BACHELOR OF SCIENCE (PCM)
Duration: 36 Months (3 Years) Eligibility: 12th Pass

COURSE STRUCTURE OF B.SC MATHEMATICS (HONOURS) Ist SEMESTER

Course Details				External Assesment		Internal Assesment				Credit Distribution			Allotted Credits
Course Code	Course Type	Course Title	Total Marks	Major		Minor		Sessional		L	T	P	Subject wise Distribution
				Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks				
Theory Group													
3HBHL101H	**Ability Enhancement**	हिन्दी भाषा और संरचना	50	25	08	10	04	15	06	2	-	-	2
3CBCA201H	**Ability Enhancement**	Basic Information Computer Technology - I	50	25	08	-	-	-	-	1	-	1	2
3SBMA105H	**Core Course -1**	Algebra, Trigonometry & Geometry	150	75	25	30	12	45	18	5	1	-	6
3SBMA106H	**Core Course -2**	Logic & Sets	150	75	25	30	12	45	18	5	1	-	6
	Generic Elective -1	(Select From Below Given Specialised Subject)*	100	50	17	20	08	30	12	4	-	-	4
Practical Group				Term End Practical Exam		Sessional							
	Practical	(Select From Below Given Specialised Subject)*	50	25	8	25	8	-	-	-	-	2	2
3CBCA201H	**Practical**	Basic of Computer & Information technology-I	-	-	-	10	04	15	06	-	-	-	-
		Grand Total	550	-	-	-	-	-	-	17	02	03	22

Minimum Passing Marks are equivalent to Grade C   **L- Lectures T- Tutorials P- Practical**
Major- Term End Theory Exam
Minor- Pre University Test
Sessional weightage – Attendance 50%, Three Class Tests/Assignments 50%
* Generic Elective Specialization: Opted Specialization by student in 1st Semester will remain same in IInd, IIIrd and IVthSeemster (See the specialisation subject as mentioned below)*

Generic Elective- 1		
Specialisation	**Course Code**	**Subject**
Physics	3SBPH103H	Mechanics, Oscillations and Properties of Matter
Chemistry	3SBCH104H	Chemistry –I

BACHELOR OF SCIENCE

Duration: 36 Months (3 Years) Eligibility: 12th Pass

COURSE STRUCTURE OF B.SC MATHEMATICS (HONOURS) IInd SEMESTER

Course Code	Course Type	Course Title	Total Marks	Major Max Marks	Major Min Marks	Minor Max Marks	Minor Min Marks	Sessional Max Marks	Sessional Min Marks	L	T	P	Subject wise Distribution
Course Details				**External Assesment**		**Internal Assesment**				**Credit Distribution**			**Allotted Credits**
Theory Group													
3HBEL201H	Ability Enhancement	English Language and Indian Culture	50	25	08	10	04	15	06	2	-	-	2
3MBFE101H	Ability Enhancement	Fundamental of Entrepreneurship	50	25	08	10	04	15	06	2	-	-	2
3SBMA205H	**Core Course-3**	Calculus, Differential Equations & Vector Calculus	150	75	25	30	12	45	18	5	1	-	6
3SBMA206H	**Core Course-4**	Theory of real functions	150	75	25	30	12	45	18	5	1	-	6
	Generic Elective-2	(Select From Below Given Specialised Subject)*	100	50	17	20	08	30	12	4	-	-	4
Practical Group				**Term End Practical Exam**				**Sessional**					
	Practical	(Select From Below Given Specialised Subject)*	50	25	08	25	08	-	-	-	-	2	2
Skill Courses								**Sessional**					
***	**Skill Enhancement**	Skill Enhancement Elective Course-I	50	-	-	-	-	50	20	1	-	1	2
	Grand Total		600	-	-	-	-	-	-	19	02	03	24

Minimum Passing Marks are equivalent to Grade C

L- Lectures T- Tutorials P- Practica

Major- Term End Theory / Practical Exam
Minor- Pre University Test
Sessional weightage – Attendance 50%, Three Class Tests/Assignments 50%
Skill Elective I – Any other course being offered in this semester as per the list given at the end of course structure.
* Generic Elective Specialization: Opted Specialization by student in 1st Semester will remain same in IInd, IIIrd and IVthSeemster (See the specialisation subject as mentioned below)*

Generic Elective- 2		
Specialisation	**Course Code**	**Subject**
Physics	3SBPH203H	Mathematical Background, Electrostatics, and Steady
Chemistry	3SBCH204H	Chemistry –II

BACHELOR OF SCIENCE

Duration: 36 Months (3 Years) Eligibility: 12th Pass

COURSE STRUCTURE OF B.SC MATHEMATICS (HONOURS) IIIrd SEMESTER

Course Code	Course Type	Course Title	Total Marks	External Assesment - Major Max Marks	External Assesment - Major Min Marks	Internal Assesment - Minor Max Marks	Internal Assesment - Minor Min Marks	Internal Assesment - Sessional Max Marks	Internal Assesment - Sessional Min Marks	L	T	P	Allotted Credits Subject wise Distribution
Theory Group													
3HBHL302H	Ability Enhancement	हिन्दी भाषा संरचना एवं संचार साधन	50	25	08	10	04	15	06	2	-	-	2
3CBCA502H	Ability Enhancement	Basic Information Computer Technology - II	50	25	08	-	-	-	-	1	-	1	2
3SBMA305H	**Core Course-5**	Calculus, Differential Equation and Mechanics	150	75	25	30	12	45	18	5	1	-	6
3SBMA306H	**Core Course-6**	Multivariate Calculus	150	75	25	30	12	45	18	5	1	-	6
	Generic Elective-3	(Select From Below Given Specialised Subject)*	100	50	17	20	08	30	12	4	-	-	4
Practical Group				**Term End Practical Exam**				**Sessional**					
	Practical	(Select From Below Given Specialised Subject)*	50	25	8	25	8	-	-	-	-	2	2
3CBCA502H	**Practical**	Basic of Computer & Information technology-II	-	-	-	10	04	15	06	-	-	-	-
Skill Courses								**Sessional**					
***	**Skill Enhancement**	Skill Enhancement Elective Course-II	50	-	-	-	-	50	20	1	-	1	2
		Grand Total	600	-	-	-	-	-	-	18	02	04	24

Minimum Passing Marks are equivalent to Grade C

L- Lectures T- Tutorials P- Practical

Major- Term End Theory / Practical Exam

Minor- Pre University Test

Sessional weightage – Attendance 50%, Three Class Tests/Assignments 50%

Skill Elective II – Any other course being offered in this semester as per the list given at the end of course structure.

* Generic Elective Specialization: Opted Specialization by student in 1st Semester will remain same in IInd, IIIrd and IVthSeemster (See the specialisation subject as mentioned below)*

Generic Elective- 3		
Specialisation	**Course Code**	**Subject**
Physics	3SBPH303H	Kinetic Theory of Gases, Thermo-dynamics and Statistical Mechanics.
Chemistry	3SBCH304H	Chemistry –III

BACHELOR OF SCIENCE (PCM)

Duration: 36 Months (3 Years) Eligibility: 12th Pass

COURSE STRUCTURE OF B.SC MATHEMATICS (HONOURS) IVth SEMESTER

Course Code	Course Type	Course Title	Total Marks	Major Max Marks	Major Min Marks	Minor Max Marks	Minor Min Marks	Sessional Max Marks	Sessional Min Marks	L	T	P	Subject wise Distribution
Course Details				**External Assesment**		**Internal Assesment**				**Credit Distribution**			**Allotted Credits**
Theory Group													
3HBEL402H	Ability Enhancement	English language and scientific temper	50	25	08	10	04	15	06	2	-	-	2
3HBHP401H	Ability Enhancement	Human Values & Ethics	50	25	08	10	04	15	06	2	-	-	2
3SBMA405H	**Core Course -7**	Advanced Calculus, Partial Differential Equations, Complex Analysis and Abstract Algebra	150	75	25	30	12	45	18	5	1	-	6
3SBMA406H	**Core Course -8**	Probability & Statistics	150	75	25	30	12	45	18	5	1	-	6
	Generic Elective -4	(Select From Below Given Specialised Subject)*	100	50	17	20	08	30	12	4	-	-	4
Practical Group				**Term End Practical Exam**				**Sessional**					
	Practical	(Select From Below Given Specialised Subject)*	50	25	8	25	8	-	-	-	-	2	2
	Grand Total		**550**	-	-	-	-	-	-	**18**	**02**	**02**	**22**

Minimum Passing Marks are equivalent to Grade C

L- Lectures T- Tutorials P- Practical

Major- Term End Theory Exam

Minor- Pre University Test

Sessional weightage – Attendance 50%, Three Class Tests/Assignments 50%

* Generic Elective Specialization: Opted Specialization by student in 1st Semester will remain same in IInd, IIIrd and IVthSeemster (See the specialisation subject as mentioned below)*

Generic Elective- 4		
Specialisation	**Course Code**	**Subject**
Physics	3SBPH403H	Group Waves, Acoustics and Optics
Chemistry	3SBCH404H	Chemistry –IV

BACHELOR OF SCIENCE (HONOURS)
Duration: 36 Months (3 Years) Eligibility: 12th Pass from Science with Minimum

COURSE STRUCTURE OF Mathematics (HONOURS) SEMESTER Vth													
Course Details				**External Assessment**		**Internal Assessment**				**Credit Distribution**			**Allotted Credits**
				Major		**Minor**		**Sessional *****					
Course Code	**Course Type**	**Course Title**	**Total Marks**	**Max Marks**	**Min Marks**	**Max Marks**	**Min Marks**	**Max Marks**	**Min Marks**	**L**	**T**	**P**	**Subject wise Distribution**
Theory Group													
3SBMA501H	Core Course-9	Real Analysis	150	75	25	30	12	45	18	6	-	-	6
3SBMA502H	Core Course-10	Linear Algebra	150	75	25	30	12	45	18	6	-	-	6
3SBMA503H	Core Course-11	Numerical Analysis	150	75	25	30	12	45	18	6	-	-	6
*	Discipline Specific Elective-1	Elective Paper-I	150	75	25	30	12	45	18	6	-	-	6
**	Discipline Specific Elective -2	Elective Paper-II	150	75	25	30	12	45	18	6	-	-	6
Skill Courses				Term End Practical Exam		Lab Performance		Sessional					
***	Skill Enhancement	Skill Enhancement Elective Course-II	50	25		15	10	1	-	1	2	***	2
Grand Total			800										32

Minimum Passing Marks are equivalent to Grade C   **L- Lectures T- Tutorials P- Practical**
Major- Term End Theory Exam
Minor- Pre University Test
Sessional weightage – Attendance 50%, Three Class Tests/Assignments 50%

BACHELOR OF SCIENCE (HONOURS)
Duration: 36 Months (3 Years) Eligibility: 12th Pass from Science with Minimum

