

Pre Revision

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

Website: www.tmu.ac.in



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




Post Revision

Study & Evaluation Scheme of

Bachelor of Science (Hons.) (Chemistry)

[Applicable for Academic Session 2019-20]



TEERTHANKER MAHAVEER UNIVERSITY

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

Website: www.tmu.ac.in



Study & Evaluation Scheme Semester I

S. No.		Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC	BAS111	Inorganic Chemistry-I	4	-	-	4	40	60	100
2	CC	BAS112	Physical Chemistry-I	4	-	-	4	40	60	100
3	AEC	BAS113	Elementary mathematics	3	1	-	4	40	60	100
4	GC	BAS114/ BAS213	Mechanics	4	-	-	4	40	60	100
5	AEC	TMUGE101	English Communication-I	2	-	2	3	40	60	100
6	CC	BAS164	Inorganic Chemistry-I (Lab)	-	-	4	2	50	50	100
7	CC	BAS165	Physical Chemistry-I (Lab)	-	-	4	2	50	50	100
8	GC	BAS166/ BAS267	Mechanics (Lab)	-	-	4	2	50	50	100
Total				17	1	14	25	350	450	800

Value Added Course: It is an audit course. The performance of the student in this course will not be counted in the overall result however the student has to pass it compulsorily with 45% marks.

1	VAAC-1	TMUGA-101	Foundation in Quantitative Aptitude	2	1	-	-	40	60	100
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Semester II

S. No.		Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC	BAS211	Organic Chemistry-I	4	-	-	4	40	60	100
2	CC	BAS212	Physical Chemistry-II	4	-	-	4	40	60	100
3	GC	BAS220	Waves & optics	4	-	-	4	40	60	100
4	AEC	TMU201	Environmental Studies	2	1	-	3	40	60	100
5	AEC	TMUGE201	English Communication-II	2	-	2	3	40	60	100
6	CC	BAS264	Organic Chemistry-I (Lab)	-	-	4	2	50	50	100
7	CC	BAS265	Physical Chemistry-II (Lab)	-	-	4	2	50	50	100
8	GC	BAS266	Waves & Optics (Lab)	-	-	4	2	50	50	100
Total				16	1	14	24	350	450	800

Value Added Course:

1	VAAC-2	TMUGA-201	Analytical Reasoning	2	1	-	-	40	60	100
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B.Sc. (H) (Chemistry)-Semester III

S. No	Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC	BAS311	Inorganic Chemistry-II	4	-	-	4	40	60	100
2	CC	BAS312	Organic Chemistry-II	4	-	-	4	40	60	100
3	CC	BAS313	Physical Chemistry-III	4	-	-	4	40	60	100
4	AECC	TMUGE301	English Communication-III	2	-	2	3	40	60	100
5	GEC		Generic Elective Course (Theory) Generic Elective-III	4	-	-	4	40	60	100
6	LC	BAS361	Inorganic Chemistry-II (Lab)	-	-	4	2	50	50	100
7	LC	BAS362	Organic Chemistry-II (Lab)	-	-	4	2	50	50	100
8	LC	BAS363	Physical Chemistry-III (Lab)	-	-	4	2	50	50	100
9	DGP	BGP311	Discipline & General Proficiency	-	-	-	-	100	-	100
			Total	18	-	14	25	350	450	800

Value Added Course:

1	VAAC-3	TMUGA-302	Modern Algebra and Data Management	2	1	-	-	40	60	100
2	VAAC-4	TMUGS-301	Managing Self	2	1	-	-	50	50	100



B.Sc. (H) (Chemistry)-Semester IV

S. No	Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC	BAS419	Inorganic Chemistry-III	4	-	-	4	40	60	100
2	CC	BAS412	Organic Chemistry-III	4	-	-	4	40	60	100
3	CC	BAS413	Physical Chemistry-IV	4	-	-	4	40	60	100
4	AECC	TMUGE401	English Communication-IV	2	-	2	3	40	60	100
5	GEC		Generic Elective Course Generic Elective-IV	4	-	-	4	40	60	100
6	LC	BAS461	Inorganic Chemistry-III (Lab)	-	-	4	2	50	50	100
7	LC	BAS462	Organic Chemistry-III (Lab)	-	-	4	2	50	50	100
8	LC	BAS465	Physical Chemistry-IV (Lab)	-	-	4	2	50	50	100
9	DGP	BGP411	Discipline & General Proficiency	-	-	-	-	100	-	100
Total				18	-	14	25	350	450	800

Value Added Course:

1	VAAC-5	TMUGA-402	Advance Algebra and Geometry	2	1	-	-	40	60	100
2	VAAC-6	TMUGS-401	Managing Work and Others	2	1	-	-	50	50	100

MOOC Course:

1	MOOC-1	MOOC12	MOOC Program –I (Optional)	-	-	-	2	-	100	100
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B.Sc. (H) (Chemistry)-Semester V

S. No	Category	Course Code	Course	Periods			Credit	Evaluation Scheme			
				L	T	P		Internal	External	Total	
1	CC	BAS525	Organic Chemistry-IV	4	-	-	4	40	60	100	
2	CC	BAS526	Physical Chemistry-V	4	-	-	4	40	60	100	
3	MC	BHM515	Human Values & Professional Ethics	3	-	-	3	40	60	100	
DSE-I											
4	DSE		Discipline Specific Elective Courses	Discipline Specific Elective Course-I	4	-	-	4	40	60	100
5	DSE			Discipline Specific Elective Course-I(Lab)	-	-	4	2	50	50	100
6	OEC		Open Elective Course	Open Elective-I	3	-	-	3	40	60	100
7	LC	BAS561	Organic Chemistry-IV (Lab)		-	-	4	2	50	50	100
8	LC	BAS562	Physical Chemistry-V (Lab)		-	-	4	2	50	50	100
9	PROJ	BAS598	Industrial Training & Presentation		-	-	6	3	50	50	100
10	DGP	BGP511	Discipline & General Proficiency		-	-	-	-	100	-	100
			Total		18	-	18	27	400	500	900

MOOC Course:

1	MOOC-2	MOOC13	MOOC Program –II (Optional)	-	-	-	2	-	100	100
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B.Sc. (H) (Chemistry)-Semester VI

S. No	Category	Course Code	Course	Periods			Credit	Evaluation Scheme			
				L	T	P		Internal	External	Total	
1	CC	BAS624	Inorganic Chemistry-IV	4	-	-	4	40	60	100	
2	CC	BAS625	Organic Chemistry-V	4	-	-	4	40	60	100	
DSE- II											
3	DSE		Discipline Specific Elective Courses	Discipline Specific Elective Course-II	4	-	-	4	40	60	100
4	DSE			Discipline Specific Elective Course-II (Lab)	-	-	4	2	50	50	100
DSE-III											
5	DSE		Discipline Specific Elective Courses	Discipline Specific Elective Course-III	4	-	-	4	40	60	100
6	DSE			Discipline Specific Elective Course-III (Lab)	-	-	4	2	50	50	100
7	OEC		Open Elective Course	Open Elective-II	3	-	-	3	40	60	100
8	LC	BAS661	Inorganic Chemistry-IV (Lab)		-	-	4	2	50	50	100
9	LC	BAS662	Organic Chemistry-V (Lab)		-	-	4	2	50	50	100
10	DGP	BGP611	Discipline & General Proficiency		-	-	-	-	100	-	100
			Total		19	-	16	27	400	500	900



