, II Edition

Reference Books:

1. P. T. Anastas and J.C Warner, Green Chemistry theory and Practice, Oxford University press, Oxford.
2. P. Tundoet. al., Green Chemistry, Wiley –Blackwell, London. Protti D.Dondi et.al., Green Chemistry

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

Semester-VI
Open Elective

Introduction to Statistical Package for Social Sciences

Subject Code: BAS011

L	T	P	C
3	0	0	3

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

Course Contents-

Unit-I **(Lectures 08)**

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

Unit-II **(Lectures 08)**

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

Unit-III **(Lectures 08)**

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

Unit-IV **(Lectures 08)**

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

Unit-V **(Lectures 08)**

Correlation and regression: Correlation: Bivariate and Partial correlation; correlation matrix; Regression: Simple linear regression; Multiple regression analysis; Factor analysis, Cluster analysis.

Text and References Books:

1. Field, Andy. "Discovering Statistics Using SPSS." 3rd Ed., Sage Publishers.
2. Pallant, Julie. "SPSS Survival Manual." 4th Ed., McGraw-Hill.
3. Cronk, Brian. "How to Use SPSS: A Step-By-Step Guide to Analysis and Interpretation." 5thEd.
4. Kiran Pandya, Smruti Bulsari, Sanjay Sinha, "SPSS in simple steps" Wiley/Dreamtech Press.

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

Industrial Chemistry

Course Code: BAS012 **L T P C**
3 0 0 3

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

Course Contents:

Unit I **(08 Lectures)**

Silicate Industries:

Glass: Glassy state and its properties, classification (silicate and non-silicate glasses). Manufacture and processing of glass. Composition and properties of the following types of glasses: Soda lime glass, lead glass, armoured glass, safety glass, borosilicate glass, fluorosilicate, coloured glass, photosensitive glass.

Ceramics: Important clays and feldspar, ceramic, their types and manufacture. Hightechnology ceramics and their applications.

Cements: Classification of cement, ingredients and their role, Manufacture of cement and the setting process, quick setting cements.

Unit II **(08 Lectures)**

Fertilizers:

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

Unit III **(08 Lectures)**

Alloys:

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

Unit IV **(08 Lectures)**

Paints and Pigments: Introduction, : Characteristic of the pigments Classification of paints, Manufacture of paints, for example white lead, Sublimed white lead (Basic sulphate), Zinc oxide, Lithophone, Titanium dioxide, manufacture, Ultramarine blue , Read lead, Chrome green, Guignet's green , Reinmann's green , Setting of the paints Requirements of a good paint Emulsion paints, Constituents of emulsion paints. Advantages, Luminescent paints. Heat resistant paints, Varnishes, Manufacturing of varnishes, Lacquers, Solvents and thinners.

Unit V **(08 Lectures)**

Soaps & Detergents:

Introduction to oils and fats; common fatty acids present in oils and fats, Hydrogenation of

fats and oils, Saponification value, acid value, iodine number. Reversion and rancidity.
Soap: Soap and its manufacture, Toilet and transparent soap, Other soaps, Oil to be used for soap, Cleansing action of soap.

Detergents: Principal groups of synthetic detergents, Classification of surface active agents, Anionic detergents, Cationic detergents. Non-ionic detergents. Amphoteric detergents.

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Text & Reference Books:

1. E. Stocchi: Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK.
2. R. Gopalan, D. Venkappayya, S. Nagarajan: Engineering Chemistry, Vikas Publications, New Delhi.
3. Sharma, B.K. & Gaur, H. Industrial Chemistry, Goel Publishing House, Meerut.

*** Latest editions of all the suggested books are recommended**

Introduction to Nanoscience & Technology

Course Code: BAS013

L	T	P	C
3	0	0	3

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

Course Contents:

Unit I **(08 Lectures)**

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

Unit II **(08 Lectures)**

Quantum Dots: Excitons and excitonic Bohr radius – difference between nanoparticles and quantum dots - Preparation through colloidal methods - Epitaxial methods- MOCVD and MBE growth of quantum dots - current-voltage characteristics - magneto tunneling measurements -spectroscopy of Quantum Dots: Absorption and emission spectra - photo luminescence spectrum -optical spectroscopy - linear and nonlinear optical spectroscopy.

Unit III **(08 Lectures)**

Synthesis of Nanostructure Materials: Gas phase condensation – Vacuum deposition - Physical vapor deposition (PVD) - chemical vapor deposition (CVD) – laser ablation- Sol-Gel- Ball milling –Electro deposition- electroless deposition – spray pyrolysis – plasma based synthesis process (PSP) - hydrothermal synthesis.

Unit IV **(08 Lectures)**

Characterization: Principle and working of Atomic Force Microscopy (AFM) and Scanning tunneling microscopy (STM) - near-field Scanning Optical Microscopy – Principle of Transmission Electron Microscopy (TEM) – applications to nanostructures – nanomechanical characterization – nanoindentation.

