

Study & Evaluation Scheme

of

Pre-Revised

Bachelor of Science in Forensic Science

[Applicable w.e.f. Academic Session 2011-12 till revised]



TEERTHANKER MAHAVEER UNIVERSITY

Delhi Road, Moradabad, Uttar Pradesh-244001

Website: www.tmu.ac.in

B.Sc. (Forensic Science) Syllabus Applicable w.e.f. Academic Session 2011-12 (22022012) Page 1 of 46



Study & Evaluation Scheme
Bachelor of Science (Forensic Science)

First Year

Paper	Course Code	Subjects	Periods			Credit	Evaluation Scheme		
			L	T	P		Internal	External	Total
1	BFS101	Basics of Forensic Science	4	-	-	4	30	70	100
2	BFS102	Basics of Forensic Chemistry	4	-	-	4	30	70	100
3	BFS103	Basics of Forensic Biology	4	-	-	4	30	70	100
4	BFS104	Basics of Forensic Psychology	4	-	-	4	30	70	100
5	BFS105	Basics of Digital and Cyber Forensics	4	-	-	4	30	70	100
6	BFS106	Foundation English I	2	-	2	3	30	70	100
7	BFS151	Basics of Forensic Science (Practical)	-	-	2	1	50	50	100
8	BFS152	Basics of Forensic Chemistry (Practical)	-	-	2	1	50	50	100
9	BFS153	Basics of Forensic Biology (Practical)	-	-	2	1	50	50	100
10	BFS154	Basics of Forensic Psychology (Practical)	-	-	2	1	50	50	100
11	BFS155	Basics of Digital and Cyber Forensics (Practical)	-	-	2	1	50	50	100
Total			22	-	12	28	430	670	1100

Second Year

Paper	Course Code	Subjects	Periods			Credit	Evaluation Scheme		
			L	T	P		Internal	External	Total
1	BFS201	Advanced Forensic Science	4	-	-	4	30	70	100
2	BFS202	Advanced Forensic Chemistry	4	-	-	4	30	70	100
3	BFS203	Advanced Forensic Biology	4	-	-	4	30	70	100
4	BFS204	Advanced Forensic Psychology	4	-	-	4	30	70	100
5	BFS205	Advanced Digital and Cyber Forensics	4	-	-	4	30	70	100
6	BFS251	Advanced Forensic Science (Practical)	-	-	2	1	50	50	100
7	BFS252	Advanced Forensic Chemistry (Practical)	-	-	2	1	50	50	100
8	BFS253	Advanced Forensic Biology (Practical)	-	-	2	1	50	50	100
9	BFS254	Advanced Forensic Psychology (Practical)	-	-	2	1	50	50	100
10	BFS255	Advanced Digital and Cyber Forensics (Practical)	-	-	2	1	50	50	100
Total			20	-	10	25	400	600	1000



Third Year

Paper	Course Code	Subjects	Periods			Credit	Evaluation Scheme		
			L	T	P		Internal	External	Total
1	BFS301	Applied Forensic Science	4	-	-	4	30	70	100
2	BFS302	Applied Forensic Chemistry	4	-	-	4	30	70	100
3	BFS303	Applied Forensic Biology	4	-	-	4	30	70	100
4	BFS304	Applied Forensic Psychology	4	-	-	4	30	70	100
5	BFS305	Applied Digital and Cyber Forensics	4	-	-	4	30	70	100
6	BFS351	Applied Forensic Science (Practical)	-	-	2	1	50	50	100
7	BFS352	Applied Forensic Chemistry (Practical)	-	-	2	1	50	50	100
8	BFS353	Applied Forensic Biology (Practical)	-	-	2	1	50	50	100
9	BFS354	Applied Forensic Psychology (Practical)	-	-	2	1	50	50	100
10	BFS355	Applied Digital and Cyber Forensics (Practical)	-	-	2	1	50	50	100
Total			20	-	10	25	400	600	1000

L – Lecture
1L = 1Hr

T- Tutorial
1T= 1Hr

P- Practical
1P= 1 Hr

C-Credits

1C = 1Hr of Lecture/2 Hrs of Practical/Tutorial

Question Paper Structure

1. The question paper shall consist of eight questions. First question shall be of short answer type and will be compulsory. It shall contain 8 parts, covering entire syllabus and the student shall be required to answer any five of them (weightage 4 marks each).
2. Out of the remaining seven questions, student shall be required to attempt any five. The weightage of Question No. 2 to 8 shall be 10 marks each.



STUDY & EVALUATION SCHEME OF B.Sc. FORENSIC SCIENCE

(BFS)

Post Revised

[Applicable W.E.F. Academic Session - 2019-20 Till Revised]

[As per CBCS guidelines given by UGC]



TEERTHANKER MAHAVEER UNIVERSITY
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B.Sc. Forensic Science (BFS) Syllabus as per CBCS (2019-20) W.E.F. till revised

B.SC. FORENSIC SCIENCE CURRICULUM

SEMESTER I

S.N	Category	Course Code	Course		Periods			Cred it	Evaluation Scheme		
					L	T	P		Internal	External	Total
1	CC-1	BFS-S-105	Fundamentals of Forensic Science -I		4	0	0	4	40	60	100
2	CC-2	BFS-S-103	Basics of Biology- I		4	0	0	4	40	60	100
3	CC-3	BFS-S-106	Fundamentals of Computer Science		4	0	0	4	40	60	100
4	AECC-1	TMUGE101	English Communication-I		2	0	2	3	40	60	100
5	DSEC-1	BFS-S-108	Discipline Specific Elective Courses	Group Elective – A	4	0	0	4	40	60	100
		Group Elective – B									
6	SEC-1	BFS-S-155	Fundamentals of Forensic Science- I (Lab)		0	0	2	1	50	50	100
7	SEC-2	BFS-S-153	Basics of Biology -I (Lab)		0	0	2	1	50	50	100
8	SEC-3	BFS-S-156	Fundamentals of Computer Science (Lab)		0	0	2	1	50	50	100
9	DSEC-1 Practical	BFS-S-158	Discipline Specific Elective Courses	Group Elective – A	0	0	2	1	50	50	100
		Group Elective – A									
Total					18	0	10	23	400	500	900



SEMESTER II

S.N	Category	Course Code	Course		Periods			Cred it	Evaluation Scheme		
					L	T	P		Internal	External	Total
1	CC-4	BFS-S-205	Fundamentals of Forensic Science- II		4	0	0	4	40	60	100
2	CC-5	BFS-S-203	Basics of Biology -II		4	0	0	4	40	60	100
3	CC-6	BFS-S-206	Basics of Digital & Cyber Forensic		4	0	0	4	40	60	100
4	AECC-2	TMUGE201	English Communication-II		2	0	2	3	40	60	100
5	DSEC-2	BFS-S-208	Discipline Specific Elective Courses	Group Elective – A	4	0	0	4	40	60	100
		Group Elective – B									
6	SEC-4	BFS-S-255	Fundamentals of Forensic Science -II (Lab)		0	0	2	1	50	50	100
7	SEC-5	BFS-S-253	Basics of Biology -II (Lab)		0	0	2	1	50	50	100
8	SEC-6	BFS-S-256	Basics of Digital & Cyber Forensic (Lab)		0	0	2	1	50	50	100
9	DSEC-2	BFS-S-258	Discipline Specific Elective Courses	Group Elective – A	0	0	2	1	50	50	100
	Practical	BFS-S-259		Group Elective – B							
Total					18	0	10	23	400	500	900



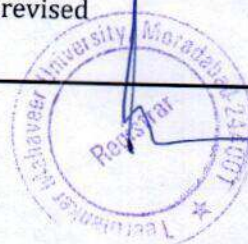
SEMESTER III

S. N	Category	Course Code	Course		Periods			Credit	Evaluation Scheme			
					L	T	P		Internal	External	Total	
1	CC-7	BFS-S- 303	Forensic Biology-I		4	0	0	4	40	60	100	
2	DSC-1	BFS –S-305	Forensic Medicine		4	0	0	4	40	60	100	
3	DSC-2	BFS –S-310	Advanced Digital & Cyber Forensic		4	0	0	4	40	60	100	
4	AECC-3	TMUGE301	English Communication-III		2	0	2	3	40	60	100	
5	AECC-4	BFS-S-306	Environmental Science		4	0	0	4	40	60	100	
6	DSEC-3	BFS-S-308	Discipline Specific Elective Courses	Group Elective – A	4	0	0	4	40	60	100	
		Group Elective – B										
7	SEC-7	BFS-S-353	Forensic Biology-I (Lab)		0	0	2	1	50	50	100	
8	SEC-8	BFS-S-355	Forensic Medicine (Lab)		0	0	2	1	50	50	100	
9	SEC-9	BFS-S-356	Advanced Digital & Cyber Forensic (Lab)		0	0	2	1	50	50	100	
10	DSEC-3 Practical	BFS-S-358	Discipline Specific Elective Courses	Group Elective – A	0	0	2	1	50	50	100	
		Group Elective – B										
			Total		22	0	10	27	440	560	1000	
VALUE ADDED COURSE –I (VAC-I) EVALUATION SCHEME												
1	VAC -1	TMUGS301	Managing Self		2	1	0	0		50	50	100



SEMESTER IV

S.N	Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC-8	BFS-S- 403	Forensic Biology-II	4	0	0	4	40	60	100
2	CC-9	BFS -S-411	Quality Management in Laboratories	4	0	0	4	40	60	100
3	DSC-3	BFS -S-405	Forensic Dermatoglyphics	4	0	0	4	40	60	100
4	DSC-4	BFS -S-410	Applied Digital & Cyber Forensic	4	0	0	4	40	60	100
5	AECC-5	TMUGE401	English Communication-IV	2	0	2	3	40	60	100
6	DSEC-3	BFS-S-408	Discipline Specific Elective Courses	4	0	0	4	40	60	100
		BFS-S-409								
7	SEC-10	BFS-S-453	Forensic Biology-II (Lab)	0	0	2	1	50	50	100
8	SEC-11	BFS-S-455	Forensic Dertmatoglyphics (Lab)	0	0	2	1	50	50	100
9	SEC-12	BFS-S-456	Applied Digital & Cyber Forensic (Lab)	0	0	2	1	50	50	100
10	DSEC-4 Practical	BFS-S-458	Discipline Specific Elective Courses	0	0	2	1	50	50	100
		BFS-S-459								
11		MOOC I		-	-	-	2			100
12			Open elective				3	As Per University Guidelines		
			Total	22	0	10	32	440	560	1100
VALUE ADDED COURSE -I (VAC-I) EVALUATION SCHEME										
1	VAC-II	TMUGS401	Managing work and others	2	1	0	0	50	50	100