COURSE STRUCTURE OF MATHEMATICS (HONOURS) SEMESTER VIth														
Course Details				External Assessment		Internal Assessment						Credit Distribution			Allotted Credits
Course Code	Course Type	Course Title	Total Marks	Major		Minor		Sessional ***				L	T	P	Subject wise Distribution
				Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks						
Theory Group															
3SBMA601H	Core Course-12	Special Function	150	75	25	30	12	45	18	6	-	-	6
3SBMA602H	Core Course-13	Operation Research	150	75	25	30	12	45	18	6	-	-	6
3SBMA603H	Core Course-14	Numerical Methods using C programming	100	50	17	20	08	30	12	4	-	-	4
***	Discipline Specific Elective-1	Elective Paper	150	75	25	30	12	45	18	6	-	-	6
****	Project/ Dissertation	Project & **Viva-Voce**	150	75	25	30	12	45	18	6	-	-	6

Practical Group				Term End Practical Exam		Lab Performance		Sessional					
3SBMA607H	**Practical-I**	**Core Course-14**	50	25	08	25	08	-	-	-	-	2	2
Grand Total			750										30

Minimum Passing Marks are equivalent to Grade C   **L- Lectures T- Tutorials P- Practical**
Major- Term End Theory Exam
Minor- Pre University Test
Sessional weightage – Attendance 50%, Three Class Tests/Assignments 50

DISCIPLINE SPECIFIC ELECTIVE

*Note - Students need to select any two from below mentioned four papers from Each Group Elective's forFifth and Sixth semester of **B.Sc. Mathematics (Honours).**

ELECTIVES FOR SEMESTER 5TH			ELECTIVES FOR SEMESTER 6TH		
Course Code	Course Type	List of Electives	Course Code	Course Type	List of Electives
***GROUP ELECTIVE -I			*** GROUP ELECTIVE -III		
3SBMA504H		Dynamics	3SBMA604H		DIFFERENTIAL GEOMETRY
3SBMA505H		Number Theory	3SBMA605H		HYDROSTATICS
**** GROUP ELECTIVE -II			****GROUP ELECTIVE -IV		
3SBMA506H		Discrete Mathematics			
3SBMA507H		Metric spaces	3SBMA608H		PROJECT AND VIVA-VOCE

SKILL ENHANCEMENT ELECTIVE COURSES

Elective No.	Department/ Faculty Name		
	Non-Technical		
	Faculty of Information Technology		
I	SCIT 201	Data Entry Operation	2(1+0+1)
II	SCIT 301	Multimedia	2(1+0+1)
III	SCIT 501	Web Designing with HTML	2(1+0+1)
IV	SCMIT 201	Web Development	2(1+0+1)
V	SCMIT 301	LINUX	2(1+0+1)
	Faculty of Management		
I	SMGT 201	Briefing and Presentation Skills	2(1+0+1)
II	SMGT 301	Resolving Conflicts and Negotiation Skills	2(1+0+1)
III	SMGT 802	Entrepreneurship Development	2(1+0+1)
	Faculty of Commerce		
I	SCOM 201	Tally ERP 9	2(1+0+1)
II	SCOM 302	Multimedia	2(1+0+1)
III	SCOM 803	Data Analyst	2(1+0+1)
	Faculty of Humanities		
I	SHBA 301	Pursuing Happiness	2(1+0+1)
II	SHBA302	Communication Skill and Personality Development	2(1+0+1)
III	SHMA301	Tourism in M.P	2(1+0+1)
	Faculty of Science		
I	SSBI 301	Mushroom Cultivation	2(1+0+1)
II	SSPH 301	House Hold Wiring	2(1+0+1)
III	SSPH 301	Basic Instrumentation	2(1+0+1)
IV	SSPH 301	DTP Operator	2(1+0+1)
V	SSCH 301	Graphic Designing	2(1+0+1)
	Faculty of Education		
I	SCBE 403	Understanding of ICTC (Information Communication Technology)	2(1+0+1)
II	SCPE 201	Yoga Education	2(1+0+1)

हिन्दी भाषा और संरचना

पाठ्यक्रम के उद्देश्य:

1. विद्यार्थियों में राष्ट्र प्रेम की भावना का विकास करना।
2. हिन्दी के समृद्ध साहित्य को नयी पीढ़ी तक पहुँचाना ।
3. पत्र–लेखन, सार लेखन, भाव पल्लवन एवं साक्षात्कार के कौशल का विकास करना।
4. डायरी,संस्मरण, लेखन, पारिभाषिक, शब्दावली, तत्सम, तद्भव, देशज, विदेशी शब्दों इत्यादि के ज्ञान का परिमार्जन करना।

पाठ्यक्रम

इकाई-1

भारत वंदना) काव्य(	सूर्यकांत त्रिपाठी निराला
जाग तुझको दूर जाना	सुश्री महादेवी वर्मा
स्वतंत्रता पुकारती) काव्य(	जयशंकर प्रसाद
हम अनिकेतन) काव्य(	बालकृष्ण शर्मा नवीन
भाषा की महत्ता और उसके विविध रूप	
भाषा-कौशल	

इकाई-2

करूणा) निबंध (	आचार्य रामचन्द्र शुक्ल
समन्वय की प्रक्रिया) निबंध(	रामधारी सिंह दिनकर॰
बिच्छी बुआ) कहानी(	डॉ .लक्ष्मण विष्ट बटरोही॰
अनुवाद	परिभाषा प्रकार॰ महत्व॰ विशेषताएं
हिन्दी की शब्द-संपदा	
परिभाषिक शब्दावली	

इकाई-3

विलायत पहुंच ही गया) आत्मकथांश (	महात्मा गांधी
अफसर (व्यंग्य)	शरद जोशी
तीर्थयात्रा) कहानी(	डॉ .मिथिलेष कुमार मिश्र
मकड़ी का जाला) व्यंग्य(	डॉ .रामप्रकाश सक्सेना
वाक्य- संरचना :तत्सम॰ तद्भव देशज विदेशी	

इकाई-4

अप्प दीपो भव) वक्तृत्व कला(	स्वामी श्रद्धानंद
भारत का सामाजिक व्यक्तित्व) प्रस्तावना (	जवाहरलाल नेहरू
पत्र मैसूर के महाराजा को) पत्र-लेखन (	स्वामी विवेकानंद
बनी रहेंगी किताबें) आलेख(	डॉ .सुनीता रानी घोष
पत्र-लेखन:महत्व और उसके विविध रूप	
सड़क पर दौड़ते ईहा मृग) निबंध (	डॉ .श्यामसुन्दर दुबे

इकाई-5

योग की शक्ति) डायरी (	डॉ .हरिवंश राय बच्चन
कोश के अखाड़े में कोई पहलवान नहीं उतरता)साक्षात्कार (–	भाषाविद् डॉ. हरिदेव बाहरी से प्रो. त्रिभुवननाथ शुक्ल
नीग्रो सैनिक से भेंट) यात्रा-संस्मरण(	डॉ .देवेन्द्र सत्यार्थी
यदि बा न होती तो शायद गांधी को यह ऊँचाई न मिलती) साक्षात्कार (कथाकार.	
	गिरिराज किशोर से सत्येन्द्र शर्मा

सार- लेखनए भाव-पल्लवन साक्षात्कार और कौशल

अपेक्षित परिणामः

1. विद्यार्थी भारत भूमि से प्रेम व स्नेह के भावों को बढ़ा सकेगें।
2. विद्यार्थियों की हिन्दी की शब्द संपदा में वृद्धि होगी।
3. पत्र–लेखन ,सार लेखन, भाव पल्लवन साक्षात्कार के कौशल का विकास होगा।
4. डायरी एवं संस्मरण लेखन विद्या का परिमार्जन होगा।
5. हिन्दी के समृद्ध साहित्य कोश से लाभान्वित होगें।

| **Chairperson** | **Dean** | **(Registrar)** |
| **(Board of Studies)** | **(Academic Council)** | **Seal** |

BASIC COMPUTER & INFORMATION TECHNOLOGY-I

COURSE OBJECTIVE:-

To educate students to analyze, design, integrate & manageinformation systems using information technology.

Syllabus:

UNIT – I   Introduction to computer organization History of development of Computer system oncepts. Characteristics, Capability and limitations.
Generation of computer. Types of PC's Desktop. Laptop, Notebook. Workstation & their Characteristics.

इकाई – 1   कम्प्यूटर ऑर्गनाईजेशन का परिचय कम्प्यूटर का इतिहास, कम्प्यूटर सिस्टम विचारधारा, विशेषताएं, योग्यता एवं सीमाएं, कम्प्यूटर की पीढ़ियां, पी.सी. के प्रकार, डेस्कटॉप के प्रकार, लेपटॉप के प्रकार, नोटबुक, वर्क स्टेशन आदि की विशेषताएं।

UNIT – II   Introduction to computer organization Basic components of a computer system Control Unit, ALU, Input / Output function and Characteristics, memory RAM, ROM, EPROM, PROM.

इकाई – 2   कम्प्यूटर ऑर्गनाईजेशन का परिचय कम्प्यूटर सिस्टम के आधार उपकरण, कंट्रोल युनिट, ए.एल. यू. इनपूट/आउटपुट फंक्शन और विशेषताएं, मेमोरी रेम, रोम, इपी रोम, पी रोम, और अन्य प्रकार की मैमोरी।

UNIT – III Input & output devices Input Devices : Keyboard, Mouse, Trackball. Joystick, Digitizing tablet, Scanners, Digital Camera,MICR, OCR, OMR, Bar-code Reader, Voice Recognition, Light pen, Touch Screen.
Output Devices: Monitors Characteristics and types of monitor, Video Standard VGA, SVGA, XGA,
LCD Screen etc. Printer, Daisy wheel, Dot Matrix, Inkjet, Laser, Line Printer. Plotter, Sound Card andSpeakers.

इकाई – 3   इनपुट तथा आउटपुट डिवाईसेस **इनपुट डिवाइसः** कीबोर्ड, माउस, ट्रेकबॉल, जॉयस्टीक, डिजिटाईजिंग टेबलेट, स्केनर्स, डिजिटल केमरा, एमआईसीआर, ओसीआर, ओएमआर, बार कोड रीडर, आवाज को पहचानने वाला, लाइटपेन, टच स्क्रीन।
इनपुट डिवाइसः मॉनीटर की विशेषताएं एवं मोनीटर के प्रकार, वीडियो स्टैण्डर्ड VGA, SVGA, XGA, LCD स्क्रीन आदि, प्रिंटर्स, डेजी व्हील, डॉट मैट्रिक्स, इंकजेट, लेजर, लाईन प्रिंटर, प्लोटर, साउंड कार्डस एव स्पीकर्स।

UNIT – IV   Storage Devices Storage fundamental primary Vs Secondary. Various Storage Devices magnetic Tape. Cartridge Tape, Data Drives, Hard Drives, Floppy Disks, CD, VCD, CD-R, CD-RW,Zip Drive, DVD, DVD-RW.