ELECTIVE COURSES OFFERED

S. No	Code	Course	L	T	P	Credit
Semester III- Generic Elective III -(Any one)						
1	BAS314	Elements of Modern Physics	4	-	-	4
2	BAS331	Numerical Analysis	4	-	-	4
Semester IV- Generic Elective IV -(Any one)						
3	BAS418	Thermal Physics	4	-	-	4
4	BAS435	Introduction to Probability	4	-	-	4
Semester V						
Discipline Specific Elective Course-I (Any one)						
5	BAS527	Analytical Chemistry	4	-	-	4
	BAS563	Analytical Chemistry (Lab)	-	-	4	2
6	BAS529	Molecular modeling & Drug Design	4	-	-	4
	BAS565	Molecular modeling & Drug Design (Lab)	-	-	4	2
Semester VI						
Discipline Specific Elective Course-II (Any One)						
7	BAS637	Polymer Chemistry	4	-	-	4
	BAS671	Polymer Chemistry (Lab)	-	-	4	2
8	BAS638	Novel Inorganic Solids	4	-	-	4
	BAS672	Novel Inorganic Solids (Lab)	-	-	4	2
Semester VI						
Discipline Specific Elective Course-III (Any One)						
9	BAS626	Green Chemistry	4	-	-	4
	BAS663	Green Chemistry (Lab)	-	-	4	2
10	BAS627	Chemistry of Drugs, Cosmetics & Perfumes	4	-	-	4
	BAS664	Chemistry of Drug Cosmetics & Perfumes (Lab)	-	-	4	2

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New course Added

Course Code: TMUGA-101	Value Added Course BSC- Semester-I Foundation in Quantitative Aptitude	L-2 T-1 P-0 C-0
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Solving complex problems using criss cross method, base method and square techniques.	
CO2.	Applying the arithmetical concepts of Average, Mixture and Allegation.	
CO3.	Evaluating the different possibilities of various reasoning based problems in series, Blood relation and Direction.	
CO4.	Operationalizing the inter-related concept of Percentage in Profit Loss and Discount, Si/CI and Mixture/Allegation.	
Course Content:		
Unit-1:	Speed calculations Squares till 1000, square root, multiplications: base 100, 200 300 etc., 11-19, crisscross method for 2X2, 3X3, 4X4, 2X3, 2X4 etc., cubes, cube root	2 Hours
Unit-2:	Percentages Basic calculation, ratio equivalent, base, change of base, multiplying factor, percentage change, increment, decrement, successive percentages, word problems	5 Hours
Unit-3:	Profit Loss Discount Basic definition, formula, concept of mark up, discount, relation with successive change, faulty weights	5 Hours
Unit-4:	SI and CI Simple Interest, finding time and rate, Compound Interest, difference between SI and CI, Installments	2 Hours
Unit-5:	Averages Basic Averages, Concept of Distribution, Weighted Average, equations	2 Hours
Unit-6:	Mixtures and allegations Mixtures of 2 components, mixtures of 3 components, Replacements	4 Hours
Unit-7:	Number and alphabet series Number series, alphabet series	2 Hours
Unit-8:	Blood relations Indicating type, operator type, family tree type	2 Hours
Unit-9:	Ranking Linear ranking, complex ranking	1 Hours
Unit-10:	Direction sense Simple statements, shadow type	1 Hours
Unit-11:	Cubes and dices Concept of cubes, rotation type, Dices, regular dices, irregular dices	4 Hours
Text Book:	• Quantitative Aptitude by R.S. Agrawal	



<u>Course Code:</u> TMUGA-201	Value Added Course B.Sc.(H) Chemistry- Semester-II Analytical Reasoning	L-2 T-1 P-0 C-0
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Applying the arithmetical concepts in Ratio Proportion Variation.	
CO2.	Employing the techniques of Percentage; Ratios and Average in inter related concepts of Time and Work, Time Speed and Distance.	
CO3.	Identifying different possibilities of reasoning based problems of Syllogisms and Venn diagram.	
CO4.	Examining the optimized approach to solve logs and Surds.	
Course Content:		
Unit-1:	Ratio, proportions and variations Concept of ratios, proportions, variations, properties and their applications	5 Hours
Unit-2:	Time and Work Same efficiency, different efficiency, alternate work, application in Pipes and Cisterns	6 Hours
Unit-3:	Time Speed Distance Average speed, proportionalities in Time, Distance, trains, boats, races, circular tracks	6 Hours
Unit-4:	Logs and Surds Concept and properties of logs, surds and indices	4 Hours
Unit-5:	Coding and decoding Sequential coding, reverse coding, abstract coding	3 Hours
Unit-6:	Syllogisms Two statements, three statements	4 Hours
Unit-7:	Venn diagram Basic concept and applications	2 Hours
<u>Reference Books:</u>	<ul style="list-style-type: none"> R1:-Arun Shrama:- How to Prepare for Quantitative Aptitude R2:-Quantitative Aptitude by R.S. Agrawal R3:-M Tyra: Quicker Maths R4:-Nishith K Sinha:- Quantitative Aptitude for CAT R5:-Reference website:- Lofoya.com, gmatchclub.com, cracku.in, handakafunda.com, tathagat.mba, Indiabix.com R6:-Logical Reasoning by Nishith K Sinha R7:-Verbal and Non Verbal Reasoning by R.S. Agrawal <p>* Latest editions of all the suggested books are recommended.</p>	

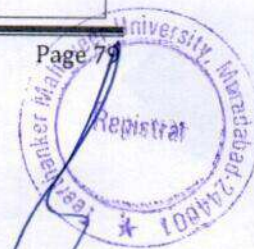


New Course Added

Course Code: TMUGA-302	<p align="center">Value Added Course</p> <p align="center">B.Sc. (H) Chemistry- Semester-III</p> <p align="center">Modern Algebra and Data Management</p>	L-2 T-1 P-0 C-0
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Applying the concepts of modern mathematics Divisibility rule, Remainder Theorem, HCF /LCM in Number System.	
CO2.	Relating the rules of permutation and combination, Fundamental Principle of Counting to find the probability.	
CO3.	Applying calculative and arithmetical concepts of ratio, Average and Percentage to analyze and interpret data.	
CO4.	Correlating the various arithmetic concepts to check sufficiency of data	
Course Content:		
Unit-1:	Number theory Classification of Numbers, Divisibility Rules, HCF and LCM, Factors, Cyclicity(Unit Digit and Last Two digit), Remainder Theorem, Highest Power of a Number in a Factorial, Number of trailing zeroes	8 Hours
Unit-2:	Data interpretation Data Interpretation Basics, Bar Chart, Line Chart, Tabular Chart, Pie Chart, DI tables with missing values	7 Hours
Unit-3:	Data Sufficiency Introduction of Data Sufficiency, different topics based DS	5 Hours
Unit-4:	Permutations and combinations Fundamental counting, and or, arrangements of digits, letters, people in row, identical objects, rank, geometrical arrangements, combination: - basic, handshakes, committee, selection of any number of objects, identical and distinct, grouping and distribution, de-arrangements	6 Hours
Unit-5:	Probability Introduction, Probability based on Dice and Coins, Conditional Probability, Bayes Theorem	4 Hours
Reference Books:	<ul style="list-style-type: none"> • R1:-Arun Shrama:- How to Prepare for Quantitative Aptitude • R2:-Quantitative Aptitude by R.S. Agrawal • R3:-M Tyra: Quicker Maths • R4:-Nishith K Sinha:- Quantitative Aptitude for CAT • R5:-Reference website:- Lofoya.com, gmatclub.com, cracku.in, handakafunda.com, tathagat.mba, Indiabix.com • R6:-Logical Reasoning by Nishith K Sinha • R7:-Verbal and Non Verbal Reasoning by R.S. Agrawal <p>* Latest editions of all the suggested books are recommended.</p>	