SEMESTER V

S.N	Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC-10	BFS -S-510	Introduction to Research Methodology	4	0	0	4	40	60	100
2	DSC-5	BFS -S-505	Forensic Ballistic	4	0	0	4	40	60	100
3	DSC-6	BFS -S-507	Serology & DNA typing	4	0	0	4	40	60	100
4	DSC-7	BFS-S-506	Questioned Documents	4	0	0	4	40	60	100
5	DSEC-5	BFS-S-508	Discipline Specific Elective Courses	4	0	0	4	40	60	100
		BFS-S-509								
6	SEC-13	BFS -S-555	Forensic Ballistic (Lab)	0	0	2	1	40	60	100
7	SEC-14	BFS -S-557	Serology & DNA typing (Lab)	0	0	2	1	50	50	100
8	SEC-15	BFS -S-556	Questioned Documents (Lab)	0	0	2	1	50	50	100
9	DSEC-5 Practical	BFS-S-558	Discipline Specific Elective Courses	0	0	2	1	50	50	100
		BFS-S-559								
10		MOOC II		-	-	-	2			100
			Total	20		8	26	390	510	1000

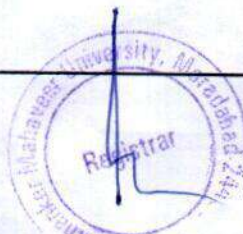


SEMESTER VI

S.N	Category	Course Code	Course		Periods			Credit	Evaluation Scheme		
					L	T	P		Internal	External	Total
1	CC-11	BFS –S-603	Technological Methods in Forensic Science		4	0	0	4	40	60	100
2	DSC-8	BFS -S-606	Forensic Toxicology		4	0	0	4	40	60	100
3	DSC-9	BFS –S-604	Forensic Psychology		4	0	0	4	40	60	100
4	DSEC-6	BFS-S-608	Discipline Specific Elective Courses	Group Elective – A	4	0	0	4	40	60	100
		Group Elective – B									
5	SEC-16	BFS –S-653	Technological Methods in Forensic Science (Lab)		0	0	2	1	40	60	100
6	SEC-17	BFS -S-656	Forensic Toxicology (Lab)		0	0	2	1	50	50	100
7	SEC-18	BFS –S-654	Forensic Psychology (Lab)		0	0	2	1	50	50	100
8	DSEC-6 Practical	BFS-S-658	Discipline Specific Elective Courses	Group Elective – A	0	0	2	1	50	50	100
		Group Elective – B									
9	SEC-19	BFS –655	Dissertation			0	8	4	50	50	100
			Total		20	0	16	24	400	500	900



Course Code: BFS-S-108 DSEC-1	DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP - A FORENSIC SCIENCE SEMESTER-I INORGANIC & ORGANIC CHEMISTRY	L-4 T-0 P-2 C-5
Course Outcomes:	On completion of the course, the students will be :	48 hours
CO1.	Remembering the basic knowledge of Chemistry (Inorganic and organic Chemistry).	
CO2.	Understanding the concept of Bohr atomic models and quantum mechanical model of atom.	
CO3.	Identifying various methods of preparations of hydrocarbons.	
CO4.	Describing the classification of organic compounds & concept of organic reaction mechanism and isomerism.	
CO5.	Describing advanced symmetry concepts of chemical molecules and its applications.	
Course Content:		
Unit-1:	Atomic Structure: Bohr's theory and its limitations, dual behavior of matter and radiation, de-Broglie's relation, Heisenberg Uncertainty principle. Shapes of s, p, d and f orbitals. Pauli's Exclusion Principle, Hund's rule of maximum multiplicity, Aufbau's principle and its limitations. Fundamentals of Organic Chemistry: Electronic Displacements: Inductive Effect, Electrometric Effect, Resonance and Hyper conjugation. Cleavage of Bonds: Homolysis and Heterolysis, Structure, shape and reactivity of organic molecules: Nucleophiles and electrophiles. Reactive Intermediates: Carbocations, Carbanions and free radicals.	9 Hours
Unit-2:	Quantum mechanics: Time independent Schrodinger equation and meaning of various terms in it. Significance of ψ and ψ^2 , Schrödinger equation for hydrogen atom. Radial and angular parts of the hydrogenic wave functions (atomic orbital's) and their variations for 1s, 2s, 2p, 3s, 3p and 3d orbital (Only graphical representation). Radial and angular nodes and their significance. Quantum numbers: Significance of quantum numbers, orbital angular momentum and quantum numbers ml and ms Shapes of s, p and d atomic orbital.	9 Hours
Unit-3:	Chemical Bonding and Molecular Structure: Ionic Bonding: General characteristics of ionic bonding. Energy considerations in ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Covalent bonding: VB Approach: Shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral	9 Hours
Unit-4:	Stereochemistry: Conformations with respect to ethane, butane and cyclohexane. Interconversion of Wedge Formula, Newmann, Sawhorse and Fischer representations. Concept of chirality (upto two carbon atoms). Optical Isomerism: Optical Activity, Specific Rotation, Chirality/Asymmetry, Racemic mixture and resolution.	9 Hours
Unit-5:	Aliphatic Hydrocarbons: Alkanes: (Upto 5 Carbons). Preparation: Catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, from Grignard reagent. Reactions: Free radical Substitution: Halogenation. Alkenes: (Up to 5 Carbons) Preparation: Elimination reactions: Dehydration of alkenes and dehydrohalogenation of alkyl halides (Saytzeff's rule); cis alkenes (Partial catalytic hydrogenation) and trans alkenes (Birch reduction). Alkynes: (Up to 5 Carbons) Preparation: Acetylene from CuCu_2 and conversion into higher alkynes by dehalogenation of tetra halides and dehydrohalogenation of vicinal-dihalides.	12 Hours
Textbook:	1. F. A. Cotton & G. Wilkinson: Basic Inorganic Chemistry, John Wiley.	
References:	1. Douglas, McDaniel and Alexander: Concepts and Models in Inorganic Chemistry, John Wiley. 2. James E. Huheey, Ellen Keiter and Richard Keiter: Inorganic Chemistry	

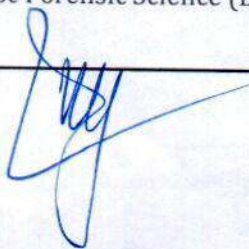
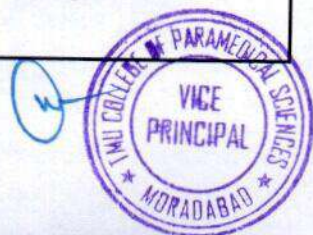


Course Code BFS-S-109 DSEC-1	DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP B FORENSIC SCIENCE SEMESTER-I ELEMENTS OF MODERN PHYSICS	L-4 T-0 P-2 C-5
Course Outcomes:	On completion of the course, the students will be :	48 hours
CO1.	Remembering the basic knowledge of Physics.	
CO2.	Understanding The central concepts of quantum mechanics: wave functions, momentum and energy operator, the Schrodinger equation, time dependent and time independent cases,	
CO3.	Understanding The properties of nuclei like density, size, binding energy, nuclear forces and structure of atomic nucleus, liquid drop model and nuclear shell model and mass formula.	
CO4.	Understanding the probability density and the normalization techniques, and applying the knowledge for skill development on Problem solving e.g. one-dimensional rigid box, tunneling through potential barrier, step potential, rectangular barrier.	
CO5.	Understanding the concepts of nuclear fission and fission and Radioactivity.	
Course Content:		
Unit-1:	Light's nature:- Planck's quantum, Planck's constant and light as a collection of photons; Photoelectric effect and Compton scattering. De Broglie wavelength and matter waves; Davisson-Germer experiment	7 Hours
Unit-2:	Problems with Rutherford model: instability of atoms and observation of discrete atomic spectra; Bohr's quantization rule and atomic stability; calculation of energy levels for hydrogen like atoms and their spectra.	7 Hours
Unit-3:	Atomic models and Quantum mechanics: gamma ray microscope thought experiment; Wave-particle duality, Heisenberg uncertainty principle, impossibility of a particle following a trajectory; Estimating minimum energy of a conned particle using uncertainty principle; Energy-time uncertainty principle. Two slit interference experiment with photons, atoms & particles; linear superposition principle as a consequence; Matter waves and wave amplitude; Schrodinger equation for non-relativistic particles; Momentum and Energy operators; stationary states; physical interpretation of wave function, probabilities and normalization; Probability and probability current densities in one dimension.	16 Hours
Unit-4:	Nuclear physics :- Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an electron being in nucleus as a consequence of the uncertainty principle. Nature of nuclear force, NZ graph, semi-empirical mass formula and binding energy.	7 Hours
Unit-5:	Radioactivity: stability of nucleus; Law of radioactive decay; Mean life and half-life; decay; decay-energy released, spectrum and Pauli's prediction of neutrino; -ray emission. Fission and fusion-mass de cit, relativity and generation of energy; Fission - nature of fragments and emission of neutrons. Nuclear reactor: slow neutrons interacting with Uranium 235; Fusion and thermonuclear reactions.	11 Hours
Textbook:	1. Modern Physics, J.R. Taylor, C.D. Zaratos, M.A. Dubson, 2009, PHI Learning	
References:	1. Quantum Physics, Berkeley Physics, Vol.4. E.H. Wichman, 2008, Tata McGraw-Hill Co. 2. Modern Physics, R.A. Serway, C.J. Moses, and C.A. Moyer, 2005, Cengage Learning 3. https://books.google.co.in/books/about/Six_Ideas_That_Shaped_Physics_Unit_Q_Par.html?id=t-9AAQAIAAJ&redir_esc=y	



Course Code: BFS-S-158 DSEC-1 12 HOURS	DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP -A FORENSIC SCIENCE SEMESTER INORGANIC & ORGANIC CHEMISTRY (LAB)	L-0 T-0 P-2 C-1
1.	Inorganic Chemistry <ol style="list-style-type: none"> 1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture. 2. Use of KMnO_4 as redox titrimetric analysis. 3. Estimation of water of crystallization in Mohr's salt by titrating with KMnO_4. 4. Estimation of Fe (II) ions by titrating it with $\text{K}_2\text{Cr}_2\text{O}_7$ using internal indicator 5. Estimation of Cu (II) ions eudiometrically using $\text{Na}_2\text{S}_2\text{O}_3$ 	
2.	Organic Chemistry <ol style="list-style-type: none"> 1. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing up to two extra elements) 2. Separation of mixtures by Chromatography: Measure the R_f value in each case (Combination of two compounds to be given) <ol style="list-style-type: none"> a. Identify and separate the components of a given mixture of two amino acids (glycine, aspartic acid, glutamic acid, tyrosine or any other amino acid) by paper chromatography. b. Identify and separate the sugars present in the given mixture by paper Chromatography. 	