इकाई – 4   स्टोरेज डिवाईसेस स्टोरेज फंडामेंटल्स प्रईमेरी विरूद्ध भिन्न स्टोरेज डिवाईजेस मेग्नेटिक टेप, कार्टरेज टेप, डाआ ड्राईव्स, हार्ड डिस्क ड्राईव्स फ्लोपी डिस्कस, सी.डी., वी.सी.डी., सी.डी.–आर. सी.डी– आर. डब्ल्यू, जीप ड्राईव, डी.वी.डी., डी.वी.डी., – आर. डब्ल्यू।

UNIT – V   Operating System Introduction to operating systems, its functioning and types. Basic commands of dos & Windows operating System.

इकाई – 5   ऑपरेटिंग सिस्टम का परिचय ऑपरेटिंग सिस्टम का परिचय, उसके लक्षण एवं प्रकार, डॉस एवं विन्डोस का मूल कमांड।

PRACTICALS:-

DOS:
- DOS commands: Internal & External Commands.
- Special batch file: Autoexec, Bar Hard disk setup.

Windows 98:
- Desktop setting: New folder, rename bin operation, briefcase, and function. Control panel utility.
- Display properties: Screen saver, background settings.

MS Word:
- Creating file; save, save as HTML, Save as Text, Template, RTF Format.
- Page setup utility: Margin settings, paper size setting, paper source, layout.
- Editing: Cut, past special, undo, redo, find, replace, go to etc.
- View file: page layout, Normal Outline, master document, ruler header, footer, footline, full screen.
- Insert: break, page number, symbol, date & time, auto text, caption file, object, hyperlink, picture etc.
- Format: font, paragraph, bullets & numbering, border & shading, change case, columns.
- Table: Draw label, insert table, cell handling, table auto format, sort formula.

COURSE OUTCOME:-

Student will be able to use computer system easily and they will get knowledge about how to use different type of operating system.

ALGEBRA, TRIGONOMETRY & GEOMETRY

COURSE OBJECTIVES:-

- Apply the concepts of matrices in solving a system of linear equations.
- Be familiar with the theory of equations.
- Expand trigonometric functions and also find the summation of T-series.
- To have knowledge about Cone and Cylinder with conicoides.
  Be familiar with group theory, ring, integral domain, field and make their fundamental strong

Syllabus:

UNIT – I   Rank of a matrix. Eigen values, eigen vectors.Characteristic equation of a matrix. Cayley Hamilton theorem and its use in finding inverse of marix. Application of matrix to a system of linear (both homogenous and non - homogenous) equations. Theorems on consistency and inconsistency of a system of linear equations. Solving the linear equations with three unknowns. Relation between the roots and coefficients of a general polynomial equation in one variable. Transformation of equations, Descarte's rule of signs.

UNIT – II   De Moivre's theorem and its application. Direct and inverse circular and hyperbolic functions, Expansion of trignometrical function. Gregory's Series, Summation of Series,

UNIT – III   Definition and basic properties of group. Order of an element of a group. Subgroups, algebra of subgroups. Cyclic groups and their simple properties. Coset decomposition and related theorems. Lagrange's theorem and its consequences, Normal sub groups, quotient groups.

UNIT- IV   Homomorphism and isomorphism of groups, kernel of Homomorphism and fundamental theorem of Homomorphism of groups Permutation groups (even and odd permutations) Alternating groups An, Cayley's theorem. Introduction to rings, subrings, integral domains and fields, simple properties and examples.

UNIT – V   General equation of second degree. Tracing of conics. Equation of cone with given base, generators of cone, condition for three mutually perpendicular generators, Right circular cone. Equation of Cylinder and its properties. Right circular cylinder, enveloping cylinder and their properties Central conicoids, Paraboloids. Plane sections of Conicoids.

COURSE OUTCOMES:-

- Understanding the ideas of matrices and ability to solve system of linear equations.
- The student will be able to acquire sound knowledge of matrices and techniques in solving equations with the help of theory of equations
- Fluency in solving equations.
- Understanding the concepts of algebra, trigonometry and geometry

LOGIC AND SETS

UNIT- I   Introduction, propositions, truth table, negation, conjunction and disjunction. Implications, biconditional propositions, converse, contra positive and inverse propositions and precedence of logical operators.

UNIT - II   Propositional equivalence: Logical equivalences.

UNIT- III   Predicates and quantifiers: Introduction, Quantifiers, Binding variables and Negations.

UNIT - IV   Sets, subsets, Set operations and the laws of set theory and Venn diagrams. Examples of finite and infinite sets. Finite sets and counting principle. Empty set, properties of empty set. Standard set operations. Classes of sets. Power set of a set.Difference and Symmetric difference of two sets. Set identities, Generalized union and Intersections.

UNIT - V   Relation: Product set, Composition of relations, Types of relations, Partitions, Equivalence Relations with example of congruence modulo relation, Partial ordering relations,binary relations.

Books Recommended

1. R.P. Grimaldi, *Discrete Mathematics and Combinatorial Mathematics*, Pearson Education, 1998.
2. P.R. Halmos, *Naive Set Theory*, Springer, 1974.
3. E. Kamke, *Theory of Sets*, Dover Publishers,

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MECHANICS, OSCILLATIONS AND PROPERTIES OF MATTER

COURSE OBJECTIVE:-

1. To understands applications of Newton's Laws of Classical System.
2. Understands the concepts of elasticity and viscosity
3. Understands the damped and driven oscillators
4. Gains and appreciations of surface phenomena.

Syllabus:

UNIT – I   Mechanics Laws of motion, centripetal acceleration, Coriolis force and its applications. Kepler's laws. Gravitational law and field,. Gauss &Poisson's Equation of Gravitational self-energy System of. particles,, centre, of mass, equation of motion, conservation of linear and angular, momentum, conservation of energy, single stage and multistage rockets, elastic and inelastic collisions.

UNIT – II   Oscillations differential equation and its solution, kinetic and potential energy, simple harmonic oscillations and its examples, spring and mass system, Vibrations of a magnet, moments of inertia and their products, principal moments and axes, Euler's equations simple and compound pendulum tensional pendulum, Helmholtz resonator,LC circuit.

UNIT – III   Superposition Of Harmonic Motion Superposition of two simple harmonic motions of the same frequency along the same line, interference, superposition of two mutually perpendicular simple harmonic vibrations of the same frequency, Lissajous figures, damped harmonic oscillators, power dissipation, quality factor and their examples, driven harmonic oscillator;

UNIT – IV   Properties of matter Elasticity, Hook's Law, elastic constants for an isotropic solid beams supported at both the ends, cantilever, torsion of a cylinder bending moments and shearing forces. Kinematics of moving fluids, equations of continuity Euler's equation, Bernoulli's theorem, viscous fluids, streamline and turbulent flow, Poiseulle's law, Capillary tube flow, Reynolds number, Stokes law Surface tension and surface energy. surface wetting.

UNIT - V   Motion of charged Particles in Electric and Magnetic Fields E as an accelerating field, electron gun, case of discharge tube, linear accelerator. E as deflecting field- CRO, sensitivity of CRO. Transverse B field; 180° deflection, mass spectrograph. principles of cyclotron. discovery of isotopes, elements of mass spectrographs, principle of magnetic focusing (lenses).

COURSE OUTCOMES:-

1. To study the fundamentals of mechanics and oscillations
2. Gate the knowledge about forces help the student in their daily life
3. The information will teach the students about the rolling concepts

PRACTICAL:-

To determine the acceleration due to gravity (*g*) at a place with the help of Bar pendulum.

1. (Compound Pendulum).
2. To determine the acceleration due to gravity (*g*) at a place with the help of Kater's reversible pendulum.
3. To determine the modulus of rigidity of given wire by Torsional Pendulum.
4. To determine the moment of inertia of a flywheel about its own axis of rotation.
5. To determine the moment of inertia of given body by using inertia table.
6. To determine the moment of inertia of given body by using inertia table with lamp and scale arrangement.
7. To study and prove the perpendicular axis theorem of moment of inertia by using inertia table.
   $I_z = I_x + I_y$
8. To determine the surface tension of a liquid by the capillary rise method.
9. To determine the co-efficient of viscosity of glycerine or castor oil by falling sphere method.
10. To determine the density of liquid by using steel balls and Teflon spheres.
11. To determine the fall time of different size spheres of same material.
12. To determine the Young's Modulus of elasticity of the given sample material by bending. (Bending of Beam)
13. To study and verify the truth table of Basic, Universal & CompoundLogic Gates.

Note:-
  ❖ **One experiment will be asked in the semester practical examination.**

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CHEMISTRY-I

COURSE OBJECTIVE:

To make the students conversant with basics, acquire sound knowledge to develop an understanding of the basic concepts of mathematical concept, gaseous , liquid & colloidal states, chemical kinetics, structure bonding and stereochemistry.

Syllabus:

UNIT - I   A. Mathematical Concepts : Logarithmic relations, curves stretching, linear graphs and calculation of slopes, Differentiation of functions like Kx, ex, xn, sinx, logx; maxima and minima, partial differentiation and reciprocity relations. Integration of some useful/relevant functions; permutations and combinations. Factorials, Probability. **B. Gaseous States** : Deviation from ideal behaviour, van der Waals equation of state. Critical phenomenon : PV isotherms of ideal gases, continuity of states, the isotherms of van der Waals equations, relationship between critical constants and van der Waals constants, the law of corresponding states, reduced equation of states.

UNIT - II   A. Liquid State : Intermolecular forces, structure of liquids (a qualitative description) Liquid crystals: Difference between liquid crystal, solid and liquid. Classification, structure of nematic and cholestric phases. Thermography and seven segment cell. **B. Colloidal State** : Definition of colloids, classification of colloids. Solids in liquids (sols): properties- kinetic, optical and electrical; stability of colloids, protective action, Hardy-Schulze law, gold number. Liquids in liquids (emulsions) : types of emulsions, preparation. Emulsifier. Liquids in solids (gels): classification, preparation and properties, inhibition, general applications of colloids.

UNIT - III   Chemical Kinetics : Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction concentration, temperature, pressure, solvent, light and catalyst. Concentration dependence of rates, mathematical characteristics of simple chemical reactions- zero order, first order, second order, pseudo order, half life and mean life. Determination of the order of reaction - differential method, method of integration, method of half life period and isolation method. Experimental methods of chemical kinetics - conductometric, potentiometic, optical methods- polarimetry and spectrophotometery. Theories of chemical kinetics: effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy. Simple collision theory based on hard sphere model, transition state theory (equilibrium hypothesis) Expression for the rate constant based on equilibrium constant and thermodynamic aspects.