Course Code: TMUGS-301	Value Added Course B.Sc.(H) Chemistry- Semester-III Managing Self	L-2 T-1 P-0 C-0
Course Outcomes:	On completion of the course, the students will be:	
CO1.	Utilizing effective verbal and non-verbal communication techniques in formal and informal settings	
CO2.	Understanding and analyzing self and devising a strategy for self-growth and development.	
CO3.	Adapting a positive mindset conducive for growth through optimism and constructive thinking.	
CO4.	Utilizing time in the most effective manner and avoiding procrastination.	
CO5.	Making appropriate and responsible decisions through various techniques like SWOT, Simulation and Decision Tree.	
CO6.	Formulating strategies of avoiding time wasters and preparing to-do list to manage priorities and achieve SMART goals.	
Course Content:		
Unit-1:	Personal Development: Personal growth and improvement in personality Perception Positive attitude Values and Morals High self motivation and confidence Grooming	10 Hours
Unit-2:	Professional Development: Goal setting and action planning Effective and assertive communication Decision making Time management Presentation Skills Happiness, risk taking and facing unknown	8 Hours
Unit-3:	Career Development: Resume Building Occupational Research Group discussion (GD) and Personal Interviews	12 Hours
Reference Books:	<ol style="list-style-type: none"> 1. Robbins, Stephen P., Judge, Timothy A., Vohra, Neharika, Organizational Behaviour (2018), 18th ed., Pearson Education 2. Tracy, Brian, Time Management (2018), Manjul Publishing House 3. Hill, Napoleon, Think and grow rich (2014), Amazing Reads 4. Scott, S.J., SMART goals made simple (2014), Createspace Independent Pub 5. https://www.hloom.com/resumes/creative-templates/ 6. https://www.mbauniverse.com/group-discussion/topic.php 7. Rathgeber, Holger, Kotter, John, Our Iceberg is melting (2017), Macmillan 8. Burne, Eric, Games People Play (2010), Penguin UK 9. https://www.indeed.com/career-advice/interviewing/job-interview-tips-how-to-make-a-great-impression <p>* Latest editions of all the suggested books are recommended.</p>	



New Course
Added

Course Code: BAS331	Generic Elective Course-III B.Sc.(H) Chemistry- Semester-III Numerical Analysis	L-4 T-0 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding finite differences and interpolation with equal intervals and Unequal Intervals.	
CO2.	Understanding introduction of operators and its properties.	
CO3.	Applying numerical solution of first order differential equation using Eulers, Picards and Runge Kutta methods and derivative using forward and backward difference interpolation.	
CO4.	Analyzing Lagrange's interpolation formula for unequal intervals.	
CO5.	Evaluating Numerical differentiation and Integration, Trapezoidal Formulae, Simpson's Rule, Weddle rule and Cote's formula.	
Course Content:		
Unit-1:	Introduction of finite differences; Forward and backward differences, Forward and backward differences table, Missing term problems, General Introduction of operators and its properties.	8 Hours
Unit-2:	Interpolation with equal intervals and Unequal Intervals; Newton Gregory Forward and Backward Formula, Divided difference table, Newton's divide difference Formula, Lagrange's Interpolation Formula, Hermit Interpolation formulas using differences.	8 Hours
Unit-3:	Central difference formulae, Bessel's and Stirling formula, Gauss Forward and Backward, Evertt formula.	8 Hours
Unit-4:	Numerical differentiation and Integration, Derivative using forward and backward difference interpolation formula, Trapezoidal Rule, Simpson's one-third and three-eighth rules, Weddle rule and Cotes formula.	8 Hours
Unit-5:	Numerical solution of first order differential equation using Eulers, Picards and Runge Kutta methods.	8 Hours
Text Books:	1. Numerical analysis", by Burden, Cengage Learning. 2. "Numerical Analysis" by B. S. Grewal, Khanna Publishing. 3. "Numerical Analysis" by Pradeep Niyosi, Tata Mcgraw Hell.	
Reference Books:	1. "Numerical Analysis" by P.P. Gupta and Sanjay Gupta, Krishana Prakashan Mandir. 2. "Numerical Analysis" by S.S. Sastry, Prentice Hall of India. 3. "Introduction to Numerical Analysis" by C. E. Froberg, Addition Welly Publishing Co. https://www.youtube.com/watch?v=awhBIJoemZU *Latest editions of all the suggested books are recommended.	



New Course Added

Course Code: BAS418	Generic Elective Course-IV B.Sc.(H) Chemistry- Semester-III Thermal Physics	L-4 T-0 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Remembering and understanding the laws of thermodynamics, entropy, and Maxwell's thermodynamic relations.	
CO2.	Understanding the Kinetic theory of gases-distribution of velocities, and molecular collisions in Physics.	
CO3.	Understanding the basics of real gases.	
CO4.	Applying the T-S diagram to understand phase transition processes	
CO5.	Applying Maxwell's thermodynamic relations to understand ideal and Van der Waal Gases, Energy equations, Change of Temperature during Adiabatic Process	
Course Content:		
Unit-1:	Introduction to Thermodynamics: Zeroth, First & Second Law of Thermodynamics: Thermodynamic Variables & Equilibrium, Concept of Temperature, Work & Heat, Internal Energy, Applications of First Law: General Relation between C_p and C_v , Work Done during Isothermal and Adiabatic Processes, Compressibility and Expansion Co-efficient. Reversible and Irreversible process with examples, Conversion of Work into Heat and Heat into Work, Carnot's Cycle, Carnot engine & efficiency, Applications of Second Law of Thermodynamics.	8 Hours
Unit-2:	Entropy & Thermodynamic Potentials: Concept of Entropy, Clausius Theorem, Clausius Inequality, Second Law of Thermodynamics in terms of Entropy, Entropy of a perfect gas, Principle of Increase of Entropy. Entropy Changes in Reversible and Irreversible processes with examples. Entropy of the Universe, Principle of Increase of Entropy. Temperature-Entropy diagrams. Third Law of Thermodynamics. Thermodynamic Potentials, First and second order Phase Transitions with examples, Clausius Clapeyron Equation and Ehrenfest equations.	8 Hours
Unit-3:	Maxwell's Thermodynamic Relations: Derivations and applications of Maxwell's Relations, Maxwell's Relations: (1) Clausius Clapeyron equation, (2) Values of C_p-C_v , (3) TdS Equations, (4) Joule-Kelvin coefficient for Ideal and Van der Waal Gases, (5) Energy equations, (6) Change of Temperature during Adiabatic Process.	8 Hours
Unit-4:	Kinetic Theory of Gases-Distribution of Velocities, Molecular Collisions: Maxwell-Boltzmann Law of Distribution of Velocities in an Ideal Gas and its Experimental Verification, Degrees of Freedom. Law of equipartition of Energy (No proof required). Specific heats of Gases, Mean Free Path, Collision Probability, Estimates of Mean Free Path. Transport Phenomenon in Ideal Gases: (1) Viscosity, (2) Thermal Conductivity and (3) Diffusion. Brownian motion and its Significance.	8 Hours
Unit-5:	Real Gases: Behavior of Real Gases: Deviations from the Ideal Gas Equation. The Virial Equation, Critical Constants, Continuity of Liquid and Gaseous State. Vapour	8 Hours