Unit V **(08 Lectures)**

Nanotechnology Applications: Applications of nanoparticles, quantum dots, nanotubes and nanowires for nanodevice fabrication – Single electron transistors, coulomb blockade effects in ultra-small metallic tunnel junctions - nanoparticles based solar cells and quantum dots based white LEDs – CNT based transistors – principle of dip pen lithography.

Text & References Books:

1. Hand book of Nanoscience, Engineering and Technology (The Electrical Engineering handbook series), Kluwer Publishers.
2. "Sol-Gel Science", C.J. Brinker and G.W. Scherrer, Academic Press, Boston.
3. Nanoscale characterization of surfaces & interfaces, N John Dinardo, Weinheim Cambridge: Wiley-VCH.
4. "Nanotechnology" G. Timp. Editor, AIP press, Springer-Verlag, New York.
5. "Nanostructured materials and nanotechnology'', Concise Edition, Editor:-Hari Singh Nalwa; Academic Press, USA.

*** Latest editions of all the suggested books are recommended**

Semester-VI
Inorganic Chemistry-IV (Lab)

Course Code: BAS661 **L T P C**
0 0 3 2

Objective:
It consists of theoretical principals in qualitative analysis of mixture including two basic radicals & two acidic radicals

List of Experiments:
Qualitative semimicro analysis of mixtures containing 3 anions and 3 cations. Emphasis should be given to the understanding of the chemistry of different reactions. The following radicals are suggested:

$CO3^{2-}$, $NO2^{-}$, S^{2-}, $SO3^{2-}$,$S2O3^{2-}$, $CH3COO^{-}$, F^{-},Cl^{-}, Br^{-}, I^{-}, $NO3^{-}$, BO 3^{3-}, $C2O4^{2-}$, $PO4^{3-}$, $NH4^{+}$, Pb^{2+}, Cu^{2+}, Cd^{2+}, Bi^{3+}, Sn^{2+}, Sb^{3+}, Fe^{3+}, Al^{3+}, Cr^{3+}, Zn^{2+}, Mn^{2+}, Co^{2+}, Ni^{2+}, Ba^{2+},Sr^{2+}, Ca^{2+}, Mg^{2+}

Mixtures should preferably contain one interfering anion, **or** insoluble component (BaSO4, SrSO4, PbSO4, CaF2 or Al2O3) **or** combination of anions e.g. $CO3^{2-}$and $SO3^{2-}$, $NO2^{-}$ and $NO3^{-}$, Cl^{-} and Br^{-}, Cl^{-} and I^{-}, $Br^{-}$and I^{-}, $NO3^{-}$ and Br^{-}, $NO3^{-}$ and I^{-}.
Spot tests should be done whenever possible.

i. Controlled synthesis of two copper oxalate hydrate complexes.
ii. Preparation of acetylacetanato complexes of Cu^{2+}/Fe^{3+}. Find the λmax of the complex.
iii. Synthesis of ammine complexes of Ni(II) and its ligand exchange reactions (e.g. bidentate ligands like acetylacetone, DMG, glycine) by substitution method.

Text & Reference Books:

1. Vogel's Qualitative Inorganic Analysis, Revised by G. Svehla. Pearson Education.
2. Marr & Rockett Practical Inorganic Chemistry. John Wiley & Sons.

*** Latest editions of all the suggested books are recommended**

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

Evaluation scheme:

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

External Evaluation (50 marks)

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

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

Semester-VI
Organic Chemistry-V (Lab)

Course Code: BAS662 **L T P C**
0 0 3 2

Objective: This course content provides an idea to the student for the extraction of caffeine from tea leaves, preparation of polymers & analysis of organic compounds.

List of Experiments:

1. Extraction of caffeine from tea leaves.
2. Preparation of sodium polyacrylate.
3. Preparation of urea formaldehyde.
4. Analysis of Carbohydrate: aldoses and ketoses, reducing and non-reducing sugars.
5. Qualitative analysis of unknown organic compounds containing monofunctional groups (carbohydrates, aryl halides, aromatic hydrocarbons, nitro compounds, amines and amides) and simple bifunctional groups, for e.g. salicylic acid, cinnamic acid, nitrophenols, etc.
6. Identification of simple organic compounds by IR spectroscopy (Spectra to be provided).
7. Preparation of methyl orange.

Text & Reference Books:

1. Vogel, A.I. Quantitative Organic Analysis, Part 3, Pearson.
2. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education.
3. Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. Practical Organic Chemistry, Pearson.
4. Ahluwalia, V.K. & Aggarwal, R. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, University Press.
5. Ahluwalia, V.K. & Dhingra, S. Comprehensive Practical Organic Chemistry: Qualitative Analysis, University Press.

*** Latest editions of all the suggested books are recommended**

Evaluation Scheme of Practical Examination:

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

Evaluation scheme:

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

External Evaluation (50 marks)

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

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

Semester-VI
Green Chemistry (Lab)

Course Code: BAS663 **L T P C**
0 0 3 2

Objective:
The aim of green chemistry is very clear. The students are advice to use the safe chemicals mostly reactions are carried out under natural sunlight to put any pollutant in nature. The catalyst and solvents used in green chemistry do not give any harmful impact on environment

List of Experiments:

1. Preparation and characterization of nanoparticles of gold using tea leaves.
2. Preparation of propene by two methods can be studied
   - **i.** Triethylamine ion + OH^- → propene + trimethylpropene + water
   - **ii.** (II) 1-propanol ⟶ propene + water
3. Benzoin condensation using Thiamine Hydrochloride as a catalyst instead of cyanide.
4. Mechanochemical solvent free synthesis of azomethines
5. Solvent free, microwave assisted one pot synthesis of phthalocyanine complex of copper (II).
6. Photoreduction of benzophenone to benzopinacol in the presence of sunlight.