UNIT - IV   A. Structure and Bonding : Hybridizations, Bond lengths and bond angles, bond energy : Localized and delocalized chemical bond, van-der Waals interactions, inclusion compounds, clatherates, charge transfer complexes, resonance, hyperconjugation, aromaticity, inductive and field effects, hydrogen bonding. B. Mechanism of Organic reactions : Curved arrow notations, drawing electron movements with arrows, half-headed and double headed arrows, homolytic and heterolytic bond breaking. C. Types of Reagents : Electrophiles and nucleophiles. Types of organic reactions. Energy consideration. Reactive intermediates-carbocations, carbanions, free radicals and carbenes. Methods of determination of reaction mechanism.

UNIT - V   A. Stereochemistry : Concept of isomerism, types of isomerism, optical isomerism, elements of symmetry, molecular chirality, enantiomers, stereogeniccentres, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogeniccentres, diastereomers, mesocompounds, resolution of enantiomers, inversion, retention and racemization. Relative and absolute configurations, sequence rule, D &L , R & S systems of nomenclature. E and Z system of Nomenclature geometrical isomerism in alicyclic compounds. Conformation, conformational analysis of ethane and n-butane. Conformations of cyclohexanes, axial and equatorial bonds, Newman projection and Sawhorse formulae, Fischer and Flying wedge formulae.

COURSE OUTCOMES:-

The knowledge gained on mathematics concept, liquid state, chemical kinetics, structure & bonding and stereochemistry will provide a strong platform to understand the concepts on these subjects for further learning.

PRACTICAL: -

Physical Chemistry
A. (Any one experiment will be asked in examination form the following carrying)
1. Calibration of thermometer
2. Determination of melting point
3. Determination of boiling point
4. Determination of mixed melting point
5. Preparation of solutions of various concentrations, NaOH, HCl, H_2SO_4.
    B. (Any one experiment will be asked in examination form the following carrying)
1. To determine the velocity constant (specific reaction rate) of hydrolysis of methyl acetate/ethyl acetate catalyzed by hydrogen ions at room temperature.
2. To study the effect of acid strength on the hydrolysis of an ester.
3. To compare the strength of HCl and H_2SO_4 by studying the kinetics of hydrolysis of ester.
4. To study kinetically the reaction rate of decomposition of iodide by H_2O_2.
5. Determination of surface tension / percentage composition of given organic mixture using surface tension method.
6. Determination of viscosity / percentage composition of given organic mixture using viscosity method.

Organic chemistry
    (Any one experiment will be asked in examination form the following carrying)
1. Distillation
2. Crystallization
3. Decolourisation and crystallization using charcoal
4. Sublimation

COURSE OUTCOMES:

Upon completion of this course, the student will be able to identify different types of melting, boiling point and different methods for organic mixture by their characteristics.

ENGLISH LANGUAGE AND INDIAN CULTURE

COURSE OBJECTIVES:-

- To Study the basic concept and Language Skills of English Language.
- Comprehensive study of different kinds of vocabulary in English Language.
- To Study the different era in every story and moods in poems.

Syllabus:

UNIT – I

1. Amalkanti: Nirendranath Chakrabarti
2. Sita: Toru Dutt
3. Tryst with Destiny: Jawaharlala Nehru
4. Delhi in 1857: Mirza Ghalib
5. Preface to the Mahabharata: C. Rajagopalachari
6. Where the Mind is Without Fear: Rabindranath Tagore
7. A Song of Kabir: Translated by Tagore
8. Satyagraha: M.K. Gandhi
9. Toasted English: R.K. Narayan
10. The Portrait of a Lady: Khushwant Singh
11. Discovering Babasaheb: Ashok Mahadevan

UNIT – II   Comprehension

UNIT – III   Composition and Paragraph Writing (Based on expansion of an idea)

UNIT – IV   Basic Language Skills : Vocabulary – Synonyms, Antonyms, Word Formation, Prefixes and Suffixes, Words likely to be confused and Misused, Words similar in Meaning or Form, Distinction between Similar Expressions, Speech Skill.

UNIT – V   Basic Language Skills : Grammar and usage – The Tense Forms, Propositions, Determiners and Countable/Uncountable Nouns, Verb, Articles, Adverbs.

COURSE OUTCOMES:-

1. Students will be able to understand the basic concept and Language Skills of English Language.
2. Students will be able to understand the different use of vocabulary in their sentences.
3. Students will be able to understand the varieties of stories on different issues and on different format.

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FUNDAMENTALS OF ENTREPRENEURSHIP

COURSE OBJECTIVE:-

Understanding basic concepts of entrepreneurship and key steps in the elaboration of business ideas, Developing personal creativity and entrepreneurial initiative.

Syllabus:

UNIT – I Entrepreneurship-Definition, Characteristics and importance, Types and functions of an entrepreneur, merits of a good entrepreneur motivational factors of entrepreneurship.

UNIT – II Motivation to achieve targets and establishment of ideas. Setting targets and facing challenges. Resolving problems and creativity. Sequenced planning and guiding capacity, Development of self confidence. Communication skills, Capacity to influence, leadership.

UNIT – III Project Report- Evaluation of selected process. Detailed project report - Preparation of main part of project report pointing out necessary and viability.
Selecting the form of Organization: Meaning and characteristics of sole   Proprietorship, Partnership and cooperative committees, elements affecting selection of a form of an organization.
Economic management -Role of banks and financial institutions banking, financial plans, working capital-evaluation and management, Cost and Price determination, Calculation of Profits, keeping of accounts.

UNIT – IV Production management - Methods of purchase. Management of movable assets/goods. Quality management. Employee management. Packing.
Marketing management Sales and the art of selling. Understanding the market and market policy. Consumer management. Time management.

UNIT - V Role of regulatory institutions - district industry centre, pollution control board, food and drug administration, special study of electricity development and municipal corporation.
Role of development organizations, khadi & village Commission/ Board, State Finance Corporation, scheduled banks, MP Women's Economics Development Corporation.
Self-employment-oriented schemes, Prime Minister's Employment schemes, Golden Jubilee Urban environment scheme, Rani Durgavati Self-Employment scheme, Pt. Deendayal Self-employment scheme.
Various grant schemes - Cost-of-Capital grant, interest grant, exemption from entry tax, project report, reimbursement grant, etc.
Special incentives for women entrepreneurs, prospects 8s possibilities.
Schemes of Tribal Finance Development Corporation, schemes of Antyavasai Corporation, schemes of Backward Class and Minorities Finance Development Corporation.
Special incentives for women entrepreneurs, prospects 8s possibilities.
Schemes of Tribal Finance Development Corporation, schemes of Antyavasai Corporation, schemes of Backward Class and Minorities Finance Development Corporation.

COURSE OUTCOME:-

Understanding basic concepts in the area of entrepreneurship, understanding the stages of the entrepreneurial process, adopting of the key steps in the elaboration of business ideas, Developing personal creativity and entrepreneurial initiative.

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CALCULUS, DIFFERENTIAL EQUATIONS & VECTOR CALCULUS

COURSE OBJECTIVES:-

- To solve problem using expansion of functions.
- Familiar with curve tracing.
- Apply integral calculus in solving problems.
- To make the student acquire sound knowledge of techniques in solving differential quations.
- Familiar with physical interpretation of divergence and curl of a vector.

Syllabus:

UNIT – I   Concept of Partial differentiation, Successive differentiation, Leibnitz theorem, Maclaurin and Taylor series expansions, Asymptotes and Curvature, Tests for concavity and convexity, Points of inflexion. Multiple points. Tracing of curves in cartesian and polar co-ordinates

UNIT – II   Integration of irrational algebraic functions and transcendental functions. Reduction formulae. Definite Integrals. Quadrature, Rectification, Volumes and Surfaces of solids of revolution of curves.

UNIT – III Linear equations and equations reducible to the linear form, Exact differential equation First order higher degree equations for x, y, p, Clairaut's form and singular solutions. Linear differential equations with constant coefficients.

UNIT – IV   Homogenous linear ordinary differential equations, linear differential equations of second order. Transformation of the equation by changing the dependent variable and the independent Variable, Method of variation of parameters, Ordinary simultaneous differential equations.

UNIT – V   Vector differentiation. Gradient, Divergence and Curl. Vector integration, Theorem of Gauss (without proof) and problems based on it. Theorem of Green (without proof) and problems based on it. Stoke's theorem (without proof) and problems based on it.

COURSE OUTCOMES:-

- Understanding the ideas and concept of calculus and facility in solving standard examples.
- Fluency in integration using standard methods, including the ability to find an appropriate method for a given integral.
- Fluency in solving differential equations and facility in solving standard examples.
- Understanding the ideas of vector calculus and facility in solving standard examples.

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THEORY OF REAL FUNCTIONS

UNIT-1 Limits of functions ($\in - \delta$ approach), sequential criterion for limits, divergence criteria. Limit theorems, one sided limits. Infinite limits and limits at infinity.

UNIT-II Continuous functions, sequential criterion for continuity and discontinuity. Algebra of continuous functions. Continuous functions on an interval, intermediate value theorem, location of roots theorem, preservation of intervals theorem. Uniform continuity, non-uniform continuity criteria, uniform continuity theorem.

UNIT-III Differentiability of a function at a point and in an interval, Caratheodory's theorem, algebra of differentiable functions. Relative extrema, interior extremum theorem. Rolle's theorem, Mean value theorem, intermediate value property of derivatives

UNIT-IV Darboux's theorem. Applications of mean value theorem to inequalities and approximation of polynomials, Taylor's theorem to inequalities.

UNIT-V Cauchy's mean value theorem. Taylor's theorem with Lagrange's form of remainder, Taylor's theorem with Cauchy's form of remainder, application of Taylor's theorem to convex functions, relative extrema. Taylor's series and Maclaurin's series expansions of exponential and trigonometric functions, $\ln(1 + x)$, $1/ax+b$ and $(1 +x)_n$.

Books Recommended
1. R. Bartle and D.R. Sherbert, *Introduction to Real Analysis*, John Wiley and Sons, 2003.
2. K.A. Ross, *Elementary Analysis: The Theory of Calculus*, Springer, 2004.
3. A. Mattuck, *Introduction to Analysis*, Prentice Hall, 1999.
4. S.R. Ghorpade and B.V. Limaye, *A Course in Calculus and Real Analysis,* Springer, 2006.

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MATHEMATICAL BACKGROUND, ELECTROSTATICS, AND STEADY CURRENTS

COURSE OBJECTIVE:-

1. The main objective of this subject is introducing the basic concepts of Electrostatics to student and help in developing problem solving skills.
2. Student will study basic ideology of Scalar and Vector product, double and triple integral.
3. Introducing the basic concepts of electrostatics to student and help in developing problem solving skills.