	and Gas. Boyle Temperature. Van der Waal's Equation of State for Real Gases. P-V Diagrams, Joule's Experiment. Free Adiabatic Expansion of a Perfect Gas. Joule-Thomson Porous Plug Experiment. Joule-Thomson Effect for Real and Van der Waal Gases. Temperature of Inversion, Joule-Thomson Cooling.	
<u>Text Books:</u>	1. 1. Thermal Physics, S. Garg, R. Bansal and Ghosh, 2 nd Edition, Tata McGraw-Hill Modern Thermodynamics with Statistical Mechanics, Carl S. Helrich, Springer	
<u>Reference Books:</u>	<ol style="list-style-type: none"> 1. Heat and Thermodynamics, M.W. Zemansky, Richard Dittman, McGraw-Hill. A Treatise on Heat, Meghnad Saha, and B. N. Srivastava, Indian Press 2. Thermodynamics, Kinetic Theory & Statistical Thermodynamics, Sears & Salinger. Narosa. 3. Concepts in Thermal Physics, S.J. Blundell and K.M. Blundell, Oxford University Press 4. Thermal Physics, A. Kumar and S.P. Taneja, R. Chand Publications. 5. https://itp.uni-frankfurt.de/~gros/Vorlesungen/TD/5 Thermodynamic potentials.pdf <p>* Latest editions of all the suggested books are recommended</p>	



New course Added

Course Code: TMUGA-402	<p align="center">Value Added Course</p> <p align="center">B.Sc. (H) Chemistry- Semester-IV</p> <p align="center">Advance Algebra and Geometry</p>	<p align="center">L-2 T-1 P-0 C-0</p>
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Recognizing the rules of Crypt-arithmetic and relate them to find out the solutions.	
CO2.	Illustrating the different concepts of Height and Distance and Functions.	
CO3.	Employing the concept of higher level reasoning in Clocks, Calendars and Puzzle Problems.	
CO4.	Correlating the various arithmetic and reasoning concepts in checking sufficiency of data.	
Course Content:		
Unit-1:	Clocks and calendars Introduction , Angle based , faulty Clock, Interchange of hands, Introduction of Calendars, Leap Year , Ordinary Year	5 Hours
Unit-2:	Set theory Introduction , Venn Diagrams basics, Venn Diagram – 3 sets, 4-Group Venn Diagrams	4 Hours
Unit-3:	Heights and Distance Basic concept, Word problems	3 Hours
Unit-4:	Functions Introduction to Functions, Even and Odd Functions, Recursive	3 Hours
Unit-5:	Problem Solving Introduction, Puzzle based on 3 variable, Puzzle based on 4 variable	6 Hours
Unit-6:	Data Sufficiency Introduction, Blood relation based, direction based, ranking based	5 Hours
Unit-7:	Crypt Arithmetic Introduction of Crypt Arithmetic, Mathematical operations using Crypt Arithmetic, Company Specific Pattern	4 Hours
Reference Books:	<ul style="list-style-type: none"> R1:-Arun Shrama:- How to Prepare for Quantitative Aptitude R2:-Quantitative Aptitude by R.S. Agrawal R3:-M Tyra: Quicker Maths R4:-Nishith K Sinha:- Quantitative Aptitude for CAT R5:-Reference website:- Lofoya.com, gmatclub.com, cracku.in, handakafunda.com, tathagat.mba, Indiabix.com R6:-Logical Reasoning by Nishith K Sinha R7:-Verbal and Non Verbal Reasoning by R.S. Agrawal <p>* Latest editions of all the suggested books are recommended.</p>	



Course Code: TMUGS-401	Value Added Course B.Sc.(H) Chemistry- Semester-IV Managing Work and Others	L-2 T-1 P-0 C-0
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Communicating effectively in a variety of public and interpersonal settings.	
CO2.	Applying concepts of change management for growth and development by understanding inertia of change and mastering the Laws of Change.	
CO3.	Analyzing scenarios, synthesizing alternatives and thinking critically to negotiate, resolve conflicts and develop cordial interpersonal relationships.	
CO4.	Functioning in a team and enabling other people to act while encouraging growth and creating mutual respect and trust.	
CO5.	Handling difficult situations with grace, style, and professionalism.	
Course Content:		
Unit-1:	Intrapersonal Skills: Creativity and Innovation Understanding self and others (Johari window) Stress Management Managing Change for competitive success Handling feedback and criticism	8 Hours
Unit-2:	Interpersonal Skills: Conflict management Development of cordial interpersonal relations at all levels Negotiation Importance of working in teams in modern organisations Manners, etiquette and net etiquette	12 Hours
Unit-3:	Interview Techniques: Job Seeking Group discussion (GD) Personal Interview	10 Hours
Reference Books:	1. Robbins, Stephen P., Judge, Timothy A., Vohra, Neharika, Organizational Behaviour (2018), 18 th ed., Pearson Education 2. Burne, Eric, Games People Play (2010), Penguin UK 3. Carnegie, Dale, How to win friends and influence people (2004), RHUK 4. Rathgeber, Holger, Kotter, John, Our Iceberg is melting (2017), Macmillan 5. Steinburg, Scott, Nettiquette Essentials (2013), Lulu.com	

Course Code: BAS435	Generic Elective Course-IV B.Sc.(H) Chemistry- Semester-IV Introduction to Probability	L-4 T-0 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding the concept of the probability, addition law of probability and multiplication law of probability with its applications.	
CO2.	Applying the concept of discrete and continuous random variable to calculate the moment and generating functions.	
CO3.	Analyzing the concept of mathematical expectation, addition and multiplication theorem of Expectation.	
CO4.	Analyzing the M.G.F, C.F and P.D.F of the discrete and continuous distributions.	
CO5.	Evaluating the concept of Probability distributions and its recurrence relation of the distribution.	
Course Content:		
Unit-1:	Probability: Introduction, sample space, events and algebra of events, Kinds of Probability: classical, statistical, and axiomatic. Conditional Probability, laws of addition and multiplication, independent events.	8 Hours
Unit-2:	Random Variables: Discrete and continuous random variables, p.m.f, p.d.f, c.d.f. Illustrations of random variables and its properties, variance, moments and moment generating function.	8 Hours
Unit-3:	Mathematical Expectation- Expectation of a Random Variable, Addition & Multiplication Theorem of Expectation, Moments-Moment Generating Function, Limitations of m.g.f. cumulants - additive property.	8 Hours
Unit-4:	Discrete probability distributions: Bernoulli distribution : M.G.F, C.F , mean and variance, Binomial distribution : M.G.F, C.F , P,D.F, mean and variance, Poisson distribution: M.G.F, C.F , P,D.F, mean and variance.	8 Hours
Unit-5:	Continuous Probability Distributions: Gamma Distribution : M.G.F, C.F , P,D.F, mean and variance, Beta distribution: M.G.F, C.F , P,D.F, mean and variance, and Uniform distribution: M.G.F, C.F , P,D.F, mean and variance,	8 Hours
Text Books:	1. Mathematical Statistics" by S.C. Gupta, S. Chand & co. 2. Hogg, R.V., Tanis, E.A. and Rao J.M.: Probability. 3. Statistical Inference, Pearson Education, New Delhi.	
Reference Books:	1. Miller, Irwin and Miller, Marylees : John E. Freund's Mathematical Statistics with Applications, Pearson Education, Asia. 2. Myer, P.L.: Introductory Probability and Statistical Applications, Oxford & IBH Publishing, New Delhi. 3. http://www.columbia.edu/~kr2248/4109/chapter4.pdf *Latest editions of all the suggested books are recommended	