Text & Reference Books:

1. Anastas, P.T & Warner, J.C. Green Chemistry: Theory and Practice, Oxford University Press.
2. Kirchoff, M. & Ryan, M.A. Greener approaches to undergraduate chemistry experiment. American Chemical Society, Washington DC.
3. Ryan, M.A. Introduction to Green Chemistry, Tinnesand, American Chemical Society, Washington DC.
4. Cann, M.C. & Connelly, M. E. Real world cases in Green Chemistry, American Chemical Society.

*** Latest editions of all the suggested books are recommended**

Evaluation Scheme of Practical Examination:

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

Evaluation scheme:

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

External Evaluation (50 marks)

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

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

Semester-VI
Seminar, Viva & Presentation

Course Code: BAS698

L	T	P	C
0	0	4	2

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

General guidelines are as follows-

1. Students will make seminar report which should be preferably a working of third thoughts based on their subject.
2. The student will be assigned a faculty guide who will be the supervisor of the students. The faculty would be identified at the end of the V^{th} semester.
3. Internal assessment of the students should be done at least twice in the semester.
4. The students shall present the final presentation live using overhead projector PowerPoint presentation on LCD to the internal committee and the external examiner.
5. The internal evaluation committee shall consist of faculty members constituted by the college which would be comprised of at least three members comprising of the department Coordinator's, Class Coordinator and a nominee of the Director/Principal. The students guide would be special in invitee to the presentation. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each members of the committee.

The Marking shall be as follows.

Internal: 50 marks

By the Faculty Guide – 25 marks

By Committee appointed by the Director/Principal – 25 marks

External: 50 marks

By External examiner appointed by the University – 50

Top Cover- The sample top cover shall be as under:

TITLE (18 pt Times New Roman CAPS)

SEMINAR REPORT (14)

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

BACHELOR OF SCIENCE (16)

In (16)

Chemistry (16)

Submitted by (12)

Name

Enrollment No

Under the guidance of (12)

Name of Guide & Designation (14)

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

(December, 2017) (14)

EVALUATION SHEET

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

Name of Candidate:
Roll No:

Class and Section:

Please evaluate out of Five marks each.

S. No.	Details	Marks (5) Guide	Marks (5) Int. Exam. 1	Marks (5) Int. Exam. 2
1.	Objective Identified &Understood			
2.	Literature Review / Background Work (Coverage, Organization, Critical Review)			
3.	Discussion/Conclusions (Clarity, Exhaustive)			
4.	Slides/Presentation Submitted (Readable, Adequate)			
5.	Frequency Of Interaction (Timely Submission, Interest Shown, Depth, Attitude)			
	Total (Out of 25)			
	Average out of 50			

Signature: Signature: Signature:
Date: Date: Date:

EVALUATION SHEET FOR EXTERNAL EXAMINER

(To be filled by the External Examiner only)

Name of Candidate:

Roll No:

I. For use by **External Examiner ONLY**

S. No.	Details	Marks (10) each
1.	Objective Identified & Understood	
2.	Literature Review / Back ground Work (Coverage, Organization, Critical Review)	
3.	Discussion/Conclusions (Clarity, Exhaustive)	
4.	Power Point Presentation (Clear, Structured)	
5.	Slides (Readable, Adequate)	
	Total (Out of 50)	

Signature:

Date:

EVALUATION SUMMARY SHEET

(To be filled by External Examiner)

Name and Roll No.	Internal Examiners (50)	External Examiner (50)	Total (100)	Result (Pass/Fail)

Note: The summary sheet is to be completed for all students and the same shall also be Compiled for all students examined by External Examiner. The Format shall be provided by the course coordinator.

Semester VI

DISCIPLINE & GENERAL PROFICIENCY

Course Code: BGP611 **C-1**

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

1. Observance of dress code.

2. Participation in Conferences /Workshops / Seminars.

3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

4. Participation in community projects including NSS.

5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

8. General behavior

9. Any extraordinary achievement.

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

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

S No		Enroll No.	Student Name	Dress code	Participation in Conferences /Workshops / Seminars	Participation in guest lectures, invited talks and special technical sessions	Participation in community Services	Participation in Culture & extra curriculum activities, Department Club Activities	Participation in sports/ co-curricular activities	General Behavior	Any Extra Achievement
				(5)	**(15)**	**(20)**	**(10)**	**(20)**	**(20)**	**(5)**	**(5)**
	Responsible for marks			Mentor	Head	Head	Mentor	Cultural Events Coordinator & Department Club Coordinator	Sports Coordinator	Mentor	Director or Principal