Syllabus:

UNIT - I   Mathematical Background Scalars and vectors, dot and cross products, triple vector product, flux of a vector field, Gauss's divergence theorem. Green's theorem and Stoke's theorem.Functions of two and three variables, partial derivatives, definition of a double and triple integral ,evaluation of double and triple integrals as repeated integrals, change of variables of integration, Jacobian applications.

UNIT - II   Electrostatics Coulombs law in vacuum expressed in vector forms, calculations of E for simple distributions of charge at rest, dipole and quadrupole fields. torque on a dipole in a uniform electric field and its energy, flux of the electric field, Gauss's law and its application. Capacitors, electrostatic field energy,. Dielectrics, parallel plate capacitor with a dielectric, dielectric constant, polarization and polarization vector, and displacement vector D, molecular interpretation of Claussius-Mossotti equation.

UNIT - III   Electric Currents Steady current, current density J, non-steady currents and continuity equation, Kirchhoff 's laws and analysis of multiloop circuits, rise and decay of current in LR and CR circuits, decay constants, transients in LCR circuits. AC circuits, complex numbers and their applications solving AC circuits Problems, complex impedance and reactance, series and parallel resonance., Q factor, power consumed by an A.C. circuit, power factor,

UNIT - IV   Magneto-statics Force on a moving charge: Lorentz force equation and definition of B, force on a straight conductor carrying current in a uniform magnetic field, torque on a current loop, magnetic dipole moment, angular momentum and gyromagnetic ratio, Biot and Savart's Law, Ampere's Law, $\tilde{N} \times B = \mu_0 J$, $\tilde{N}.B=Q$; Field due to a magnetic dipole magnetization current magnetization vector, Half order field, magnetic permeability (linear cases).

UNIT - V   Time Varying Fields Electromagnetic induction, Faraday's Laws, electromotive force e = E.dl., integral and differential forms of Faraday's laws. self and mutual inductance9.transformers,. Maxwell's displacement current, Derivations of Maxwell's equations, electromagnetic field energy density., Poynting's vector. The wave equation satisfied by E and B, plane electromagnetic waves in vacuum, polarization by reflection and total internal reflection. Faraday effect, reflection and refraction by the ionosphere.

COURSE OUTCOMES:-

1. To study the basics of Mathematical Background and to introduce concepts of Electrostatics and mangnetics.

PRACTICAL:-

1. To plot graphs showing the variation of magnetic field with distance along the axis of circular coil carrying current and to estimate the radius of the coil.
2. To Determine the Dielectric Constant of different materials.

3. To determine the impedance, phase angle & power factor of R, L & C are connecting in series with the help of LCR Impedance circuit.
4. To determine the resistance per unit length of the Carrey-Foster's bridge wire.
5. To study and verify the Coulomb's law.
6. To determine the radius of a current carrying coil by using current carrying coil measurement unit.
7. To determine the magnetic field with the variation of distance along the axis of current carrying coil.

8. Experiment with Ballistic Galvanometer:

8.1 To determine the ballistic constant by steady deflection method by using ballistic galvanometer.
8.2 To determine the charge sensitivity of a moving coil ballistic galvanometer using a known capacitor.
8.3 To study the comparison of the capacitance of two condensers by using ballistic galvanometer.
8.4 To determine the logarithmic decrement for a ballistic galvanometer.

9. Electrostatics Measurement Lab:

9.1 To study the charge induction in electrostatics.
9.2 To study the charge conduction in electrostatics.
9.3 To study the pith ball pendulum with the help of Electroscope.
9.4 To study the relative charges of different rods with the help of Digital Display in millivolt.
9.5 To study the electrostatic charge with the help of Charge Demonstration Tube.
9.6 To study the electrostatics charge by the combination of different rods & clothes.

Note:-
❖ **One experiment will be asked in the semester practical examination.**

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CHEMISTRY-II

COURSE OBJECTIVE:

To make the students conversant with basics, acquire sound knowledge to develop an understanding of the basic concepts of atomic structures, gaseous , Molecular Orbital theory, s-Block Elements, Arenes and Aromaticity and Alkenes

Syllabus:

UNIT - I

A. Atomic Structure : Idea of de Broglie's matter waves, Heisenberg uncertainty principle, atomic orbitals, Schrödinger wave equation, significance of and 2 , quantum numbers, radial and angular wave functions and probability distribution curves, effective nuclear charge.

B. Periodic Properties : Atomic and ionic radii, ionization energy, electron affinity and electronegativity : definition, method of determination, trends in periodic table and applications.

C. Chemical Bonding : Covalent bond- valence bond theory and its limitations, directional characteristic of covalent bond. Hybridization and shapes of simple molecules and ions. Valence Shell Electron Pair Repulsion (VSEPR) theory to NH_3, SF_4, ClF_3, ICl_2 - and H_2O.

UNIT - II

A. Molecular Orbital theory for homonuclear and heteronuclear (CO and NO) diatomic molecules, multicenter bonding in electron deficient molecules, bond strength and the bond energy, % ionic character from dipole moment and electronegativity difference. Weak interactions , hydrogen bonding, van der Waals forces.

B. Ionic Solids : Ionic structures , radius ratio effect and coordination number, limitation of radius ratio rule, Lattice defects, semiconductors, lattice energy and Born-Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarizability of ions. Fajan's rule, Metallic bond, free electron, Valence bond and Band theories.

C. Noble Gases : Chemical properties of the noble gases, chemistry of xenon, structure and bonding in xenon compounds.

UNIT - III

A. s-Block Elements : Comparative study, diagonal relationships, salient features of hydrides, solvation and complexation tendencies including their function in biosystems, an introduction to alkyls and aryls.

B. p-Block Elements : Comparative study (including diagonal relationship) of groups 13-17 elements, compounds like hydrides, oxides, oxyacids and halides of groups 13-16. Hydrides of boron-diborane and higher boranes. Borazine, borohydrides. Fullerenes, carbides, fluorocarbons, silicates (structural principle), tetrasulphur tetranitride, basic properties of halogens, interhalogens.

UNIT – IV

A. Arenes and Aromaticity : Nomenclature of benzene derivatives. The aryl group, Aromatic nucleus and side chain structure of benzene, molecular formula and Kekule structure. Stability and carbon-carbon bond lengths of benzene, resonance structure. MO picture. Aromaticity the Huckel rule, aromatic ions. Aromatic electrophilic substitution, general pattern of the mechanism, role of s and p complexes. Mechanism of nitration, halogenation, sulphonation, mercuration and Friedel-Crafts reaction. Energy profile diagrams. Activating and deactivating substituents. orientation and ortho/para ratio. Side chain reactions of benzene derivatives. Birch reduction. Methods of formation and chemical reactions of alkylbenzenes and biphenyl.

B. Alkenes : Nomenclature of alkenes, methods of formation, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides, regio-selectivity in alcohol dehydration. The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes, mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroboration-oxidation, oxymercuration-reduction, Epoxidation, ozonolysis, hydration, hydroxylation and oxidation with

KMnO4, polymerization of alkenes, Substitution at the allylic and vinylic positions of alkenes, Industrial applications of ethylene and propene.

UNIT – V   **A.** Cycloalkenes, Dienes and alkynes : Methods of formation, conformation and chemical reactions of cycloalkenes, nomenclature and classification of dienes: isolated, conjugated and cumulated dienes. Structure of allenes and butadiene, methods of formation, polymerization. Chemical reactions - 1,2 and 1,4 additions, Diels-Alder reaction. Nomenclature, structure and bonding in alkynes. Methods of formation. Chemical reactions of alkynes, acidity of alkynes. Mechanism of electrophilic and nucleophilic addition reactions, hydroborationoxidation and polymerization.

B. Alkyl and Aryl Halides : Nomenclature and classes of alkyl halides, methods of formation, chemical reactions; mechanims of nucleophilic substitution reaction of alkyl halides, SN2 and SN1 reactions with energy profile diagrams.

Polyhalogen compounds: chloroform, carbon tetrachloride. Methods of formation of aryl halides, nuclear and side chain reactions. The addition-elimination and the elimination-addition reactions mechanisms of nucleophilic aromatic substitution reactions. Relative reactivities of alkyl halides versus allyl, vinyl and aryl halides. Synthesis and uses of DDT, BHC and Freon.

PRACTICAL:-

Inorganic chemistry
Inorganic mixture analysis 1
Macro/Semi-micro Analysis- Cation analysis, separation and identification of ions from group I-VI, anion analysis
Separation of cations by paper chromatography.
Preparation of ferrous alum. 8 marks
Organic Chemistry: (
1. Detection of elements (N, S and halogens) 2 elements,
2. Functional groups (phenolic, carboxylic, carbonyl, esters, carbohydrates, amines, amides, nitro and aniline) in simple organic compounds.
2 functional groups:

ENTREPRENEURSHIP DEVELOPMENT

COURSE OBJECTIVE:-

The content will be multidisciplinary with the view to cover a whole range of issues pertaining to entrepreneurship and small scale industry.

Syllabus:

UNIT- I   **Entrepreneur and Entrepreneurship** –Meaning, definition, significance, need, characteristics, qualities, pre- requisites function, types.

UNIT- II   **Industries and Business Organization-** Classification of industries, forms of business organization, procedures, lifecycle, motivation, environment factors, problems

UNIT- III   **Institutional Assistance-** Infrastructural, information, guidance, training, technical, financial, marketing, quality control

UNIT- IV   **Planning and growth-** Project report, feasibility study, factory location, demand analysis, market potential, project cost, working capital requirement, profit and tax planning.

UNIT- V   **Govt. support & promotional agencies-** Regulatory institutions, development organization, self- employment- oriented schemes, grant schemes, special incentives for women, and scheme for backward class, govt. & non govt. project

Practicals:

1.   To identify a project and conduct market survey of it.
2.   Prepare a project report of yours choice.
3.   To collect various formats used in industries/departments or institutions working in the field of entrepreneurship.
4.   To collect details of various schemes run by the government for self-employment and entrepreneurship.
5.   Develop logical and analytical approach of purchasing the raw material/finished goods.
6.   Collect information about market rates, quality and quantity of goods of your choice.
7.   Collect information about few small-scale industries situated in city, nearby industrial area.
8.   Discuss the problems of small-scale industries.
9.   To prepare chart to show various factors affecting entrepreneurship.
10.   To prepare case study of successful entrepreneurs.

COURSE OUTCOME: -

After completion of this course the students would be able to understand the relevance of entrepreneurship as a means of management practice in the context of a fast changing organizational structure in a global environment.