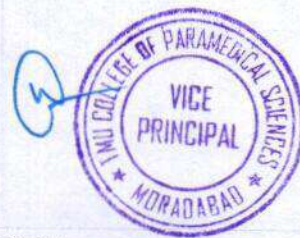
Course Code: BFS-S-159 DSEC-1 12 Hours	DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP-B FORENSIC SCIENCE SEMESTER-I ELEMENTS OF MODERN PHYSICS (LAB)	L-0 T-0 P-2 C-1
1.	To determine value of Boltzmann constant using V-I characteristic of PN diode.	
2.	To determine work function of material of filament of directly heated vacuum diode.	
3.	To determine the ionization potential of mercury.	
4.	To determine value of Planck's constant using LEDs of at least 4 different colors.	
5.	To determine the wavelength of H-alpha emission line of Hydrogen atom.	
6.	To determine the absorption lines in the rotational spectrum of Iodine vapor.	
7.	To study the reaction patterns of single and double slits using laser and measure its intensity variation using Photosensor & compare with incoherent source Na.	
8.	Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo- electrons versus frequency of light.	
9.	To determine the value of e/m by (a) Magnetic focusing or (b) Bar magnet.	

Course Code: TMUGE101 AECC-1	ABILITY ENHANCEMENT COMPULSORY COURSE FORENSIC SCIENCE SEMESTER-I ENGLISH COMMUNICATION-I	L-2 T-0 P-2 C-3
Course Outcomes:	On completion of the course, the students will be :	40 hours
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 1. Self-Introduction 2. Building Self Confidence: Identifying strength and weakness, reasons of fear of Failure, 3. strategies to overcome Fear of failure	6 Hours
Unit-2:	Basics of Grammar Parts of Speech Tense Subject and Predicate Vocabulary: Synonym and Antonym (Practice: Conversation Practice)	12 Hours
Unit-3:	Basics of Communication 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 Hours
Unit-4:	Application writing Format & Style of Application Writing Practice of Application writing on common issues.	8 Hours
Unit-5:	Value based text reading: Short Story (Non- detailed study) Gift of Magi – O. Henry	4 Hours
Textbook:	1. Singh R.P., An Anthology of Short stories, O.U.P. New Delhi	
References:	1. Carnegie Dale. "How to Win Friends and Influence People" New York: Simon & Schuster. 2. Goleman, Daniel. "Emotional Intelligence" Bantam Book. 3. https://india.oup.com/product/communication-skills-9780199488803	



Course Code: BFS-S-208	DISCIPLINE SPECIFIC ELECTIVE COURSE	L-4
DSEC-2	GROUP -A	T-0
	FORENSIC SCIENCE SEMESTER-II	P-2
	PHYSICAL & ORGANIC CHEMISTRY-I	C-5
Course Outcomes:	On completion of the course, the students will be :	48
CO1.	Remembering the fundamental concept of Chemistry (Physical and organic Chemistry).	hours
CO2.	Understanding the laws of Thermodynamics.	
CO3.	Understanding the basic concept of Thermo chemistry.	
CO4.	Summarizing the different methods of preparation of aromatic hydrocarbon and aryl halides	
CO5.	Explaining the ionization of electrolytes and salt hydrolysis.	
Course Content:		
Unit-1:	Laws of Thermodynamics: Introduction of thermodynamics; Statement of First, second Third Law of thermodynamics and calculation of absolute entropies of substances.	9 Hours
Unit-2:	Chemical Energetic: Important principles and definitions of thermo chemistry. Concept of standard state and standard enthalpies of formations, integral and differential enthalpies of solution and dilution. Calculation of bond energy, bond dissociation energy and resonance energy from thermo chemical data.	9 Hours
Unit-3:	Ionic Equilibrium: 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. Salt hydrolysis- calculation of hydrolysis constant, degree of hydrolysis and pH for different salts.	9 Hours
Unit-4:	Aromatic hydrocarbons Preparation (Case benzene): from phenol, by decarboxylation, from acetylene, from benzene sulphonc acid. Reactions: (Case benzene): Electrophilic substitution: nitration, halogenations and sulphonation.	9 Hours
Unit-5:	Aryl Halides: Preparation: (Chloro, bromo and iodo-benzene case): from phenol, Sandmeyer & Gattermann reactions. Reactions (Chlorobenzene): Aromatic nucleophilic substitution (replacement by - OH group) and effect of nitro substituent. Alcohols: Preparation: Preparation of primary, secondary and tertiary alcohols: using Grignard reagent, Ester hydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters.	12 Hours
Textbook:	1. F. A. Cotton & G. Wilkinson: Basic Inorganic Chemistry, John Wiley.	
References:	1. Douglas, McDaniel and Alexader: Concepts and Models in Inorganic Chemistry, John Wiley. 2. Peter Sykes: A Guide Book to Mechanism in Organic Chemistry, Orient Longman. 3. https://books.google.co.in/books/about/Organic_Chemistry.html?id=E4VylgguUR8C	

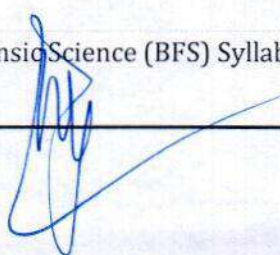
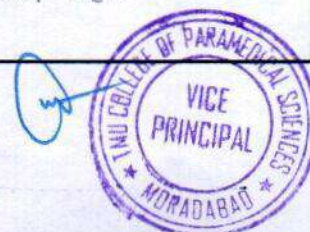


Course Code: BFS-S-209 DSEC-2	DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP -B FORENSIC SCIENCE SEMESTER-II MECHANICS	L-4 T-0 P-2 C-5
Course Outcomes:	On completion of the course, the students will be :	48 hours
CO1.	Recognising the concept of simple harmonic motion and damped oscillator.	
CO2.	Recalling the frame of references and understanding fundamentals of special relativity.	
CO3.	Understanding the concept of relativity and implementing the knowledge for context of time dilation, length contraction, and relativistic addition of velocities.	
CO4.	Explaining the concept of Dynamics of rigid bodies and Moment of inertia.	
CO5.	Applying the concept of gravitation	
Course Content:		
Unit-1:	Laws of Motion: Frames of reference. Newton's Laws of motion. Dynamics of a system of particles, Centre of Mass. Momentum and Energy: Conservation of momentum. Work and energy, Conservation of energy.	9 Hours
Unit-2:	Rotational Motion: Angular velocity and angular momentum. Torque. Conservation of angular Momentum. Gravitation: Newton's Law of Gravitation. Motion of a particle in a central force Field (motion is in a plane, angular momentum is conserved, areal velocity is constant). Kepler's Laws (statement only).	9 Hours
Unit-3:	Oscillations: Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages. Damped oscillations	9 Hours
Unit-4:	Special Theory of Relativity: Constancy of speed of light. Postulates of Special Theory of Relativity. Length contraction. Time dilation. Relativistic addition of velocities.	9 Hours
Unit-5:	Elasticity: Hooke's law - Stress-strain diagram - Elastic moduli-Relation between elastic constants Poissons Ratio-Expression for Poissons ratio in terms of elastic constants - Work done in stretching and work done in twisting a wire - Twisting couple on a cylinder - Determination of Rigidity modulus by static torsion - Torsional pendulum-Determination of Rigidity modulus and moment of inertia - q, and by Searles method.	12 Hours
Textbook:	1. Mechanics, D.S. Mathur, S. Chand and Company Limited.	
References:	1. An introduction to mechanics, D. Kleppner, R.J. Kolenkow, McGraw-Hill. 2. Mechanics, Berkeley Physics, vol.1, C. Kittel, W. Knight, et.al. Tata McGraw-Hill. Physics, Resnick, Halliday and Walker, Wiley. 3. Analytical Mechanics, G.R. Fowles and G.L. Cassiday. Cengage Learning. 4. https://www.feynmanlectures.caltech.edu/I_toc.html	



Course Code: BFS-S-258 DSEC-2 12 HOURS	DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP-A FORENSIC SCIENCE SEMESTER-II PHYSICAL & ORGANIC CHEMISTRY- I (LAB)	L-0 T-0 P-2 C-1
1.	Physical Chemistry <ol style="list-style-type: none"> Determination of heat capacity of calorimeter for different volumes. Determination of enthalpy of neutralization of hydrochloric acid with sodium hydroxide. Determination of enthalpy of ionization of acetic acid. Determination of integral enthalpy of solution of salts (KNO₃, NH₄Cl). Determination of enthalpy of hydration of copper sulphate. Study of the solubility of benzoic acid in water and determination of ΔH pH measurements Measurement of pH of different solutions like aerated drinks, fruit juices, shampoos and soaps (use dilute solutions of soaps and shampoos to prevent damage to the glass electrode) using pH-meter. <p>Preparation of buffer solutions: (i) Sodium acetate-acetic acid (ii) Ammonium chloride ammonium hydroxide (iii) Measurement of the pH of buffer solutions and comparison of the values with Theoretical values.</p>	
2.	Organic Chemistry <p>Purification of organic compounds by crystallization (from water and alcohol) and distillation. Criteria of Purity: Determination of melting and boiling points.</p> <p>Preparations: Mechanism of various reactions involved to be discussed. Recrystallisation, determination of melting point and calculation of quantitative yields to be done. (a) Bromination of Phenol/Aniline. (b) Benzoylation of amines/phenols. (c) Oxime and 2,4-dinitrophenylhydrazone of aldehyde/ketone.</p>	

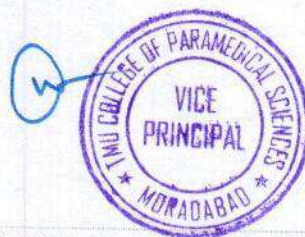
Course Code: BFS-S-259 DSEC-2 12 HOURS	DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP-B FORENSIC SCIENCE SEMESTER-II MECHANICS (LAB)	L-0 T-0 P-2 C-1
1.	Measurements of length (or diameter) using vernier caliper, screw gauge and travelling micro-scope.	
2.	To determine the Height of a Building using a Sextant.	
3.	To determine the Moment of Inertia of a Flywheel.	
4.	To determine the Young's Modulus of a Wire by Optical Lever Method.	
5.	To determine the Modulus of Rigidity of a Wire by Maxwells needle.	
6.	To determine the Elastic Constants of a Wire by Searles method.	
7.	To determine 'g' by Bar Pendulum & Katers Pendulum.	

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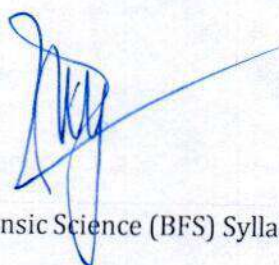
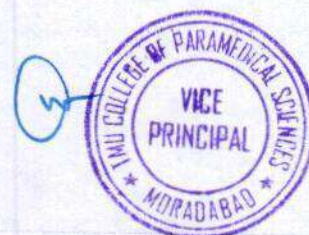
To study the Motion of a Spring and calculate

(a) Spring Constant (b) g.