New Course Added

Course Code: BAS529	B.Sc (H) Chemistry (Semester-V) Molecular modeling & Drug Design	L-4 T-0 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding the principles of Molecular modeling, information regarding the software and hardware related to it.	
CO2.	Understanding various force field used in Molecular modeling.	
CO3.	Understanding different methods of energy minimization and related methods.	
CO4.	Understanding principles of Molecular Dynamics Simulation methods.	
CO5.	Analyzing structure prediction, basic introduction to comparative modeling and Cheminformatics.	
Course Content:		
Unit-1:	Introduction to Molecular Modelling: Introduction. Useful Concepts in Molecular Modelling: Coordinate Systems. Potential Energy Surfaces. Molecular Graphics. Surfaces. Computer Hardware and Software. The Molecular Modelling Literature.	8 Hours
Unit-2:	Force Fields: Fields. Bond Stretching. Angle Bending. Introduction to nonbonded interactions. Electrostatic interactions. Van der Waals Interactions. Hydrogen bonding in Molecular Mechanics. Force Field Models for the Simulation of Liquid Water	8 Hours
Unit-3:	Energy Minimization and Computer Simulation: Minimization and related methods for exploring the energy surface. Non-derivative method, First and second order minimization methods. Computer simulation methods. Simple thermodynamic properties and Phase Space. Boundaries. Analyzing the results of a simulation and estimating Errors.	8 Hours
Unit-4:	Molecular Dynamics & Monte Carlo Simulation: Molecular Dynamics Simulation Methods. Molecular Dynamics using simple models. Molecular Dynamics with continuous potentials. Molecular Dynamics at constant temperature and pressure. Metropolis method. Monte Carlo simulation of molecules. Models used in Monte Carlo simulations of polymers	8 Hours
Unit-5:	Structure Prediction and Drug Design: Structure prediction – Introduction to comparative Modeling. Sequence alignment. Constructing and evaluating a comparative model. Predicting protein structures by 'Threading', Molecular docking. Structure based de novo ligand design, Drug Discovery – Chemoinformatics – QSAR.	8 Hours
Text Books:	1. A.R. Leach, <i>Molecular Modelling Principles and Application</i> , Longman, 2001.	



Course Code: BAS565	B.Sc (H) Chemistry (Semester-V) Molecular Modeling & Drug Design (Lab)	L-0 T-0 P-4 C-2
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Remembering methods of Structure editing and optimizations.	
CO2.	Analyzing and visualizing the electron density maps of different molecules	
CO3.	Analyzing and visualizing the electrostatic potential maps of different molecules	
CO4.	Building and minimizing organic compounds of your choice containing different functional groups.	
CO5.	Understanding the optimization of bond angles of H ₂ O, H ₂ S, and H ₂ Se.	
Course Content:		

List of Experiments:

1. Compare the optimized C-C bond lengths in ethane, ethene, ethyne and benzene. Visualize the molecular orbitals of the ethane σ bonds and ethene, ethyne, benzene and pyridine π bonds.
2. Perform a conformational analysis of butane. (b) Determine the enthalpy of isomerization of *cis* and *trans* 2-butene
3. Visualize the electron density and electrostatic potential maps for LiH, HF, N₂, NO and CO and comment. Relate to the dipole moments. Animate the vibrations of these molecules.
4. Relate the charge on the hydrogen atom in hydrogen halides with their acid character. (b) Compare the basicities of the nitrogen atoms in ammonia, methylamine, dimethylamine and trimethylamine.
5. Compare the shapes of the molecules: 1-butanol, 2-butanol, 2-methyl-1-propanol, and 2-methyl-2-propanol. Note the dipole moment of each molecule. (b) Show how the shapes affect the trend in boiling points: (118 °C, 100 °C, 108 °C, 82 °C, respectively).
6. Build and minimize organic compounds of your choice containing the following functional groups. Note the dipole moment of each compound: (a) alkyl halide (b) aldehyde (c) ketone (d) amine (e) ether (f) nitrile (g) thiol (h) carboxylic acid (i) ester (j) amide.
7. (a) Determine the heat of hydration of ethylene. (b) Compute the



resonance energy of benzene by comparison of its enthalpy of hydrogenation with that of cyclohexene.

8. Arrange 1-hexene, 2-methyl-2-pentene, (*E*)-3-methyl-2-pentene, (*Z*)-3-methyl-2-pentene, and 2,3-dimethyl-2-butene in order of increasing stability.
9. (a) Compare the optimized bond angles H₂O, H₂S, H₂Se. (b) Compare the HAH bond angles for the second row dihydrides and compare with the results from qualitative MO theory.

Note: Software: ChemSketch, ArgusLab (www.planaria-software.com), TINKER 6.2 (dasher.wustl.edu/ffe), WebLab Viewer, Hyperchem, or any similar software.

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)
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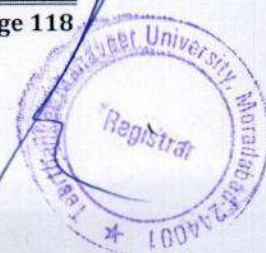
Course Code: BHM515	B.Sc.(H) Chemistry- Semester-V Human Values & Professional Ethics	L-3 T-0 P-0 C-3
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding the importance of value education in life and method of self-exploration.	
CO2.	Understanding 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration.	
CO3.	Applying right understanding about relationship and physical facilities.	
CO4.	Analysing harmony in myself, harmony in the family and society, harmony in the nature and existence.	
CO5.	Evaluating human conduct on ethical basis.	
Course Content:		
Unit-1:	Understanding of Morals, Values and Ethics; Introduction to Value Education- need for Value Education. Self- Exploration- content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration. Continuous Happiness and Prosperity- basic Human Aspirations. Gender Issues: Gender Discrimination and Gender Bias (home & office), Gender issues in human values, morality and ethics.	8 Hours
Unit-2:	Conflicts of Interest: Conflicts between Business Demands and Professional Ethics. Social and Ethical Responsibilities of Technologists. Ethical Issues at Workplace: Discrimination, Cybercrime, Plagiarism, Sexual Misconduct, Fraudulent Use of Institutional Resources. Intellectual Property Rights and its uses. Whistle blowing and beyond, Case study.	8 Hours
Unit-3:	Harmony in the Family and Society- Harmony in Human-Human Relationship, Understanding harmony in the Family- the basic unit of human interaction. Understanding values in human-human relationship; meaning of Nyaya; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship. Understanding the meaning of Vishwas; Difference between intention and competence. Understanding the meaning of Samman and other salient values in relationship.	8 Hours
Unit-4:	Understanding Harmony in the Nature and Existence – Whole existence as Co-existence. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature. Understanding Existence as Coexistence (Sah-astitva) of mutually interacting units in all pervasive space. Holistic perception of harmony at all levels of existence.	8 Hours
Unit-5:	Implications of the above Holistic Understanding of Harmony on Professional Ethics. Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Competence in professional ethics:	8 Hours