COURSE CODE: SMGT 802

Text Books:

- Udhyamita Vikas : U.C Gupta (Kailash Prakashan)
- Udhmita Vikas (H) : Entrepreneruship Development / by Tribhuvannath Shukl Bhopal : Madhya Pradesh Hindi Granth Academy,
- Varshney, G.K. (2010).Fundamental Of Entrepreneurship, SahityaBhawan Publications
- Agrawal and Mishra (2017) Fundamental Of Entrepreneurship, SahityaBhawan Publications.
- Fundamentals of Entrepreneurship by G.K. Varshney Agra Sahitya Bhawan
- Fundamentals of Entrepreneurship (H) by Avnish Kumar Mishra Agra Sahitya Bhawan
- Fundamentals of Entrepreneurship by H. Nandan New Delhi PHI Learning
- Fundamentals of Entrepreneurship and Small Business Management by Vasant Desai Mumbai Himalaya Publishing House
- Fundamentals of Entrepreneurship : Principles, Policies and Programmes by K.K. Patra Mumbai Himalaya Publishing House
- Fundamentals of Entrepreneurship by Sangram Keshari Mohanty New Delhi PHI Learning

Reference Books:

- Entrepreneurial Development: Dr. S.S. Khanka (S. Chand)
- Entrepreneurship Development: D. Acharya (Himalaya Publication House)
- Entrepreneurship: New Venture Creation by David H. Holt New Delhi PHI Learning

हिन्दी भाषा संवेदना एवं संचार साधन

पाठ्यक्रम के उद्देश्य–

- विद्यार्थियों को भारतीय संवेदना, संस्कृति, वैश्विक चेतना से परिचित कराना।
- धर्म, दर्शन, न्याय, नीति,साहित्य की प्राचीन व नवीन मान्यताओं से परिचित करवाना।
- संचार संसाधनों से परिचित करवाना।

पाठ्यक्रमः

- सिनेमा, रंगमंच,संगीत, चित्रकला इत्यादि से परिचित करवाना।

इकाई -1

1. भारतीय संस्कृति
2. भारतीय समाज व्यवस्था
3. सभ्यता एव संस्कार
4. वैश्विक चेतना
5. समन्वयीकरण भारतीय एवं अंतर्राष्ट्रीय संदर्भ में

इकाई – 2

1. धर्म
2. न्याय
3. दर्शन
4. नीति
5. साहित्य

इकाई – 3

1. संचार संसाधन रू संपर्क के नए क्षितिज
2. समाचार पत्र
3. भारतीय प्रेस परिषद्
4. रेडियो
5. दूरदर्शन

इकाई – 4

1. सिनेमा
2. रंगमंच
3. संगीत
4. चित्र, मूर्ति, स्थापत्य कला
5. शिल्प कला

इकाई – 5

1. कम्प्यूटर
2. दूरभाष सौगात विज्ञान की
3. मंत्र रू;कहानीद्ध प्रेमचंद
4. मातृ भूमिगुप्त मैथिलीशरण रू;कविताद्ध
5. साहित्यकार का दायित्व डॉ. भारती प्रेम ण

अपेक्षित परिणामः

1. विद्यार्थी आधुनिक संचार संसाधनों के प्रयोग में कुशल हो सकेंगें।
2. भारत की धर्म,दर्शन , नीति,संस्कृति,सभ्यता, संस्कारों इत्यादि के प्रति ज्ञान प्राप्त कर कुशल एवं संवेदनशील नागरिक बन सकेंगें।

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BASIC COMPUTER & INFORMATION TECHNOLOGY-II

Course Objective:

To educate students to analyze , design , integrate & manage information systems using information technology.

Syllabus:

UNIT – I: Word Processing: Word

- MS Word: features, Creating, Saving and Operating Multi document windows, Editing Text selecting, Inserting, deleting moving text.
- Previewing documents, Printing document to file page. Reduce the number of pages by one.
- Formatting Documents: paragraph formats, aligning Text and Paragraph, Borders and shading, Headers and Footers, Multiple Columns.

इकाई–1: वर्डप्रोसेसिंग

- वर्डप्रोसेसिंग का परिचय
- एम. एस वर्डः फीचर्स, क्रीएटिंग, सेविंग एवं ओपनिंग, मल्टी डॉक्यूमेंट विंडोस, एडिटिंग टेक्स्ट सिलेक्टिंग, इंसर्टिंग, डिलीटिंग टेक्स्ट।
- प्रीव्यूविंग डॉक्यूमेंट्स, प्रिटिंगडॉक्यूमेंट फ्रॉम दि स्टेण्डर्ड टूलबार, प्रिंट डॉक्यूमेंट फ्रॉम दि स्टेण्डर्ड टूलबार, डॉक्यूमेंट को मीनू द्वारा प्रिंट करना, श्रिकिंग ए डॉक्यूमेंट इन ए फाइल पेज, पेजों को कम करना।
- फॉरमेटिंग डॉक्यूमेंट्सः पैराग्राफ फारमेट, अलाइनिंग टेक्स्ट एंड पैराग्राफ, बार्डर एवं हेडर्स एवं फुटर्स, मल्टीपल कॉलम्स।

UNIT – II: Introduction to Excel& Worksheet

- Worksheet basic.
- Creating worksheet, entering data into worksheet, heading information, data text, dates, alphanumeric, values, saving & quitting worksheet.
- Opening and moving around in an existing worksheet.
- Toolbars and Menus, keyboard shortcuts.
- Working with single and multiple workbook coping, renaming, moving, adding and deleting. coping entries and moving between workbooks.
- Working with formulas & cell referencing.
- Autosum.
- Coping formulas
- Absolute & Relative addressing.

इकाई–2: एक्सेल एवं वर्कशीट का परिचय
- एक्सेल एंड वर्कशीट
- वर्कशीट का आधार, वर्कशीट बनाना, वर्कशीट में डाटा एंटर करना, हेडिंग इंफॉर्मेशन, डाटा टेक्स्ट डेट, अल्फा न्यूमेरिक, वेल्यूज, सेविंग और वर्कशीट छोड़ना।
- पहले बनी हुई वर्कशीट को खोलना तथा चलाना।
- टूलबार मीनू और कीबोर्ड के शॉर्टकट।
- एक एवं अनेक वर्कशीट पर काम करना, कॉपी, रिनेमिंग, मूविंग, एडिंग एंड डिलीटिंग, एन्टीज को कॉपी तथा विभिन्न वर्कशीट में ले जाना।

- फॉर्मूला एवं सेल रिफ्रेसिंग के साथ काम करना।
- ऑटो सम फॉर्मूला को कॉपी करना, एब्स्ल्यूट एंड रिलेटिव एड्रेसिंग।

UNIT – III: INTRODUCTION TO POWER POINT

- Features and various versions.
- Creating presentation using Slide master and template in various colour scheme.
- Working with slides make new slide move, copy, delete, duplicate, lay outing of slide, zoom in or out of a slide.
- Editing and formatting text: Alignment, editing, inserting, deleting, selecting, formatting of text, find and replace text.

इकाई—3: पॉवरपाइंट का परिचय—1

- फीचर्स एंड विभिन्न वर्जन्स
- प्रजेन्टेशन तैयार करना स्लाइड मास्टर एवं टेम्प्लेट इन वेरियस कलर स्कीम।
- पॉवरपाइंट के भिन्न व्यूस के साथ काम करना एवं पॉवरपाइंट के मेन्यू।
- स्लाईडस के साथ काम करना, नये स्लाईड तैयार करना एवं मूव करना, कॉपी करना, डिलीट करना, डुपलीकेट स्लाईड तैयार करना, ले—आडिटिंग करना, जूम इन और आउट करना।
- एडिटिंग एवं फॉरमेटिंग टेक्स्ट: अलाइनमेंट, एडिटिंग, इनसर्टिंग, डिलीटिंग, सिलेक्टिंग, फॉरमेटिंग ऑफ टेक्स्ट, फाईन्ड एवं रिप्लेस टेक्स्ट।

UNIT – IV: POWER POINT – II

- Bullets , footer, paragraph formatting, spell checking.
- Printing presentation Print slides, notes, handouts and outlines.
- Inserting objects Drawing and Inserting objects using Clip Arts picture and charts.
- Slide sorter, slide transition effect and animation effects.
- Presenting the show making stand alone presentation, Pack and go wizards.

इकाई—4: पॉवरपाइंट का परिचय—2

- बुलेट्स, फुटर, पैराग्राफ फॉरमेटिंग, स्पेल चेकिंग।
- प्रिंटिंग प्रजेन्टेशन, प्रिंट स्लाईडस, नोट्स, हेण्डआउट एवं आउट लाईन्स।
- इंसर्टिंग आब्जेक्ट, ड्राइंग एवं इंसर्टिंग ऑब्जेक्टस क्लिपआर्ट पिक्चर्स एवं चार्टस का प्रयोग करना।
- स्लाईडस सोर्टर, स्लाईड ट्रांजिशन के प्रभाव एवं अन्य ऐनिमशन प्रभाव।
- प्रेजेटिंग शो मेकिंग स्टेंड अलोन प्रजेन्टेशन, पके एवं गोविजार्ड।

UNIT – V: INTRODUCTION OF INTERNET

Evolution, Protocol, concept, Internet, Dial-up connectivity, leased line, VSAT, Broad band, URLs, Domain names, Portals. E-mail, Pop &web based Email. Basic of sending and receiving Emails, Email

& Internet Ethics, Computer virus, Antivirus software wage, Web Browsers.

इकाई—5: इंटरनेट का परिचयः

इवोल्यशन, प्रोटोकोल, विचारधारा, इंटरनेट, डायल अप कनेक्टिविटि, डीज्डलाइन, वीएसटी, ब्रोडबेंड, यू.आर. एल्स., डोमेननेम्स, पोसटल्स, ई—मेल, पॉप एवं वेब बेस्डई—मेल, बेसिक्स ऑफ सेडिंग एवं रिसीविंग इमेल्स, ई—मेल एवं इंटरनेट एथिक्स, कम्प्यूटर वायरस, एंटी वायरस सॉफ्टवेयर, वेब ब्राउसर।

PRACTICALS:

MS- Power Point:

Creating new slide, formatting slide layout, slide show & sorter, Inserting new slide, slide no., date, time, chart, formatting slide, tool operation.

List of suggested practical work:

- Under standing of a dial up connection through modern.
- Configuring a computer for an e-mail and using outlook Express or Netscape Messenger.
- Registration an e-mail address.
- Understanding of e-mail drafting.
- Understanding of address book maintenance for e-mail.
- Understanding of different mail program tools.
- Send and receive functions of e-mail.

Course outcome:

Student will be able to use computer system easily and they will get knowledge about how to use different type of operating system.

<table>
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CALCULUS, DIFFERENTIAL EQUATION AND MECHANICS

COURSE OBJECTIVES:-

- The goal of this course is for students to gain proficiency in calculus computations..
- To make the student acquire sound knowledge of sequences, series and their convergence.
- To familiarize the student with Laplace and inverse Laplace transforms as well as applications of Laplace transformation in solving linear differential equations.

Syllabus:
- To acquaint the student with mechanics.