New course Added.

Course Code: TMUGE201 AECC-2	ABILITY ENHANCEMENT COMPIULSORY COURSE FORENSIC SCIENCE SEMESTER-II ENGLISH COMMUNICATION-II	L-2 T-0 P-2 C-3
Course Outcomes:	On completion of the course, the students will be :	40 hours
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.	Creating Official Letters, E-Mail & Paragraphs in correct format.	
Course Content:		
Unit-1:	Functional Grammar- a. Prefix, suffix and One words substitution b. Modals c. Concord	10 Hours
Unit-2:	Listening Skills- a. Difference between listening & hearing, Process and Types of Listening b. Importance and Barriers to listening	4 Hours
Unit-3:	Writing Skills- a. Official letter and email writing b. Essentials of a paragraph, c. Developing a paragraph: Structure and methods d. Paragraph writing (100-120 words)	12 Hours
Unit-4:	Strategies & Structure of Oral Presentation a. Purpose, Organizing content, Audience & Locale, Audio-visual aids, Body language b. Voice dynamics: Five P's - Pace, Power, Pronunciation, Pause, and Pitch. c. Modes of speech delivery and 5 W's of presentation	8 Hours
Unit-5:	Value based text reading: Short Essay (Non- detailed study) How should one Read a book? – Virginia Woolf	6 Hours
Textbook:	1. Singh R.P., An Anthology of English Essay, O.U.P. New Delhi	
References:	1. Nesfield J.C. "English Grammar Composition & Usage" Macmillan Publishers 2. Sood Madan "The Business letters" Goodwill Publishing House, New Delhi 3. https://india.oup.com/product/communication-skills-9780199488803	

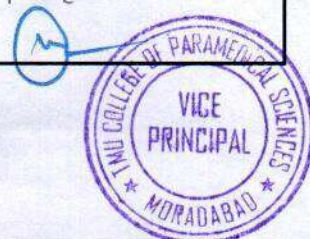
B.Sc Forensic Science (BFS) Syllabus as per CBCS (2019-20) W.E.F. till revised 36 | Page



Course Code: BFS-S-308 DSCE-3	DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP -A FORENSIC SCIENCE SEMESTER-III ANALYTICAL CHEMISTRY	L-4 T-0 P-2 C-5
Course Outcomes:	On completion of the course, the students will be :	48 hours
CO1.	Describing the basic concept of analytical chemistry. Qualitative and quantitative analysis.	
CO2.	Understanding the theoretical principles of various separation techniques in chromatography, and Explaining the applications of chromatographic techniques.	
CO3.	Applying the basic statistical treatment of the analytical data for getting a correct result.	
CO4.	Analyzing the chemical structure of water and soil.	
CO5.	Analyzing the chemical composition of cosmetics and their functions in different products.	
Course Content:		
Unit-1:	Qualitative and quantitative aspects of analysis: Sampling, evaluation of analytical data, errors, accuracy and precision, methods of their expression. Normal law of distribution of indeterminate errors, statistical test of data; F, Q and t test, rejection of data, and confidence intervals.	9 Hours
Unit-2:	Analysis of soil: Composition of soil, Concept of pH and pH measurement, Complex metric titrations, Chelation, Chelating agents, Determination of pH of soil samples.	9 Hours
Unit-3:	Analysis of water: Definition of pure water, sources responsible for contaminating water, water sampling methods, water purification methods. Determination of pH, acidity and alkalinity of a water sample. Determination of dissolved oxygen (DO) of a water sample.	9 Hours
Unit-4:	Chromatography: Definition general introduction on principles of chromatography, paper chromatography TLC etc. 1. Paper chromatographic separation of mixture of metal ion (Fe^{3+} and Al^{3+}). 2. To compare paint samples by TLC method. Ion-exchange: Column, ion-exchange chromatography etc.	9 Hours
Unit-5:	Analysis of cosmetics: Major and minor constituents and their function. 1. Analysis of deodorants and anti perspirants, Al, Zn, boric acid, chloride, sulphate. 2. Determination of constituents of talcum powder: Magnesium oxide, Calcium oxide, Zinc	12 Hours
Textbook:	1. Harris, D. C. Quantitative Chemical Analysis, W. H. Freeman.	
References:	1. Willard, H. H. Instrumental Methods of Analysis, CBS Publishers. 2. Skoog & Lerry. Instrumental Methods of Analysis, Saunders College Publications, New York. 3. Modern analytical chemistry by David T Harvey(E-book) 4. Handbook Of Instrumental Techniques For Analytical Chemistry by Frank A. Settle (E-book)	



Course Code: BFS-S-309 DSEC-3	DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP-B FORENSIC SCIENCE SEMESTER-III ELECTRICITY & MAGNETISM	L-4 T-0 P-2 C-5
Course Outcomes:	On completion of the course, the students will be :	48 hours
CO1.	Understanding the relation between electric field and potential, exploiting the potential to solve a variety of problems, and relating it to the potential energy of a charge distribution.	
CO2.	Describing electric dipoles and the role of molecular dipoles in the electrostatic response of dielectrics. Demonstrating a working understanding of capacitors.	
CO3.	Identifying the Calculation of the magnetic forces that act on moving charges and the magnetic fields due to currents (Biot- Savart and Ampere laws)	
CO4.	Applying the Gauss's law of electrostatics to solve a variety of problems.	
CO5.	Applying the concepts of induction and self-induction, to solve problems using Faraday's and Lenz's laws	
Course Content:		
Unit-1:	Electric Field and Electric Potential Electric field lines, Electric flux, Gauss' Law with applications to charge distributions with spherical, cylindrical and planar symmetry. Electrostatic Potential. Laplace's and Poisson equations (Only statement). Potential and Electric Field of a dipole. Force and Torque on a dipole.	9 Hours
Unit-2:	Electrostatics: Electrostatic energy of system of charges. Electrostatic energy of a charged sphere. Conductors in an electrostatic Field. Surface charge and force on a conductor. Capacitance of a system of charged conductors. Parallel-plate capacitor. Capacitance of an isolated conductor.	9 Hours
Unit-3:	Dielectric Properties of Matter: Electric Field in matter. Polarization, Polarization Charges. Electrical Susceptibility and Dielectric Constant. Capacitor (parallel plate, spherical, cylindrical) filled with dielectric. Displacement vector D . Relations between E , P and D . Gauss' Law in dielectrics.	9 Hours
Unit-4:	Magnetic Field: Magnetic force between current elements and definition of Magnetic Field B . Biot- Savart's Law and its simple applications: straight wire and circular loop. Ampere's Circuital Law. Magnetic Force on (1) point charge (2) current carrying wire (3) between current elements.	9 Hours
Unit-5:	Magnetic Properties of Matter: Magnetization vector (M), Magnetic Intensity (H). Magnetic Susceptibility and permeability. Relation between B , H , M . Ferromagnetism. B-H curve and hysteresis Electromagnetic Induction: Faraday's Law. Lenz's Law. Self Inductance and Mutual Inductance. Energy stored in a Magnetic Field.	12 Hours
Textbook:	1. A Text Book of Practical Physics, I. Prakash & Ramakrishna, 11 th Ed., Kitab Mahal	
References:	1. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, , Heinemann Education Publishers 2. Engineering Practical Physics, S. Panigrahi and B. Mallick, Cengage Lea 3. A Treatise on Electricity and Magnetism by James Clerk Maxwell(E-book) 4. Electricity and magnetism by Nayfeh M.H., Brussel M.K(E-book)	



New course Added

Course Code: BFS-S-358 DSEC-3 12 HOURS	DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP-A FORENSIC SCIENCE SEMESTER-III ANALYTICAL CHEMISTRY (LAB)	L-0 T-0 P-2 C-1
1.	Separation Techniques: Chromatography <ol style="list-style-type: none"> 1. Separation of mixtures--Paper chromatographic separation of Fe^{3+} and Al^{3+}. 2. Separation and identification of the monosaccharide present in the given mixture (glucose & fructose) by paper chromatography. 3. Separate a mixture of Sudan yellow and Sudan Red by TLC technique and identify them on the basis of their R_f values. 	
2.	Solvent Extractions: <ol style="list-style-type: none"> 1. Determine the pH of the given aerated drinks fruit juices, shampoos and soaps. 2. Determination of Na, Ca, Li in cola drinks and fruit juices using flame photometric techniques. 3. Analysis of soil: <ol style="list-style-type: none"> i. Determination of pH of soil. ii. Total soluble salt iii. Estimation of calcium, magnesium, phosphate, nitrate 	

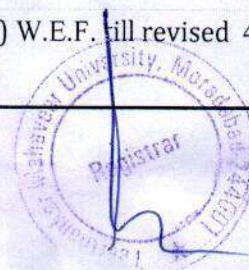
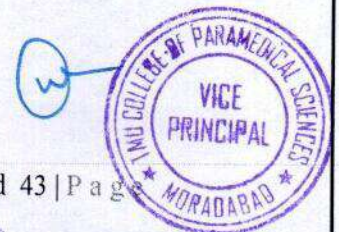
Course Code: BFS-S-359 DSEC-3 12 HOURS	DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP-B FORENSIC SCIENCE SEMESTER-III ELECTRICITY & MAGNETISM (LAB)	L-0 T-0 P-2 C-1
1.	Use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, (d) Capacitances, and (e) Checking electrical fuses.	
2.	To study the characteristics of a series RC Circuit.	
3.	To determine an unknown Low Resistance using Potentiometer.	
4.	To determine an unknown Low Resistance using Carey Foster's Bridge.	
5.	To compare capacitances using De'Sauty's bridge.	
6.	Measurement of field strength B and its variation in a solenoid (determine dB/dx).	
7.	To determine self-inductance of a coil by Anderson's bridge.	
8.	To study response curve of a Series LCR circuit and determine its (a) Resonant frequency, & Impedance at resonance,	
9.	To study response curve of a Series LCR circuit and determine its (a) Quality factor Q, & (b) Band width.	
10.	To study the response curve of a parallel LCR circuit and determine its (a) Anti- resonant frequency and (b) Quality factor Q.	
11.	Determine a high resistance by leakage method using Ballistic Galvanometer.	
12.	To determine self-inductance of a coil by Rayleigh's method.	