	<p>a) Ability to utilize the professional competence for augmenting universal human order</p> <p>b) Ability to identify the scope and characteristics of people friendly and eco-friendly production systems</p> <p>c) Ability to identify and develop appropriate technologies and management patterns for above production systems.</p>	
<u>Text Book:</u>	1. R R Gaur, R Sangal, G P Bagaria, A Foundation Course in Value Education.	
<u>Reference Books:</u>	<p>1. Ivan Illich, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA</p> <p>2. E.F. Schumacher, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.</p> <p>3. A Nagraj, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.</p> <p>3. Sussan George, How the Other Half Dies, Penguin Press. Reprinted.</p> <p>4. PL Dhar, RR Gaur, Science and Humanism, Commonwealth Purblishers.</p> <p>5. A.N. Tripathy, Human Values, New Age International Publishers.</p> <p>6. E G Seebauer & Robert L. Berry, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press.</p> <p>*Latest editions of all the suggested books are recommended.</p>	
<u>Additional electronics reference material</u>	<p>https://www.youtube.com/watch?v=Cnw1nK3K5qk</p> <p>https://www.youtube.com/watch?v=hTTCMrQyF8E</p>	



Course Code: BAS598	B.Sc. (H)-Chemistry- Semester-V Industrial Training & Presentation	L-0 T-0 P-6 C-3
Course Procedure:	<p>Students will have to undergo industrial training of six weeks in any industry or reputed organization after the II semester examination in summer. The evaluation of this training shall be included in the V semester evaluation.</p> <p>The student will be assigned a faculty guide who would be the supervisor of the student. The faculty would be identified before the end of the IV semester and shall be the nodal officer for coordination of the training.</p> <p>Students will prepare an exhaustive technical report of the training during the V semester which will be duly signed by the officer under whom training was undertaken in the industry/ organization. The covering format shall be signed by the concerned office in-charge of the training in the industry. The officer-in-charge of the trainee would also give his rating of the student in the standard University format in a sealed envelope to the Director/Principal of the college.</p> <p>The student at the end of the V semester will present his report about the training before a committee constituted by the Director/Principal of the College which would comprise of at least three members comprising of the Department Coordinator, Class Coordinator and a nominee of the Director/Principal. The students guide would be a special 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 member of the committee separately in a sealed envelope to the Director/Principal.</p> <p>The marks by the external examiner would be based on the report submitted by the student which shall be evaluated by the external examiner and cross examination done of the student concerned.</p> <p>Not more than three students would form a group for such industrial training/ project submission.</p>	
	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 Officer-in-charge trainee in industry – 25 marks. By External examiner appointed by the University – 25 marks	
	Technical report will consist five chapter as per given format:	
Chapter 1:	Brief about organization	
Chapter 2:	Detail of business carried out by organization	
Chapter 3:	Specific contribution during the industrial training (not more than 500 words)	
Chapter 4:	Learning during the industrial training (not more than 200 words)	
Chapter 5:	Conclusion	



Course Code: BAS638	B.Sc (H) Chemistry (Semester-VI) Novel Inorganic Solids	L-4 T-0 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding the synthesis of inorganic solids and their modification by various physical and chemical methods.	
CO2.	Understanding the importance and types of inorganic solids like Electrolytes , molecular, colored compounds and inorganic liquid crystals.	
CO3.	Understanding the preparation, structure , classification of Nano particles , nano tubes , nano-architecture and different types of nano materials.	
CO4.	Analyzing the chemical composition, mechanical and fabricating characteristics of metals, non metals and alloys.	
CO5.	Applying the various types of composites as engineering materials and environmental effects on composites.	
CO6.	Applying various types of polymers, ceramics and refractory materials and their commercial manufacturing.	
Course Content:		
Unit-1:	Synthesis and modification of inorganic solids: Conventional heat and beat methods, Co-precipitation method, Sol-gel methods, Hydrothermal method, Ion-exchange and Intercalation methods. Inorganic solids of technological importance: Solid electrolytes – Cationic, anionic, mixed Inorganic pigments – coloured solids, white and black pigments. Molecular material and fullerides, molecular materials & chemistry – one-dimensional metals, molecular magnets, inorganic liquid crystals. Inorganic solids of technological importance: Solid electrolytes – Cationic, anionic, mixed Inorganic pigments – coloured solids, white and black pigments. Molecular material and fullerides, molecular materials & chemistry – one-dimensional metals, molecular magnets, inorganic liquid crystals.	8 Hours
Unit-2:	Nanomaterials: Overview of nanostructures and nanomaterials: classification. Preparation of gold and silver metallic nanoparticles, self-assembled nanostructures-control of nanoarchitecture-one dimensional control. Carbon nanotubes and inorganic nanowires. Bio-inorganic nanomaterials, DNA and nanomaterials, natural and antisical nanomaterials, bionano composites.	8 Hours
Unit-3:	Introduction to engineering materials for mechanical construction: Composition, mechanical and fabricating characteristics and applications of various types of cast irons, plain carbon and alloy steels, copper, aluminum and their alloys like duralumin, brasses and bronzes cutting tool materials, super alloys thermoplastics, thermosets and composite materials.	8 Hours



Unit-4:	Composite materials: Introduction, limitations of conventional engineering materials, role of matrix in composites, classification, matrix materials, reinforcements, metal-matrix composites, polymer-matrix composites, fibre-reinforced composites, environmental effects on composites, applications of composites.	8 Hours
Unit-5:	Speciality polymer: Conducting polymers – Introduction, conduction mechanism, polyacetylene, polyparaphenylene and polypyrrole, applications of conducting polymers, Ion-exchange resins and their applications. Ceramic & Refractory: Introduction, classification, properties, raw materials, manufacturing and applications.	8 Hours
Text Books:	1. Adam, D.M. <i>Inorganic Solids: An introduction to concepts in solid-state structural chemistry</i> , John Wiley & Sons, 1974.	
Reference Books:	2. Shriver & Atkins. <i>Inorganic Chemistry</i> , Peter Atkins, Tina Overton, Jonathan Rourke, Mark Weller and Fraser Armstrong, 5 th Edition, Oxford University Press (2011-2012) 3. Poole, C.P. & Owens, F.J. <i>Introduction to Nanotechnology</i> John Wiley & Sons, 2003. 4. Rodger, G.E. <i>Inorganic and Solid State Chemistry</i> , Cengage Learning India Edition, 2002.. 5. https://nptel.ac.in/courses/118/104/118104008/ * Latest editions of all the suggested books are recommended.	



Course Code: BAS672	B.Sc (H) Chemistry (Semester-IV) Novel Inorganic Solids (Lab)	L-0 T-0 P-4 C-2
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Determining the mechanism of cation exchange method.	
CO2.	Evaluating the total difference of solids.	
CO3.	Understanding the synthesis of hydrogel by co-precipitation method.	
CO4.	Understanding the synthesis of silver metal nanoparticles	
CO5.	Understanding the synthesis of gold metal nanoparticles	
Course Content:		

List of Experiments:

1. Determination of cation exchange method
2. Determination of total difference of solids.
3. Synthesis of hydrogel by co-precipitation method.
4. Synthesis of silver metal nanoparticles.
5. Synthesis of gold metal nanoparticles.