UNIT – 1   Definition of a sequence. Theorems on limits of sequences. Bounded and monotonic sequences. Cauchy's convergence criterion . Series of non-negative terms. Comparison test, Cauchy's integral test, Ratio test. Raabe's test ,logarithmic test. Leibnitz's theorem. Absolute and conditional convergence.

UNIT – II   Continuity of functions of one variable , sequential continuity. Properties of continuous functions. Uniform continuity. Chain rule of differentiability. Mean value theorems and their geometrical interpretations. Darboux's intermediate value theorem for derivatives. Limit and continuity of functions of two variables.

UNIT - III   Series Solution of Differential Equations-Power series Method, Bessel's Equation Bessel's function and its properties, recurrence and generating relations. Legendre's

UNIT – IV   Laplace transformations, Linearity of the Laplace transformation, Existence theorem of Laplace transforms, Laplace transforms of derivatives and integrals. Shifting theorem . Differentiation and integration of transforms. Inverse Laplace transforms, Convolution theorem. Applications of Laplace transformation in solving linear differential equations with constant coefficients.

UNIT - V   Analytical conditions of equilibrium of Coplanar forces. Catenary. Forces in three dimensions. Velocities and accelerations along Radial and transverse direction.

COURSE OUTCOMES:-

- Understanding the ideas of sequences and series and ability to find their convergence.
- Understanding of the ideas of limit and continuity and an ability to calculate with them and apply them for function of one and two variables.
- Understanding of the ideas of differential equation and facility in solving standard examples.
- Understanding the ideas of Laplace and inverse Laplace transforms facility in solving standard examples and apply them.
- Understanding of the ideas of Mechanics and facility in solving simple standard examples.

MULTIVARIATE CALCULUS

UNIT-I   Functions of several variables, limit and continuity of functions of two variables Partial differentiation, total differentiability and differentiability, sufficient condition for differentiability.

UNIT-II   Chain rule for one and two independent parameters, directional derivatives, the gradient, maximal and normal property of the gradient, tangent planes, Extrema of functions of two variables, method of Lagrange multipliers, constrained optimization problems, Definition of vector field, divergence and curl

UNIT-III   Double integration over rectangular region, double integration over non-rectangular region, Double integrals in polar co-ordinates, Triple integrals, Triple integral over a parallelepiped and solid regions. Volume by triple integrals, cylindrical and spherical co-ordinates.

UNIT-IV   Change of variables in double integrals and triple integrals. Line integrals, Applications of line integrals: Mass and Work. Fundamental theorem for line integrals, conservative vector fields, independence of path.

UNIT-V   Green's theorem, surface integrals, integrals over parametrically defined surfaces. Stoke's theorem, The Divergence theorem.

Books Recommended

1. G.B. Thomas and R.L. Finney, *Calculus*, 9th Ed., Pearson Education, Delhi, 2005.

2. M.J. Strauss, G.L. Bradley and K. J. Smith, *Calculus,* 3rd Ed., Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Delhi, 2007.

3. E. Marsden, A.J. Tromba and A. Weinstein, *Basic Multivariable Calculus*, Springer (SIE), Indian reprint, 2005.

4. James Stewart, *Multivariable Calculus, Concepts and Contexts*, 2nd Ed., Brooks /Cole, Thomson Learning, USA, 2001.

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KINETIC THEORY OF GASES, THERMO-DYNAMICS AND STATISTICAL MECHANICS

COURSE OBJECTIVES:-

1. To express the basic assumption of the kinetic theory of gases.
2. Students learns the different laws of Thermodynamics.
3. To learn Thermodynamically function and their relations.

Syllabus:

UNIT – I   Kinetic Theory of Gases: Ideal Gas Kinetic model, deduction of Boyle's law, interpretation of temperature, estimation of rms speeds of molecules. Brownian motion, estimation of the Avogadro number. Law of Equipartition of energy, specific heat of monatomic gas, extension to di- and tri- atomic gases, behavior at low temperatures. Adiabatic expansion of an ideal gas, applications to atmospheric physics. Real Gas: Van der Waals gas, Equation of state, nature of Vander Waals forces, comparison with experimental P-V curves. The critical constants; gas and vapour. Joule expansion of ideal gas and Vander Waals gas, Joule coefficient, estimates of J-T cooling. Liquefaction of gases: Boyle temperature and inversion temperature. Principle of regenerative cooling, liquefaction of hydrogen and helium. Refrigeration cycle, meaning of efficiency.

UNIT – II   Thermodynamics The laws of thermodynamics: The Zeroth law, first law of thermodynamics, internal energy as a state function and other applications. Reversible and irreversible changes, Carnot cycle and its efficiency, Carnot theorem and the second law of thermodynamics, Entropy,. The thermodynamic scale of temperature; its identity with the perfect gas scale. Impossibility of attaining the absolute zero; third law of thermodynamics. Thermodynamic relationships: Thermodynamic variables: Maxwell's general relationships, application to Joule – Thomson cooling and adiabatic cooling in a general system, Clausius-Clapeyron Latent heat equation.   Cooling due to adiabatic demagenetization, Production and measurement of very low temperatures.

UNIT – III   Statistical Physics The statistical basis of thermodynamics: Probability and thermodynamic probability, principle of equal a priori probabilities, probability distribution and its narrowing with increase in number of particles. The expressions for average properties. Constrains, accessible and inaccessible states, distribution of particles with a given total energy into a discrete set of energy states. Some universal laws: The µ space representation, division of µ space into energy states and into phase cells of arbitrary size, applications to one-dimensional harmonic oscillator and free particles. Equilibrium between two systems in thermal contact, bridge with macroscopic physics. Probability and entropy, Boltzmann entropy relation. Statistical interpretation of second law of thermodynamics. Boltzmann canonical distribution law and its applications; Rigorous form of equipartition of energy.

UNIT - IV   Maxwellian distribution of speeds in an ideal gas Distribution of speeds and velocities, experimental verification, distinction between mean, rms and most probable speed values. Doppler broadening of spectral lines. Black Body Radiation :Pure temperature dependence, Stefan-Boltzmann law, pressure of radiation, Spectral distribution of Black Body radiation. Wien's displacement law, Rayleigh-Jean's law, the ultraviolet catastrophe, Planck's quantum postulates, Planck's law, complete fit with experiment. Interpretation of behaviour of specific heats of gases at low temperature.

UNIT - V   Quantum Statistics Transition to quantum statistics; "h" as a natural constant and its implications, cases of particle in a one dimensional box and one-dimensional harmonic oscillator. Indistinguishability of particles and its.

consequences, Bose- Einstein and Fermi-Dirac conditions; applications to liquid helium, Free electrons in a metal, and photons in blackbody chamber. Fermi level and Fermi energy. Transport Phenomena : Transport phenomena is gases; Molecular collisions, mean free path and collision cross sections. Estimates of molecular diameter and mean free path. Transport of mass, momentum and energy and interrelationship, dependence on temperature and pressure.

COURSE OUTCOMES:-

1. understand the concept of Thermodynamics and their laus.
2. Describe the Thermodynamics function and their relations.
3. Student learn about the concepts of Quantum Statics.

PRACTICAL:-

1. To determine the mechanical equivalent of heat of the water (J) by using Callendar & Barne's method.
2. To study and verify the Stefan's law by electrical method.
3. To study the temperature dependence of total radiation and hence, to verify the Stefan's law.
4. To determine the grid voltage plate current characteristics of a Triode valve (6C5) and then to find the triode constants.
5. To determine the plate current I_P for different plate voltage V_P when grid voltage V_G remains fixed.
6. To study and plot the plate characteristics for different values of grid voltage V_G.
7. To study and plot the transfer characteristic for different values of plate voltage V_P.
8. To determine the Coefficient of Thermal Conductivity of bad conductors of given material by Lee's Disc method.
9. Study of Brownian motion.

Note:-
   ❖ **One experiment will be asked in the semester practical examination.**

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CHEMISTRY –III

Syllabus:

Physical Chemistry

UNIT – I   Thermodynamics-1 Definition of thermodynamic terms: System, surrounding, Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process. Concept of heat and work.

First Law of Thermodynamics: Statement, definition of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship. Joule's Law: Joule Thomson coefficient and inversion temperature.

Calculation of w, q, dU and dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process. Thermochemistry: Standard state, standard enthalpy of formation: Hess's Law of heat summation and its application. Heat of reaction at constant pressure and at constant volume. Enthalpy of neutralization. Bond dissociation energy and its calculation from thermochemical data, temperature dependence of enthalpy, Kirchoff's equation.

Second Law of Thermodynamics- Need for the law, different statements of the law, Carnot cycle and its efficiency. Carnot theorem. Thermodynamic scale of temperature.

UNIT – II   Thermodynamics-II (a) Concept of entropy: Entropy as a state function, entropy as a function of P&T, entropy change in physical change, Clausius inequality, entropy as criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases. Third Law of Thermodynamics: Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data, Gibbs and Helmholtz functions, Gibbs function (G) and Helmholtz function(A) as a thermodynamic quantities, A and G as a criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of G and A with P, V and T.

(b) Chemical equilibrium Equilibrium constant and free energy. Thermodynamic derivation of law of mass action. Le Chateliers's principle. Reaction isotherm and reaction isochore: Clapeyron equation and Clausius- Clapeyron equation, applications.

(c) Buffers: Mechanism of buffer action, Henderson-Hazel equation, Hydrolysis of salts.

(d) Corrosion: types, theories and methods of combating it.

Inorganic Chemistry

UNIT – III   Chemistry of elements of I transition series: Characteristic properties of d-block elements. Properties of the elements of the first transition series, their binary compounds such as carbides, oxides and sulphides. Complexes illustrating relative stability of their oxidation states, coordination number and geometry chemistry of elements of II and III transition series: General characteristics, comparative

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

UNIT – IV   **(a)** Coordination Compounds: Werner's coordination theory and its experimental verification, EAN Concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds,VBT of transition metal complexes.

(b) Oxidation and Reduction: Use of redox potential data, analysis of redox cycle, redox stability in H2O: Frost, Latimer and Pourbaix diagram. Principles involved in the extraction of elements.