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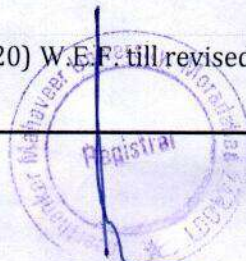
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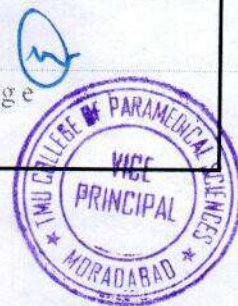
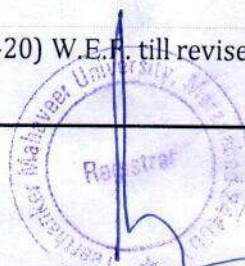
Course Code: TMUGE301 AECC-3	ABILITY ENHANCEMENT COMPULSORY COURSE FORENSIC SCIENCE SEMESTER-III ENGLISH COMMUNICATION-III	L-2 T-0 P-2 C-3
Course Outcomes:	On completion of the course, the students will be :	24 Hours
CO1.	Remembering and understanding the English grammar and vocabulary.	
CO2.	Understanding the art of public speaking and strategies of reading comprehension.	
CO3.	Applying correct vocabulary and sentence construction during public speaking or professional writing.	
CO4.	Analyzing different types of sentences like simple, compound and complex. Drafting notice, agenda and minutes of the meeting.	
CO5.	Developing speaking skills during common conversation and power point presentation.	
Course Content:		
Unit-1:	English Grammar & Vocabulary <ul style="list-style-type: none"> • Correction of Common Errors (with recap of English Grammar with its usage in practical context.) • Synthesis : Simple , complex and compound sentence • Commonly used Idioms & phrases (Progressive learning whole semester) 	06 Hours
Unit-2:	Speaking Skills <ul style="list-style-type: none"> • Art of public speaking • Common conversation • Extempore • Power Point Presentation (Pptx) Skills: Nuances of presenting PPTs 	08 Hours
Unit-3:	Comprehension Skills <ul style="list-style-type: none"> • Strategies of Reading comprehension: Four's • How to solve a Comprehension (Short unseen passage: 150-200 words) 	03 Hours
Unit-4:	Professional Writing <ol style="list-style-type: none"> 1. Preparing Notice, Agenda & Minutes of the Meeting 	04 Hours
Unit-5:	Value based text reading: Short story. <ul style="list-style-type: none"> • The Barber's Trade Union – Mulk Raj Anand 	03 Hours
Textbook:	1. Singh R.P., An Anthology of Short stories, O.U.P. New Delhi.	
References:	<ol style="list-style-type: none"> 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. Kumar Sanjay & Pushplata "Communication Skills" Oxford University Press, New Delhi. 	



Course Code: TMUGS-301	VALUE ADDED COURSE -I FORENSIC SCIENCE SEMESTER-III MANAGING SELF	L-2
VAC I		T-1
		P-0
		C-0
Course Outcomes:	On completion of the course, the students will be :	TOTAL 30 HOURS
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
References:	<ol style="list-style-type: none"> 1. Robbins, Stephen P., Judge, Timothy A. Vohra, Neharika, Organizational Behavior (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), Create space Independent Pub 5. Rathgeber, Holger, Kotter, John, Our Iceberg is melting (2017), Macmillan 6. https://www.indeed.com/career-advice/interviewing/job-interview-tips-how-to-make-a-great-impression. 	



Course Code: BFS-S-408 DSEC-4	DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP -A FORENSIC SCIENCE SEMESTER-IV PHYSICAL & ORGANIC CHEMISTRY-II	L-4 T-0 P-2 C-5
Course Outcomes:	On completion of the course, the students will be :	48 hours
CO1.	Understanding the fundamentals of solution in reference to the properties of ideal, non-ideal solutions.	
CO2.	Understanding the concepts of electrochemistry and conductance and their applications.	
CO3.	Explaining and analyzing the preparation and reaction of Di azonium salt and amines.	
CO4.	Analyzing the structure of carbohydrate, their chemical properties, reactivity.	
CO5.	Evaluating the various methods of potentiometric titrations.	
Course Content		
Unit-1:	Solutions: Thermodynamics of ideal solutions: Ideal solutions and Raoult's law, deviations from Raoult's law– Non-ideal solutions. Vapour pressure-composition and temperature-composition Curves of ideal and non- ideal solutions. Distillation of solutions. Lever rule. Azeotropes	9 Hours
Unit-2:	Conductance: Conductivity, equivalent and molar conductivity and their variation with dilution for weak and strong electrolytes. Kohlrausch law of independent migration of ions. Transference number and its experimental determination using Hittorf and Moving boundary methods.	9 Hours
Unit-3:	Electrochemistry: Reversible and irreversible cells. Concept of EMF of a cell. Measurement of EMF of a cell. Nernst equation and its importance. Types of electrodes. Standard electrode potential. Electrochemical series. Potentiometric titrations: Qualitative treatment (acid-base and oxidation-reduction only)	9 Hours
Unit-4:	Amines and Diazonium salts: Amines (Aliphatic and Aromatic): (Upto 5 carbons) Preparation: from alkyl halides, Gabriel's Phthalimide synthesis, Hofmann Bromamide reaction. Reactions: Hofmann vs. Saytzeff elimination, Carbylamine test, Hinsberg test with HNO ₂ , Schotten– Baumann Reaction. Electrophilic substitution (case aniline): nitration, bromination, sulphonation. Diazonium salts: Preparation: from aromatic amines.	9 Hours
Unit-5:	Carbohydrates: Classification, and General Properties, Glucose and Fructose (open chain and cyclic structure), Determination of configuration of monosaccharides, absolute configuration of Glucose and Fructose, Mutarotation,, Structure of disaccharides (Sucrose, maltose, lactose) and polysaccharides (starch and cellulose) excluding their structure elucidation.	12 Hours
Textbook:	1. G. M. Barrow: Physical Chemistry Tata McGraw Hill (2007).	
References:	1. J. C. Kotz, P. M. Treichel, J. R. Townsend, General Chemistry, Cengage Learning India Pvt. Ltd.: New Delhi (2009). 2. H. Mahan: University Chemistry, 3rd Edn. Narosa (1998). 3. The physical basis of chemistry by Warren S. Warren (E-book) 4. A Text-Book of Practical Organic Chemistry Including Qualitative Organic Analysis by Arthur Israel Vogel(E-book)	

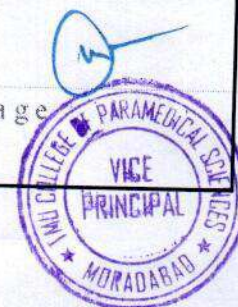
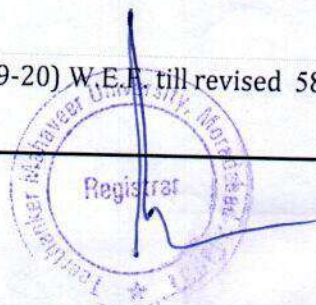


Course Code: BFS-S-409 DSEC-4	DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP -B FORENSIC SCIENCE SEMESTER-IV WAVE & OPTICS	L-4 T-0 P-2 C-5
Course Outcomes:	On completion of the course, the students will be :	48 hours
CO1.	Understanding the concept of geometrical optics including the wave motion	
CO2.	Describing the superposition of a range of collinear and mutually perpendicular simple harmonic motions and their applications.	
CO3.	Explaining the different types of waves and their velocities: Plane, Spherical, Transverse, Longitudinal and the concept of concept of temporal and spatial coherence	
CO4.	Identifying the basic and advanced concept of holography, interference and diffraction	
CO5.	Applying the Fraunhofer Diffraction from apertures: Rectangular, Slit, Double Slit, Grating, Circular apertures.	
Course Content:		
Unit-1:	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.	9 Hours
Unit-2:	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.	9 Hours
Unit-3:	Wave Optics: Electromagnetic nature of light. Definition and properties of wave front, Huygens's Principle. Temporal and Spatial Coherence.	9 Hours
Unit-4:	Fraunhofer diffraction: Single slit, double slit & nth slits, Diffraction grating. Resolving Power of a telescope Resolving power of grating.	9 Hours
Unit-5:	Holography: Principle of Holography. Recording and Reconstruction Method. Theory of Holography as Interference between two Plane Waves	12 Hours
Textbook:	1. Waves: Berkeley Physics Course, vol. 3, Francis Crawford, 2007, Tata McGraw Hill.	
References:	1. Optics, (2017), 6th Edition, Ajoy Ghatak, McGraw-Hill Education, New Delhi 2. The Physics of Vibrations and Waves, H. J. Pain, 2013, John Wiley and Sons. 3. Guided Wave Optical Components and Devices: Basics, Technology, and Applications by Bishnu P. Pal(E-book) 4. Guided Wave Optics by Alan Rolf Mickelson (E-book)	

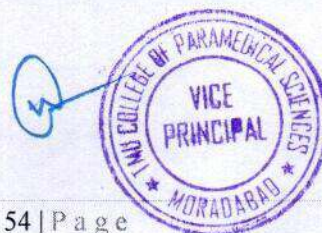


Course Code: BFS-S-458 DSEC-4 12HOURS	DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP -A FORENSIC SCIENCE SEMESTER-IV PHYSICAL & ORGANIC CHEMISTRY (LAB)	L-0 T-0 P-2 C-1
1.	Phase equilibria <ol style="list-style-type: none"> Construction of the phase diagram of a binary system (simple eutectic) using cooling curves. Determination of the critical solution temperature and composition of the phenol water system and study of the effect of impurities on it. Study of the variation of mutual solubility temperature with concentration for the phenol water system and determination of the critical solubility temperature. Conductance <ol style="list-style-type: none"> Determination of cell constant Determination of equivalent conductance, degree of dissociation and dissociation constant of a weak acid. Perform the following conduct metric titrations: Strong acid vs. strong base Weak acid vs. strong base Potentiometry: Perform the following potentiometric titrations: <ol style="list-style-type: none"> Strong acid vs. strong base Weak acid vs. strong base Potassium dichromate vs. Mohr's salt 	
2.	Organic Chemistry <ol style="list-style-type: none"> Systematic Qualitative Organic Analysis of Organic Compounds possessing mono functional groups (- COOH, phenolic, aldehydic, ketonic, amide, nitro, amines) and preparation of one derivative. Separation of amino acids by paper chromatography Determination of the concentration of glycine solution by formylation method. Titration curve of glycine 	

Course Code: BFS-S-459 DSEC-4 12 HOURS	DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP -B FORENSIC SCIENCE SEMESTER-III WAVES & OPTICS (LAB)	L-0 T-0 P-2 C-1
1	To determine the frequency of an electric tuning fork by Melde's experiment and verify λ^2 -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.	