Reference Book:

1. Fahlman, B.D. *Materials Chemistry*, Springer, 2004.

* 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)
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Course Code: BAS627	B.Sc (H) Chemistry (Semester-VI) Chemistry of Drugs, Cosmetics & Perfumes	L-4 T-0 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding the preparation and uses of various types of dyes, Shampoo's , cosmetics, antiperspirants and artificial flavours.	
CO2.	Understanding the importance of artificial and natural essential oils in cosmetic industries	
CO3.	Understanding the synthesis and design of various analgesic, Antipyretic , anti –inflammatory and anti-biotic drugs.	
CO4.	Understanding the nature of various drugs like antiviral, anti leprosy Drugs.	
CO5.	Applying the use of drugs for central nervous system. HIV- AIDS.	
CO6.	Applying the concept of fermentation for the production of Chemicals, drugs and vitamins.	
Course Content:		
Unit-1:	A general study including preparation and uses of the following: Hair dye, hair spray, shampoo, suntan lotions, face powder, lipsticks, talcum powder, nail enamel, creams (cold, vanishing and shaving creams), antiperspirants and artificial flavours.	8 Hours
Unit-2:	Essential oils and their importance in cosmetic industries with reference to Eugenol, Geraniol, sandalwood oil, eucalyptus, rose oil, 2-phenyl ethyl alcohol, Jasmone, Civetone, Muscone.	8 Hours
Unit-3:	Drug discovery, design and development; Basic Retrosynthetic approach. Synthesis of the representative drugs of the following classes: analgesics agents, antipyretic agents, anti- inflammatory agents (Aspirin, paracetamol, Ibuprofen); antibiotics (Chloramphenicol); antibacterial and antifungal agents (Sulphonamides; Sulphanethoxazol, Sulphacetamide, Trimethoprim);	8 Hours
Unit-4:	Antiviral agents (Acyclovir), Central Nervous System agents (Phenobarbital, Diazepam), Cardiovascular (Glyceryl trinitrate), antileprosy (Dapsone), HIV-AIDS related drugs (AZT- Zidovudine).	8 Hours



Unit-5:	Fermentation: Aerobic and anaerobic fermentation. Production of (i) Ethyl alcohol and citric acid, (ii) Antibiotics; Penicillin, Cephalosporin, Chloromycetin and Streptomycin, (iii) Lysine, Glutamic acid, Vitamin B2, Vitamin B12 and Vitamin C.	8 Hours
Text Books:	1. Sharma, B.K. & Gaur, H. Industrial Chemistry, Goel Publishing House, Meerut.	
<u>Reference Books:</u>	2. E. Stocchi: Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK. 3. R. Gopalan, D. Venkappayya, S. Nagarajan: Engineering Chemistry, Vikas Publications, New Delhi 4. https://www.ias.ac.in/article/fulltext/reso/009/04/0030-0041 * Latest editions of all the suggested books are recommended.	

Course Code: BAS664	B.Sc (H) Chemistry (Semester-VI)	L-0
	Chemistry of Drug, Cosmetics & Perfumes (Lab)	T-0
Course Outcomes:	On completion of the course, the students will be :	P-4
		C-2
CO1.	Preparing Aspirin and analyzing it.	
CO2.	Preparing magnesium bisilicate (Antacid) & Talcum Powder.	
CO3.	Preparing shampoo & Enamels	
CO4.	Preparing hair remover & face cream.	
CO5.	Preparing nail polish and nail polish remover.	
Course Content:		

List of Experiments:

1. Preparation of Aspirin and its analysis.
2. Preparation of magnesium bisilicate (Antacid).
3. Preparation of talcum powder.
4. Preparation of shampoo.
5. Preparation of enamels.
6. Preparation of hair remover.
7. Preparation of face cream.
8. Preparation of nail polish and nail polish remover.

Reference Books:

1. Patrick, G. L. *Introduction to Medicinal Chemistry*, Oxford University Press, UK, 2013.
2. Singh, H. & Kapoor, V.K. *Medicinal and Pharmaceutical Chemistry*, Vallabh Prakashan, Pitampura, New Delhi, 2012.
3. Foye, W.O., Lemke, T.L. & William, D.A.: *Principles of Medicinal Chemistry*, 4th ed., B.I. Waverly Pvt. Ltd. New Delhi.
4. Stocchi, E. *Industrial Chemistry*, Vol-I, Ellis Horwood Ltd. UK (1990).
5. Jain, P.C. & Jain, M. *Engineering Chemistry* Dhanpat Rai & Sons, Delhi.
6. Sharma, B.K. & Gaur, H. *Industrial Chemistry*, Goel Publishing House, Meerut (1996).
7. <http://www.egyankosh.ac.in/bitstream/123456789/15907/1/Experiment-18.pdf>



Course Code: TMUGE101	B.Sc. (H) Physics ^{Chemistry} Semester-I English Communication – I	L-2 T-0 P-2 C-3
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Remembering and understanding of the basic of English grammar and vocabulary.	
CO2.	Understanding of the basic Communication process.	
CO3.	Applying correct vocabulary and tenses in sentences construction.	
CO4.	Analyzing communication needs and developing communication strategies using both verbal & non-verbal method.	
CO5.	Drafting applications in correct format for common issues.	
CO6.	Developing self-confidence.	
Course Content:		
Unit-1:	Introductory Sessions <ul style="list-style-type: none"> • Self-Introduction • Building Self Confidence: Identifying strengths and weakness, reasons Failure, strategies to overcome Fear of Failure • Importance of English Language in present scenario (Practice: Self-introduction session)	6 Hour s
Unit-2:	Basics of Grammar <ul style="list-style-type: none"> • Parts of Speech • Tense • Subject and Predicate • Vocabulary: Synonym and Antonym (Practice: Conversation Practice)	12 Hour s
Unit-3:	Basics of Communication <ul style="list-style-type: none"> • Communication: Process, Types, 7Cs of Communication, Importance & Barrier • Language as a tool of communication • Non-verbal communication: Body Language • Etiquette & Manners • Basic Problem Sounds (Practice: Pronunciation drill and building positive body language)	10 Hour s
Unit-4:	Application writing <ul style="list-style-type: none"> • Format & Style of Application Writing • Practice of Application writing on common issues. 	8 Hour s
Unit-5:	Value based text reading: Short Story (Non- detailed study) <ul style="list-style-type: none"> • Gift of Magi - O. Henry 	4 Hour s
Text Book:	1. Singh R.P., An Anthology of Short stories, O.U.P. New Delhi.	
Reference Books:	1. Kumar, Sanjay. & Pushp Lata. "Communication Skills" New Delhi: Oxford University Press.	



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

1. Remove fear of speaking in English among peers & teachers.
2. Develop the ability to speak in English (even if grammatically not perfect).
3. Use vocabulary taught for speaking and writing simple sentence for day to day conversation.
4. Use taught vocabulary for writing applications on common issues.