Course Code: TMUGE401 AECC-5	ABILITY ENHANCEMENT COMPULSORY COURSE FORENSIC SCIENCE SEMESTER-IV ENGLISH COMMUNICATION-IV	L-2 T-0 P-2 C-3
Course Outcomes:	On completion of the course, the students will be :	40 Hours
CO1.	Remembering and understanding the English grammar and vocabulary.	
CO2.	Understanding the essentials of effective listening and speaking.	
CO3.	Understanding the corporate expectations and professional ethics.	
CO4.	Applying correct vocabulary and sentence construction during professional writing or job interviews.	
CO5.	Analyzing different types of interviews. Drafting resume, C.V. or cover letter.	
Course Content:		
Unit-1:	Vocabulary & Grammar 1. Homophones and Homonyms 2. Correction of Common Errors (with recap of English Grammar with its usage in practical context.) 3. Transformation of sentences	12 Hours
Unit-2:	Essence of Effective listening & speaking Listening short conversation/ recording (TED talks / Speeches by eminent personalities) Critical Review of these above mentioned, Impromptu	05 Hours
Unit-3:	Professional Writing 1. Proposal: Significance, Types, Structure & AIDA 2. Report Writing: Significance, Types, Structure & Steps towards Report writing	08 Hours
Unit-4:	Job Oriented Skills 1. Cover Letter 2. Preparing Résumé and Curriculum-Vitae 3. Interview: Types of Interview, Tips for preparing for Interview and Mock Interview 4. Corporate Expectation & Professional ethics: Skills expected in corporate world	10 Hours
Unit-5:	Value based text reading: Short story A Bookish Topic – R.K. Narayan	05 Hours
Textbooks:	1. Raman Meenakshi & Sharma Sangeeta, "Technical Communication-Principles & Practice" Oxford university press, New Delhi. 2. Mohan K. & Sharma R.C., "Business Correspondence of Report Writing", TMH, New Delhi. 3. Chaudhary, Sarla "Basic Concept of Professional Communication" Dhanpat Rai Publication, New Delhi.	
References:	1. Kumar Sanjay & Pushplata "Communication Skills" Oxford University Press, New Delhi. 2. Agrawal, Malti "Professional Communication" Krishana Prakashan Media (P) Ltd. Meerut.	



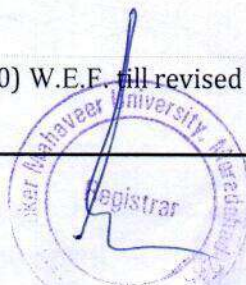
Course Code: TMUGS-401 VAC-II	VALUE ADDED COURSE (VAC)-II FORENSIC SCIENCE SEMESTER-IV MANAGING WORK AND OTHERS	L-2 T-1 P-0 C-0
Course Outcomes:	On completion of the course, the students will be:	30 Hours
CO1.	Communicating effectively in a variety of public and interpersonal settings.	
CO2.	Applying 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	08 Hours
Unit-2:	Interpersonal Skills: Conflict management Development of cordial interpersonal relations at all levels Negotiation Importance of working in teams in modern organizations Manners, etiquette and net etiquette	12 Hours
Unit-3:	Interview Techniques: Job Seeking Group discussion (GD) Personal Interview	10 Hours
References:	<ol style="list-style-type: none"> 1. Robbins, Stephen P., Judge, Timothy A., Vohra, Neharika, Organizational Behaviour (2018), 18th 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 <ol style="list-style-type: none"> 1. https://www.hloom.com/resumes/creative-templates/ 2. https://www.mbauniverse.com/group-discussion/topic.php 3. https://www.indeed.com/career-advice/interviewing/job-interview-tips-how-to-make-a-great-impression <p><i>* Latest editions of all the suggested books are recommended.</i></p>	



Course Code: BFS-S-508 DSEC-5	DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP -A FORENSIC SCIENCE SEMESTER-V INORGANIC & PHYSICAL CHEMISTRY-I	L-4 T-0 P-2 C-5
Course Outcomes:	On completion of the course, the students will be :	48 hours
CO1.	Remembering the fundamental principles of metallurgy and applications in various fields of metals and alloy behavior and their manufacturing processes	
CO2.	Understanding the Structure, bonding of s and p block materials and their oxides/compounds	
CO3.	Describing chemical kinetics: determination of order, molecularity, and theories of reaction rates determination of rate of opposing/parallel/chain reactions	
CO4.	Applying the Preparation, Properties And Reactions Of Hydrides Of Nitrogen, Halides And Oxohalides.	
CO5.	Analyzing the Concept of activation energy and its calculation from Arrhenius equation.	
Course Content:		
Unit-1:	General Principles of Metallurgy: Ellingham diagrams for reduction of metal oxides using carbon as reducing agent. Hydrometallurgy, Methods of purification of metals (Al, Pb, Ti, Fe, Cu, Ni, Zn): electrolytic, oxidative refining, Kroll process, Parting process, van Arkel-de Boer process and Mond's process.	9 Hours
Unit-2:	Compounds of s- and p-Block Elements: Hydrides and their classification (ionic, covalent and interstitial), structure and properties with respect to stability of hydrides of p- block elements. Concept of multicentre bonding (diborane): Structure, bonding and their important properties like oxidation/reduction, acidic/basic nature of the following compounds and their applications in industrial, chemistry.	8 Hours
Unit-3:	Hydrides of nitrogen: (NH ₃ , N ₂ H ₄ , N ₃ H, NH ₂ OH) Oxoacids of P, S and Cl. Halides and oxohalides: PCI ₃ , PCI ₅ , SOCl ₂ and SO ₂ Cl ₂ .	8 Hours
Unit-4:	Liquids: Surface tension and its determination using stalagmometer. Viscosity of a liquid and determination of coefficient of viscosity using Ostwald viscometer. Effect of temperature on surface tension and coefficient of viscosity of a liquid (qualitative treatment only)	11 Hours
Unit-5:	Chemical Kinetics: The concept of reaction rates. Effect of temperature, pressure, catalyst and other factors on reaction rates. Order and molecularity of a reaction. Derivation of integrated rate equations for zero, first and second order reactions (both for equal and unequal concentrations reactants). Half-life of a reaction. General methods for determination of order of a reaction. Concept of activation energy and its calculation from Arrhenius equation. Theories of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions.	12 Hours
Textbook:	1. G. M. Barrow: Physical Chemistry Tata McGraw Hill (2007).	
References:	1. F.A. Cotton & G. Wilkinson: Basic Inorganic Chemistry, John Wile 2. D. F. Shriver and P. W. Atkins: Inorganic Chemistry, Oxford University Press 3. Advance inorganic chemistry by Prof, Joel Rosenthal 4. Chemical reaction in inorganic chemistry by Chandra Leka Saravanan	



Course Code: BFS-S-509 DSEC-5	DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP -B FORENSIC SCIENCE SEMESTER-V THERMAL PHYSICS	L-4 T-0 P-2 C-5
Course Outcomes:	On completion of the course, the students will be :	48 hours
CO1.	Remembering the basic concepts of thermodynamics, the first and the second law of thermodynamics.	
CO2.	Explaining entropy and the associated theorems, the thermodynamic potentials and their physical interpretations.	
CO3.	Describing the kinetic theory of gases, Maxwell-Boltzman distribution law, equitation of energies, mean free path of molecular collisions, viscosity, thermal conductivity	
CO4.	Applying Fundamental concept of ideal and real gas in physics reactions	
CO5.	Analyzing the Behavior of Real Gases.	
Course Content:		
Unit-1:	Introduction to Thermodynamics: First & Second Law of Thermodynamics: Thermodynamic Variables & Equilibrium, Concept of Temperature, Work & Heat, Internal Energy, Applications of First Law.	8 Hours
Unit-2:	Entropy & Thermodynamic Potentials: Concept of Entropy, Clausius Theorem. Second Law of Thermodynamics in terms of Entropy. 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	8 Hours
Unit-3:	Maxwell's Thermodynamic Relations: Derivations and applications of Maxwell's Relations. Values of C_p-C_v , TdS Equations, Joule-Kelvin coefficient for Ideal and Van der Waal Gases, Energy equations, Change of Temperature during Adiabatic Process	10 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.	10 Hours
Unit-5:	Real Gases: Behavior of Real Gases: Deviations from the Ideal Gas Equation. Critical Constants. Continuity of Liquid and Gaseous State. Vapour and Gas. Boyle Temperature. Van der Waal's Equation of State for Real Gases.	12 Hours
Textbook:	1. Heat and Thermodynamics, M.W. Zemansky, Richard Dittman, McGraw-Hill.	
References:	1. Thermodynamics, Kinetic Theory & Statistical Thermodynamics, Sears & Salinger. Narosa. 2. Concepts in Thermal Physics, S.J. Blundell and K.M. Blundell, Oxford University Press 3. Thermal physics by David Goodstein	

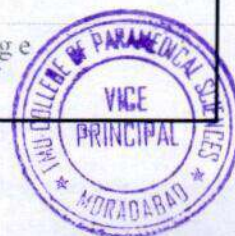


Course Code: BFS-S-558 DSEC-5 12 HOURS	DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP -A FORENSIC SCIENCE SEMESTER-V PHYSICAL & ORGANIC CHEMISTRY- I (LAB)	L-0 T-0 P-2 C-1
1.	<p>Inorganic Chemistry: Semi -micro qualitative analysis using H₂S of mixtures- not more than four ionic species (two anions and two cations and excluding insoluble salts) out of the following:</p> <p>1. Cations : NH⁺, Pb⁺, Ag⁺, Bi⁺, Cu⁺, Cd⁺, Sn⁺, Fe⁺, Al⁺, Co⁺, Cr⁺, Ni⁺, Mn⁺, Zn²⁺, Ba²⁺, Sr²⁺, Ca²⁺, K⁺ 2. Anions: CO²⁻, S²⁻, SO²⁻, S O²⁻, NO⁻, CH COO⁻, Cl⁻, Br⁻, I⁻, NO⁻, SO²⁻, PO³⁻, BO³³⁻, C²O⁴²⁻, F⁻</p> <p>(Spot tests should be carried out wherever feasible).</p>	
2.	<p>Physical Chemistry:</p> <p>1. Surface tension measurement (use of organic solvents excluded). a. Determination of the surface tension of a liquid or a dilute solution using a stalagmometer. b. Study of the variation of surface tension of a detergent solution with concentration.</p> <p>2. Viscosity measurement (use of organic solvents excluded). a. Determination of the relative and absolute viscosity of a liquid or dilute solution using an Ostwald's viscometer. b. Study of the variation of viscosity of an aqueous solution with concentration of solute.</p> <p>3. Chemical Kinetics--Study the kinetics of the following reactions. a. Initial rate method: Iodide-persulphate reaction. b. Integrated rate method. c. Acid hydrolysis of methyl acetate with hydrochloric acid.</p> <p>d. Saponification of ethyl acetate.</p> <p>e. Compare the strengths of HCl and H₂SO₄ by studying kinetics of hydrolysis of methyl.</p>	

Course Code: BFS-S-559 DSEC-5 12 HOURS	DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP -A FORENSIC SCIENCE SEMESTER-V THERMAL PHYSICS (LAB)	L-0 T-0 P-2 C-1
1	To determine the Coefficient of Thermal Conductivity of Cu by Searle's Apparatus.	
2	To determine the Coefficient of Thermal Conductivity of a bad conductor by Lee and Charlton's disc method.	
3	To determine the Temperature Coefficient of Resistance by Platinum Resistance Thermometer (PRT).	
4	To study the variation of Thermo-EMF of a Thermocouple with Difference of Temperature of its Two Junctions.	
5	To calibrate a thermocouple to measure temperature in a specified Range using (1) Null Method, (2) Direct measurement using Op-Amp difference amplifier and to determine Neutral Temperature.	




Course Code: BFS-S-608 DSEC-6	DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP -A FORENSIC SCIENCE SEMESTER-VI INORGANIC AND PHYSICAL CHEMISTRY-II	L-4 T-0 P-2 C-5
Course Outcomes:	On completion of the course, the students will be :	48 hours
CO1.	Understanding the properties of transition metals like variable oxidation states, color, magnetic and catalytic properties	
CO2.	Describing the concept of vibrational motion in physical chemistry	
CO3.	Explaining the Schrodinger wave equation for Rigid rotor and Linear harmonic oscillator and calculate their respective energies.	
CO4.	Applying the fundamentals of photochemistry and laws governing it such as Beer Lambert law	
CO5.	Applying the quantum mechanical operators, quantization, probability distribution, uncertainty principle and application of quantization to spectroscopy.	
Course Content:		
Unit-1:	Transition Elements (3d Series): General group trends with special reference to electronic configuration, variable valency, color, magnetic and catalytic properties, ability to form complexes and stability of various oxidation states (Latimer diagrams) for Mn, Fe and Cu.	9 Hours
Unit-2:	Crystal Field Theory: Crystal field effect, octahedral symmetry. Crystal field stabilization energy (CFSE), Crystal field effects for weak and strong fields. Tetrahedral symmetry. Factors affecting the magnitude of D. Spectrochemical series. Comparison of CFSE for Oh and Td complexes, Tetragonal distortion of octahedral geometry. Jahn-Teller distortion, Square planar coordination	10 Hours
Unit-3:	Quantum Chemistry & Spectroscopy: Spectroscopy and its importance in chemistry. Wave-particle duality. Link between spectroscopy and quantum chemistry. Electromagnetic radiation and its interaction with matter. Types of spectroscopy. Difference between atomic and molecular spectra. Born- Oppenheimer approximation: Separation of molecular energies into translational, rotational, Vibrational And Electronic Components.	8 Hours
Unit-4:	Rotational Motion: Schrödinger equation of a rigid rotator and brief discussion of its results (solution not required). Quantization of rotational energy levels. Microwave (pure rotational) spectra of diatomic molecules. Selection rules. Structural information derived from rotational spectroscopy. Vibrational Motion: Schrödinger equation of a linear harmonic oscillator and brief discussion of its results (solution not required). Quantization of vibrational energy levels. Selection rules, IR spectra of diatomic molecules. Structural information derived from vibrational spectra. Vibrations of polyatomic molecules.	9 Hours
Unit-5:	Photochemistry: Laws of photochemistry, Lambert-Beer's law. Fluorescence and phosphorescence. Quantum efficiency and reasons for high and low quantum yields. Primary and secondary processes in photochemical reactions. Photochemical and thermal reactions. Photoelectric cells.	12 Hours
Textbook:	1. G. M. Barrow: Physical Chemistry Tata McGraw Hill (2007).	
References:	1. Kotz, P. M. Treichel & J. R. Townsend: General Chemistry, Cengage Learning India Pvt. Ltd., New Delhi (2009). 2. H. Mahan: University Chemistry 3rd Ed. Narosa (1998). 3. Advance inorganic chemistry by Prof, Joel Rosenthal	

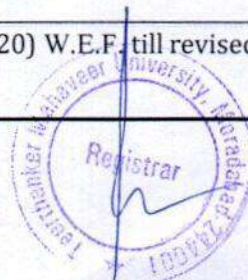


Course Code: BFS-S-609 DSEC-6	DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP -B FORENSIC SCIENCE SEMESTER-VI SOLID STATE PHYSICS	L-4 T-0 P-2 C-5
Course Outcomes:	On completion of the course, the students will be :	48 hours
CO1.	Understanding the concept of lattice, crystals and such as the reciprocal lattice and the Brillouin zone and the dynamics of atoms and electrons in solids and diffraction of X-rays by solids to determine the crystal structure.	
CO2.	Describing the concept of Type I and type II Superconductors.	
CO3.	Identifying the origin of the dielectric properties exhibited by solids and the concept of polarizability	
CO4.	Applying the basics of phase transitions and the preliminary concept and experiments related to Superconductivity in solid.	
CO5.	Applying the fundamentals of the elementary lattice dynamics and its influence on the properties of materials as well as concept of lattice vibrations, phonons.	
Course Content:		
Unit-1:	Crystal Structure: Solids: Amorphous and Crystalline Materials. Lattice: Translation Vectors, Lattice with a Basis Unit Cell, Miller Indices, Reciprocal Lattice, Types of Lattices, Brillouin Zones. Diffraction of X-rays by Crystals, Bragg's Law.	9 Hours
Unit-2:	Elementary Lattice Dynamics: Lattice Vibrations and Phonons: Linear Monoatomic and Diatomic Chains; Acoustical and Optical Phonons, Qualitative Description of the Phonon Spectrum in Solids.	10 Hours
Unit-3:	Magnetic Properties of Matter: Dia-, Para-, Ferri- and Ferromagnetic Materials. Classical Langevin Theory of dia and Paramagnetic Domains. Quantum Mechanical Treatment of Para magnetism.	9 Hours
Unit-4:	Dielectric and Ferroelectric Properties of Materials: Electric Susceptibility. Polarizability Clausius Mosotti Equation. Classical Theory of Electric Polarizability. Langevin-Debye equation. Plasma Oscillations, Plasma Frequency, Plasmons, Structural phase transition, Classification of crystals.	10 Hours
Unit-5:	Superconductivity and Elementary band theory: Critical Temperature. Critical magnetic field, Meissner effect. Type I and type II Superconductors, London's Equation and Penetration Depth. Isotope effect. Band Gap, Conductor, Semiconductor (P and N type) and insulator.	10 Hours
Textbook:	I. G. M. Barrow: Physical Chemistry Tata McGraw Hill (2007).	
References:	1. Kotz, P. M. Treichel & J. R. Townsend: General Chemistry, Cengage Learning India Pvt. Ltd., New Delhi (2009). 2. H. Mahan: University Chemistry 3rd Ed. Narosa(1998). 3. Solid state physics by James Patterson 4. Introduction to solid state physics by Michel Van Veenendaal	

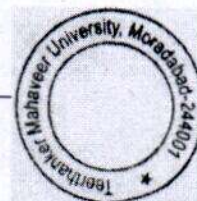


Course Code: BFS-S-658 DSEC-6 12 HOURS	DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP -A FORENSIC SCIENCE SEMESTER-VI PHYSICAL & ORGANIC CHEMISTRY II (LAB)	L-0 T-0 P-2 C-1
1.	Inorganic Chemistry: <ol style="list-style-type: none"> 1. Estimation of the amount of nickel present in a given solution as bis (dimethylglyoximate) nickel (II) or 2. Aluminium as oxinate in a given solution gravimetrically. Estimation of (i) Mg or (ii) Zn by complexometric titrations using EDTA. Estimation of total hardness of a given sample of water by complexometric titration. 3. To draw calibration curve (absorbance at λ_{max} vs. concentration) for various concentrations of a given 4. Coloured compound and estimate the concentration of the same in a given solution. 5. Determination of the composition of the Fe^{3+} - salicylic acid complex / Fe^{2+} -phenanthroline complex in solution by Job's method. 6. Determination of concentration of Na^{+} and K^{+} using Flame Photometry. 	
2.	Physical Chemistry: <p>UV/Visible spectroscopy</p> <ol style="list-style-type: none"> 1. Study the 200-500 nm absorbance spectra of $KMnO_4$ and $K_2Cr_2O_7$ (in 0.1 M H_2SO_4) and determine the λ_{max} values. Calculate the energies of the two transitions in different units (J molecule⁻¹, kJ mol⁻¹, cm⁻¹, eV). 2. Study the pH-dependence of the UV-Vis spectrum (200-500 nm) of $K_2Cr_2O_7$. 3. 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. <p>Colourimetry:</p> <ol style="list-style-type: none"> 1. Verify Lambert-Beer's law and determine the concentration of $CuSO_4/KMnO_4/K_2Cr_2O_7$ in a solution of unknown concentration. 2. Analyze the given vibration-rotation spectrum of HCl (g). 	

Course Code: BFS-S-659 DSEC-6 12 HOURS	DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP -B FORENSIC SCIENCE SEMESTER-VI SOLID STATE PHYSICS (LAB)	L-0 T-0 P-2 C-1
1	Measurement of resistivity by using 4-probe technique.	
2	Measurement of magneto resistance.	
3	Measurement of magnetic susceptibility using Quincke's method.	
4	Study of thermo luminescence of color center.	
5	Measurement of magnetic susceptibility using Gouy's method.	
6	Characteristics of Zener or Tunnel diode.	
7	Study of magnetic hysteresis.	
8	Study of Hall effect and Raman Effect.	

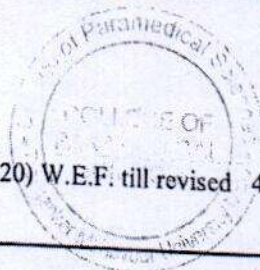
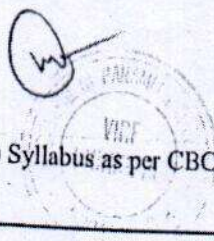


Course Code: BFS-S-655 SEC-19	SKILL ENHANCEMENT COURSE (SEC) FORENSIC SCIENCE SEMESTER-VI DISSERTATION	L-0 T-0 P-8 C-4
Course Outcomes:	On completion of the course, the students will be :	48 hours
CO1.	Understanding for the selection of the topic in accordance with police and forensic science problem associated with various crimes cases faced by these institutions.	
CO2.	Explaining the collection of primary data for a specific topic in one specific field.	
CO3.	Applying the concept of pilot survey relevance and to teach about specific laboratory techniques chosen by the student.	
CO4.	Analyzing a report on the basis of data and analysis undertaken.	
CO5.	Evaluating the topic of dissertation in routine Forensic Science cases.	
Course Content:		
	The students are supposed to prepare a Dissertation based on field work or laboratory work (for 1 month) in the specialized field chosen by the student in consultation with their supervisor. Two hard copies of the dissertation to be submitted by the student for its evaluation by the end of semester.	