Course Contents:

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

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

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

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

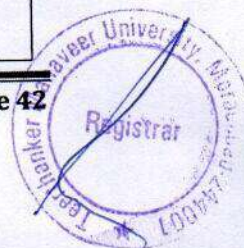
Unit – III Conversation Practice, commonly made mistake & Initiating a conversation (10 hours)

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

Unit – IV Application writing (08 hours)

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

Course Code: TMUGE201	B.Sc.(H) Physics - Semester-II English Communication – II	L-2 T-0 P-2 C-3
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Remembering & understanding the basics of English Grammar and Vocabulary.	
CO2.	Understanding the basics of Listening, Speaking & Writing Skills.	
CO3.	Understanding principles of letter drafting and various types of formats.	
CO4.	Applying correct vocabulary and grammar in sentence construction while writing and delivering presentations.	
CO5.	Analyzing different types of listening, role of Audience & Locale in presentation.	
CO6.	Drafting Official Letters, E-Mail & Paragraphs in correct format.	
Course Content:		
Unit-1:	Functional Grammar (10 hours) • Prefix, suffix and One words substitution • Modals • Concord	10 Hours
Unit-2:	Listening Skills • Difference between listening & hearing, Process and Types of Listening • Importance and Barriers to listening	04Hours
Unit-3:	Writing Skills (12 hours) • Official letter and email writing • Essentials of a paragraph, • Developing a paragraph: Structure and methods Paragraph writing (100-120 words)	12 Hours
Unit-4:	Strategies & Structure of Oral Presentation (08 hours) • Purpose, Organizing content, Audience & Locale, Audio-visual aids, Body language • Voice dynamics: Five P's - Pace, Power, Pronunciation, Pause, and Pitch. • Modes of speech delivery and 5 W's of presentation	8 Hours
Unit-5:	Value based text reading: Short Essay (Non- detailed study) (06 hours) How should one Read a book? - Virginia Woolf	6 Hours
Text Book:	1. Singh R.P., An Anthology of English Essay, O.U.P. New Delhi	



English Communication & Soft Skills - II

Course Code: BHM249 EHM249

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

1. Learn additional 50 words apart from 50 words learnt in preceding semester (Two words/lecture)
2. Write letters effectively.
3. Acquire competence in constructing short sentences dealing day to day activities with grammatical accuracy.
4. Express themselves before class / in a group and attain proficiency in deliverance.
5. Acquire adequate knowledge of grammar to address competitive exams like GATE

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)

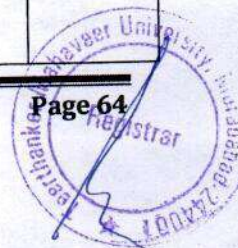
- Managing Time, Audience & Locale, Structure and Organization of Content and 5 W's
- Problem Sounds: S- Sh, J-Z and V-B

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.



Course Code: TMUGE301	B.Sc.(H) Chemistry- Semester-III English Communication- III	L-2 T-0 P-2 C-3
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding knowledge of grammar to face competitive exams.	
CO2.	Understanding advance English language by using variety of words i.e. idioms and phrase in variety of sentences in functional context.	
CO3.	Understanding listening for effective communication.	
CO4.	Applying their English grammar knowledge in day to day context.	
CO5.	Applying writing and comprehensive skills in English.	
CO6.	Analyzing Comprehending & enriching their vocabulary through prescribed text.	
Course Content:		
Unit-1:	English Grammar & Vocabulary (a) Correction of Common Errors (with recap of English Grammar with its usage in practical context.) (b) Synthesis: Simple, complex and compound sentence (c) Commonly used Idioms & phrases (Progressive learning whole semester)	14 Hours
Unit-2:	Speaking Skills (a) Art of public speaking (b) Common conversation (c) Extempore (d) Power Point Presentation (PPT) Skills: Nuances of presenting PPTs	10 Hours
Unit-3:	Comprehension Skills (a) Strategies of Reading comprehension: Four S's (b) How to solve a Comprehension (Short unseen passage: 150-200 words)	6 Hours
Unit-4:	Professional Writing (a) Preparing Notice, Agenda & Minutes of the Meeting	7 Hours
Unit-5:	Value based text reading: Short story (a) The Barber's Trade Union - Mulk Raj Anand	3 Hours
Text Book:	(d) Singh R.P., An Anthology of English Essay, O.U.P. New Delhi	
Reference Books:	1. Wren & Martin "High School English Grammar and Composition" S.Chand & Co.Ltd., New Delhi. 2. Kumar Sanjay & Pushplata "Communication Skills" Oxford University Press, New Delhi. 3. Agrawal, Malti "Professional Communication" Krishana Prakashan Media (P) Ltd. Meerut. *Latest editions of all the suggested books are recommended.	
Additional Electronics Reference Material	1- https://www.youtube.com/watch?v=dpYltVtsS_Q 2- https://www.youtube.com/watch?v=Z8HttKW8jVE 3- https://www.youtube.com/watch?v=srn5igr9TZo	



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

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

Course Contents:**Unit – I Grammar & Vocabulary****(14 hours)**

- Correction of Common Errors (with recap of English Grammar with its usage in practical context.)
- 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.



Course Code TMUGE401	B.Sc.(H) Physics Semester-IV English Communication – IV	L-2 T-0 P-2 C-3
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Remembering adequate knowledge of grammar and vocabulary through prescribed text to address competitive exams.	
CO2.	Understanding the value of listening to understand the basic content.	
CO3.	Understanding the usage of English grammar in day to day context.	
CO4.	Understating about the skills required in corporate world.	
CO5.	Applying writing and comprehensive skills in English.	
CO6.	Creating a simple proposal and report.	
Course Content:		
Unit-1:	Vocabulary & Grammar <ul style="list-style-type: none"> Homophones and Homonyms Correction of Common Errors (with recap of English Grammar with its usage in practical context.) Transformation of sentences 	12 Hours
Unit-2:	Essence of Effective listening & speaking <ul style="list-style-type: none"> Listening short conversation/ recording (TED talks / Speeches by eminent personalities) <i>Critical Review of these abovementioned</i> Impromptu 	5 Hours
Unit-3:	Professional Writing <ul style="list-style-type: none"> Proposal: Significance, Types, Structure & AIDA Report Writing: Significance, Types, Structure & Steps towards Report writing 	8 Hours
Unit-4:	Job Oriented Skills <ul style="list-style-type: none"> Cover Letter Preparing Resume and Curriculum-Vitae Interview: Types of Interview, Tips for preparing for Interview and Mock Interview Corporate Expectation & Professional ethics: Skills expected in corporate world. 	10 Hours
Unit-5:	Value based text reading: Short story <ul style="list-style-type: none"> A Bookish Topic - R.K. Narayan 	5 Hours
Text Book:	1. Singh R.P., An Anthology of English Essay, O.U.P. New Delhi	
Reference Books:	1. Joseph, Dr C.J. & Myall E.G. "A Comprehensive Grammar of Current English" Inter University Press, Delhi 2. Chaudhary Sarla "Basic Concept of Professional Communication" Dhanpat Rai Publication, New Delhi. 3. Kumar Sanjay & Pushplata "Communication Skills" Oxford University Press, New Delhi. *Latest editions of all the suggested books are recommended.	
Additional Electronics Reference Material	1- https://www.youtube.com/watch?v=dpYltVtsS_Q 2 - https://www.youtube.com/watch?v=OthdqIB0WS8 3 - https://www.youtube.com/watch?v=MrgHfK8Pcfk 4 - https://www.youtube.com/watch?v=860LtRxP3rw	

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

1. Formulate their CVs along with cover letter in Job oriented perspective.
2. Communicate technically in functional context.
3. Proactively participate in Job Oriented activities. (Like Interview, GD etc.)
4. Aware of the skills required in corporate world.

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

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

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

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

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

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

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

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

Reference Books:

- 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.