Post revision

Course Code: BFS-S-305 DSC-1	DISCIPLINE SPECIFIC COURSE FORENSIC SCIENCE SEMESTER-III FORENSIC MEDICINE	L-4 T-0 P-2 C-5
Course Outcomes:	On completion of the course, the students will be :	48 hours
CO1.	Understanding the concept of Forensic Medicine & concept of inquest, oath and various court proceedings used in medico legal investigation.	
CO2.	Interpreting the concept of biomolecular changes after death and it's the Medico legal significance	
CO3.	Explaining the wounds and injuries their nature, classification and laws and differentiate the homicide, suicidal and accidental injuries.	
CO4.	Applying the Forensic anthropological & forensic odontological techniques to determine age, sex and race from skeletal remains.	
CO5.	Analyzing the different asphyxia death scenarios like hanging, strangulation and drowning through case study.	
Course Content:		
Unit-1:	Forensic Anthropology - Nature, formation, and identification of human bones and their scope in forensic anthropology. Determination of age, sex, race from skeletal material. Facial reconstruction and its forensic significance.	9 Hours
Unit-2:	Procedure in court: Inquest and its type. Oath, Examination-in-chief, Cross Examination and Re-Examination; Medico legal Reports and Dying declaration.	9 Hours
Unit-3:	Forensic Odontology -Development, Types of teeth and their comparative anatomy. Estimation of Age from teeth, and role of forensic odontology in mass disaster and other crime scene. Bite marks -Introduction, Collection, preservation and photography of bite marks evidence. Forensic significance of bite marks and its Legal aspects.	12 Hours
Unit-4:	Thanatology - Definition, Types of death (somatic and molecular).Medico-legal aspects and estimation of time of death in terms of Changes after death (immediate, early and late changes), Ashphysxial Deaths (strangulation, hanging, drowning etc).	9 Hours
Unit-5:	Wounds and Injuries - Definition of wounds and injuries and laws governing them. Types and classification of injuries. Ante mortem and post mortem injuries. Aging of injuries. Artificial injuries. Difference between suicidal, homicidal and accidental injuries.	9 Hours
Textbook:	1. Reddy,V.R; Dental Anthropology, Inter-India Publication, New Delhi,1985.	
References:	1. Kroeber; Anthropology, Oxford & IBH Publishing Company, New Delhi, 1972. 2. Pickering, R. & Bachman D; The use of Forensic Anthropology, CRC Press, Costa Rica, 2009. 3. Simpson's Forensic Medicine by Richard Shepherd(E-book) 4. Forensic Anthropology and Medicine: Complementary Sciences From Recovery to Cause of Death by Aurore Schmitt, Eugénia Cunha, João Pinheiro (E-book)	



Pre-revision

THIRD SEMESTER

PAPER I (BFS-S- 301) – FORENSIC MEDICINE

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Learning Objectives: To understand and identification of informed Medico-legal responsibility

UNIT-I

DEATH INVESTIGATIONS-

Fundamental aspects and scope of forensic medicine. Approaching the crime scene of death. Obtaining first hand information from the caller. Rendering medical assistance to the victim, if alive. Protecting life. Recording dying declaration. Identifying witnesses and, if possible, suspect. Interviewing onlookers and segregating possible witnesses. Suspect in custody – initial interrogation and searching for evidence.

UNIT – II

Role of Forensic Medicine in court – Meaning and Scope Inquest Nature and Powers of Criminal Courts in India Procedure of calling a witness to a court.

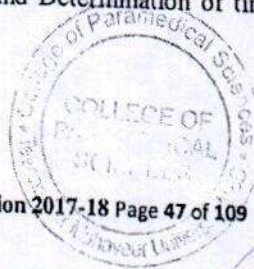
Procedure in court: Oath Examination – in –chief, Cross Examination and Re-Examination Medical Evidence Medico legal Reports and Dying declaration Doctor as medical/ Expert witness

UNIT – III

Autopsy Medical Autopsy: Introduction and objectives, rules for medico legal autopsy, external and internal examination of body, collection of Ante-mortem and post-mortem samples, autopsy report.

UNIT – IV

Thanatology- Definition of death. Types of death(somatic and molecular).Medico-legal aspects of death – Causes of death such as asphyxia(strangulation, hanging, drowning etc), electrocution, thermal trauma, heat burns, starvation, natural death, sudden death etc. Changes after death (immediate, early and late changes) and Determination of time since death.



UNIT - V

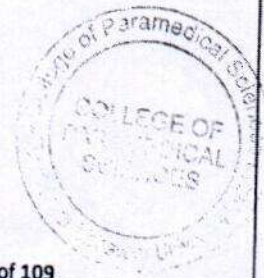
Wounds and Injuries- Definition of wounds and injuries and laws governing them. Types and classification of injuries. Ante mortem and post mortem injuries. Aging of injuries. Artificial injuries. Difference between suicidal, homicidal and accidental injuries.

Learning outcome: After studying this paper the students will know -

1. The duties of the first responding officer who receives a call on homicide or suicide case and the steps involved in processing the death scene.
2. The importance of Death and death scene to ascertaining whether the crime was staged to appear as suicide, accident, homicide.
3. The importance of External and internal autopsy findings in determining medico legal aspects of death.
4. The importance of forensic pathology in giving medicolegal answers of various modes of deaths.

SUGGESTED READINGS

1. Forensic medicine and toxicology: principles and practice, Professor Krishna Vij
Publisher: Elsevier , 5 edition ,2014
2. Practical Aspects of Forensic Medicine, Dr T.D. Dogra Dr. AD Aggrawal jaypee
publishers,2014.
3. Parikh's textbook of medical jurisprudence, forensic medicine and toxicology
Professor C. K. Parikh ,CBS; 6 edition, 2007
4. The essentials of forensic medicine and toxicology Professor K.S. Narayan Reddy
Jaypee Brothers Medical Publishers; 34th edition 2017
5. Principles of forensic medicine Professor Apurva Nandy New Central Book Agency;
3rd Revised edition edition 2010
6. A Textbook of Medical Jurisprudence and Toxicology Dr. Jaising P. Modi (Edited by
Justice K Kannan ,Lexis Nexis; 24th edition 2012



Post revision

Course Code: BFS-S-510 CC-10	CORE COURSE FORENSIC SCIENCE SEMESTER-V INTRODUCTION TO RESEARCH METHODOLOGY	L-4 T-0 P-2 C-5
Course Outcomes:	On completion of the course, the students will be :	48 hours
CO1.	Understanding the concept of research, research types, goals and criteria of a good research, research process formulation, and research-related ethical issues.	
CO2.	Describing the concept of data collection, sampling & scaling techniques used in research design.	
CO3.	Applying the process of designing a research study from its inception to its report writing and its various components	
CO4.	Analyzing the data analysis-and hypothesis testing procedures in research.	
CO5.	Evaluating the interpretation of data in research methodology.	
Course Content:		
Unit-1:	Research: Nature, Definition and Purposes; scientific attitudes theory formation: Inductive, Deductive-Reasoning; Types of research studies: Descriptive, Analytical, Exploratory and Doctrinal	7 Hours
Unit-2:	Steps in Research : Primary and Secondary - Independent and Dependent variables; Main steps in Social Research types: Formulation of research problem, selecting of problem, study area, etc; Review of Literature; Sample collection; Data Analysis and Report Writing	10 Hours
Unit-3:	Hypothesis and Sampling Hypothesis: Definition, types and sources; Research Design: Meaning and types; Reliability and validity; sampling: Non Probability and Probability types;	10 Hours
Unit-4:	Methods of data collection: Pilot study, observation, Questionnaire, Interviewing, Case study method; Unobtrusive measures, Secondary data collection.	9 Hours
Unit-5:	Data Analysis: Types of data: qualitative and quantitative; Analysis and interpretation of data, Data processing; Content analysis; Survey method measurement and types of scales. Ethics in Research: Researcher Fraud and Plagiarism, Confidentiality in Research	12 Hours
Textbook:	1. Research Methodology & Biostatistics by CR Kothari	
References:	1. Mausner & Bahn: Epidemiology-An Introductory text, 2nd Ed., W. B. Saunders Co. 2. Richard F. Morton & J. Richard Hebdt: A study guide to Epidemiology and Biostatistics, 2nd Ed., University Park Press, Baltimore. 3. Introduction to research methods by Bora Pajo 4. Research methodology by Ranjit Kumar	



Prerevision

SIXTH SEMESTER

PAPER-III (BFS-S-603): INTRODUCTION TO RESEARCH METHODOLOGY

L	T	P	C
6	0	2	7

Learning Objectives:

The primary objective of this course is to develop a research orientation among the scholars and to acquaint them with fundamentals of research methods. Specifically, the course aims at introducing them to the basic concepts used in research and to scientific social research methods and their approach. It includes discussions on sampling techniques, research designs and techniques of analysis.

UNIT I

Introduction-Definitions and types of research; Research process and steps in conducting research; Applications of Research. Ethical issues in conducting research.

UNIT II

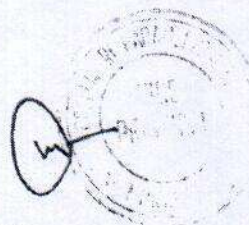
Research Modeling- Types of Data, Data collection methods- Survey method, Observation method, Experimentation; Scaling techniques; types of sampling, steps in sampling, advantage and limitations of sampling

UNIT III

Application of Statistical tools-Measures of Central tendency – Mean, Median, Mode; Introduction of Probability Theories and Concepts, Probability Distributions- Discrete and Continuous Probability Distributions; Measures of Association: Correlation and regression

UNIT IV

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Data Analysis Techniques--Quantitative and qualitative methods of data analysis; Hypothesis Testing - Parametric tests (Z-test, t-test, F-test) and Non-parametric Tests (Chi-Square Test, ANNOVA), Tests of significance based on normal distributions; association of attributes.

UNIT V

Report Writing --Report generation, report writing, and APA format – Title page, Abstract, Introduction, Methodology, Results, Discussion, References, and Appendices.

Learning Outcomes:

At the end of this course, the students should be able to:

1. Understand Some Basic Concepts Of Research And Its Methodologies
2. Identify Appropriate Research Topics • Select And Define Appropriate Research Problem And Parameters
3. Prepare A Project Proposal (To Undertake A Project)
4. Organize And Conduct Research (Advanced Project) In A More Appropriate Manner
5. Write A Research Report And Thesis
6. Write A Research Proposal (Grants)

SUGGESTED READINGS:

1. Mausner & Bahn: Epidemiology-An Introductory text, 2nd Ed., (1985) W. B. Saunders Co.
2. Richard F. Morton & J. Richard Hebd: A study guide to Epidemiology and Biostatistics, 2nd Ed.(2012), University Park Press, Baltimore.
3. Sylvia W Smoller, J Smoller, Biostatistics & Epidemiology A Primer for health and Biomedical professionals, 4th edition, Springs, 2015