Organic Chemistry

UNIT – V **(a)** Electromagnetic Spectrum: Absorption Spectra; UV absorption spectroscopy: Absorption laws (Beer-Lambert law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of conjugation.
Concept of chromophore and auxochrome. Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated enes and enones. IR absorption spectroscopy; molecular vibrations, Hook's law, selection rules, intensity and position of IR bands, measurement of IR spectrum, fingerprint region, characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds.
(b) Alcohols: Classification and nomenclature. Monohydric alcohols: nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters. Hydrogen bonding, acidic nature, reactions of alcohols. Dihydric alcohols: nomenclature, methods of formation, chemical reactions of vicinal glycols, oxidative cleavage [Pb(OAc)4 and HIO4] and pinacole-pinacolone rearrangement. Trihydric alcohols-nomenclature and methods of formation, chemical reactions of glycerol
(c) Phenols: Nomenclature, structure and bonding. Prepration of phenols, physical properties and acidic character. Comparative acidic strengths of alcohols and phenols: resonance stabilization of phenoxide ion. Reactions of phenols: electrophillic aromatic substitution, acylation and carboxylation. Mechanisms of Fries rearrangement, Claisen rearrangement, Gatterman synthesis, Hauben-Hoesch reaction, Lederer-Manasse reaction and Riemer-Tiemann reaction
(d) Ethers and Epoxides Nomenclature of ethers and methods of their formation, physical properties. Chemical reactions: cleavage and auto oxidation. Ziesel's method. Synthesis of epoxides. Acid and base-catalysed ring opening of epoxides, orientation of epoxide ring opening, reaction of Grignard and organolithium reagents with epoxides.

PRACTICAL:-

Inorganic Chemistry

Calibration of the fractional weights, pipettes and burettes. Preparation of standard solutions. Dilution of 0.1 M to 0.001 M solutions.
Quantitative analysis -Volumetric analysis.
(a) Determination of acetic acid in commercial vinegar using NaOH.
(b) Determination of alkali content- antacid tablet using HCl.
(c) Estimation of calcium content in chalk as calcium oxalate by permagnometry.
(d) Estimation of hardness of water by EDTA
Gravimetric analysis:
Barium as barium sulphate

Organic Chemistry Laboratory Techniques

A. Thin layer chromatography
Determination of Rf values and identification of organic compounds.
(a) Separation of green leaf pigments (spinach leaves may be used).
(b) Preparation and separation of 2,4-dinitrophenylhydrazones of acetone, 2-butanone, hexane-2 and 3-one using toluene and light petroleum (40:6).
(c) Separation of a mixture of dyes using cyclohexane and ethylacetate (8:5:1.5). B.

Paper chromatography: Ascending and Circular Determination of Rf values and identification of organic compounds
(a) Separation of a mixture of phenylalanine and glycine, alanine and aspartic acid, leucine and glumatic acid. Spray reagent ninhydrin.
(b) Separation of a mixture of DL-alanine, glycine and L-lucine using nbutanol: acetic acid: water (4:1:5). Spray reagent ninhydrin.
(c) Separation of monosaccharides- a mixture of D-galactose and Dfructose using n-butanol: acetone: water (4:1:5). Spray reagent-aniline hydrogen pthalate.

COURSE OUTCOME:-

Upon successful completion of this course, students will understand kinetics, equilibrium, LeChatelier's principle, acid and base reactions, pH, buffers, colligative properties, and electrochemical applications in an undergraduate laboratory.

Understand the first law of thermodynamics and the role of energy and enthalpy in chemical reactions and perform thermochemical calculations.

DATA ENTRY OPERATIONS

Course Objective:-

1 To understand the basic knowledge of computer
2 To understand the assembly-level programming
3 To understand the input output devices, storage media,
   and memory

Syllabus:

Theory :

UNIT-1

Basics of Computer: Computer Organization, Input and Output Devices, System Software and Application Software, Computer Language, Compiler and Assembler.
Operating System: Elements of Windows XP, Desktop Elements, Locating Files and Folders, Changing System Setting, File Management in Windows, Installation of Software and Hardware.

UNIT-2

Basics of Word Processing: Starting Word Program, Word Screen Layout ,Typing Screen Objects, Managing Documents, Protecting and Finding Documents, Printing Documents
Formatting Documents: Working with text, Formatting Text, Formatting Paragraphs, Bulleted and Numbered Lists, Copying and Moving Text, Spelling and Grammar, Page Formatting, Creating Tables, Mail Merge.

UNIT-3

Types of document in Mail merge: Creating data Source, Creating Mailing Labels, Creating Mailing Labels, Merging Data into Main Document.
Basics of Spreadsheet: Selecting, Adding and Renaming Worksheets, Modifying a Worksheet, Resizing Rows and Columns, Workbook Protection.

UNIT-4

Formatting Worksheets: Formatting Toolbar, Formatting Cells, Formatting Rows and Columns, Formatting Worksheets Using Styles, Protect and Unprotect Worksheets.
Formulas, Functions and Charts: Formulas and Functions, Copying a Formula, Types of Functions, Types of Charts, Auto Shapes and Smart art.

UNIT-5

Creating Presentation: Creating Slides, Slide Sorter View, Changing Slide Layouts, Moving Between Slides.
 Introduction to Internet: Getting Connected to Internet, Types of Internet Connections, Internet Terminology, Understanding Internet Address, Web Browser and Internet Services.

Course Outcomes:-

After studying this student will be able to know about terms
and concepts of Microsoft suite completely.(like MS-word,
power-point-excel sheets, outlook express)

Practicals

1. To study the features of MS-Office 2007 such as MS-Word, MS-Excel, MS-Power point and MS-Access
2. To create a document using mail merge in MS-Word.
3. To create a document for type the mathematical equation in MS-Word.
4. To create a employees work detail list using MS-Excel
5. To calculate student mark details using MS-Excel.
6. To Import External Data, Sort and Filter using MS-Excel.
7. To create a database using MS-Access.
8. To generate report using MS-Access.
9. To create a presentation text and images with effects using MS-Power point.
10. To create a presentation with effects using animation and sound effects.
11. To create a document using mail merge in MS-Word.

Reference Books:

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ENGLISH LANGUAGE AND SCIENTIFIC TEMPER

COURSE OBJECTIVES:-

- To Study the basic language skills (speaking, listening, reading, and writing) and grammar.
- Comprehensive study of different kinds of letters and applications.
- To study the different kinds of prose and poetry.

Syllabus:

UNIT – I

1.	Tina Morries	: Tree
2.	Nissim Ezekiel	: Night of the Scorpion
3.	C.P. Snow	: Ramanujan
4.	Roger Rosenblatt	: The Power of WE
5.	George Orwell	: What is Science?
6.	C.Rajagopalachari	: Three Questions
7.	Desmond Morries	: A short extract from the Naked Ape
8.	A.G. Gardiner	: On the rule of the road

UNIT – II   Comprehension of an unseen passage.

UNIT – III   Letter Writing : Formal Letters, Informal letters, Applications.

UNIT – IV   Report Writing.

UNIT – V   Language Skills
Correction of common errors in sentence structure : usage of pronouns, subject/ verb agreement word order, gender; compound nouns, collective nouns, possessives, articles and prepositions. (advanced)

COURSE OUTCOMES:-

- Student will be able to understand correct use of grammar and language skills.
- Student will be familiar with different prose and poetry.
- Student should be able to write analytically in a variety of formats, including essays, report writing and application.

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(Registrar)
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HUMAN VALUES AND ETHICS

COURSE OBJECTIVES:-

- To help students understand the basic guidelines, content and process of Human value and value crisis in contemporary Indian Society
- To help students understand the meaning of happiness and prosperity for a human being.
- To help students reflect critically on gender violence .
- To facilitate the students to understand harmony at all the levels of human living, and live accordingly.

Syllabus:

UNIT – I: Concept of value and value crisis in contemporary Indian Society.
1. Concept of value
2. Value crisis at- individual level
3. Value crisis at- Cultural level
4. Value crisis at- Societal level
5. The Indian concept of value.
6. Modern Approach to the study of Values.

UNIT – II: Moral and Ethical Human values.
1. Bases for Moral Judgment
2. Some Canons of Ethics
3. Ethics of Duty
4. Ethics of Responsibility
5. Factors to be considered in making Ethical Judgments.
6. Continuous Happiness and Prosperity- A look at basic Human Aspirations.

UNIT – III: Moral Values in Profession.
1. What is Profession?
2. Professional Ethos
3. Code of Professional Ethics
4. Corporate social Responsibility

UNIT – IV: Gender sensitization.
1. Socialization of Women
2. Demographic consequences
3. Domestic Violence
4. Women's work, its politics and economics , fact and fiction ,Unrecognized and unaccounted work

UNIT – V: Co- Curricular Activities and value Education.
1. Games and sports
2. Literary and cultural Activities
3. NSS, NCC activates
4. A New Approach to Human Value Freedom, Creativity Love & Wisdom

COURSE OUTCOMES:-

On completion of this course, the students will be able to:Understand the significance of value inputs in a classroom and start applying them in their life and profession

1. Understand the value of harmonious relationship based on trust and respect in their life and profession.
2. Students will develop a sense of appreciation of women in all walks of life .
3. Understand the role of a human being in ensuring harmony in society and nature.

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ADVANCED CALCULUS, PARTIAL DIFFERENTIAL EQUATIONS, COMPLEX ANALYSIS AND ABSTRACT ALGEBRA

COURSE OBJECTIVES:-

- The goal of this course is for students to gain proficiency in computations of advanced calculus.
- To make the student acquire sound knowledge of techniques in solving partial differential equations.

Syllabus:
- To familiarize the student with complex analysis.

UNIT – I   Partial differentiation. Change of variables. Euler's Theorem on homogeneous function, Taylor's theorem for functions of two variables. Jacobians, Envelopes, Evolutes.

UNIT – II   Maxima, minima and saddle points of functions of two variables. Beta and Gamma functions. Double and triple integrals. Dirichlet's integrals.

UNIT – III   Partial Differential equations of the first order. Lagrange's solution. Some special types of equations which can be solved easily by methods other than general methods. Charpit's general method of solution, Partial differential equations of second and higher orders. Homogeneous and non- Homogeneous equations with constant coefficients. Partial differential equations reducible to equations with constant coefficients.

UNIT – IV   Complex numbers as ordered pairs. Geometric representation of Complex numbers, Continuity and differentiability of Complex functions. Analytical function, Cauchy Riemann equation, Harmonic function, Mobius transformations, fixed point, cross ratio.

UNIT – V   Group-Automorphisms, inner automorphism. Group of Automorphism, Conjugacy relation and centraliser. Normaliser. Counting principle and the class equation of a finite group. Cauchy's theorem for finite abelian groups and non abelian groups. Ring homomorphism. Ideals and Quotient Rings.

COURSE OUTCOMES:-

- Understanding the ideas of advanced calculus and series and an ability to calculate with them and apply them.
- Understanding of the ideas of partial differential equations and facility in solving standard examples.
- Understanding of the ideas of complex analysis and ability to calculate with them.
- Improved facility in abstract algebra.

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PROBABILITY AND STATISTICS

UNIT-I   Sample space, probability axioms, real random variables (discrete and continuous), cumulative distribution function, probability mass/density functions, mathematical expectation, moments, moment generating function, characteristic function, discrete distributions

UNIT-II   Uniform, binomial,Poisson, geometric, negative binomial, continuous distributions: uniform, normal, exponential.

UNIT-III   Joint cumulative distribution function and its properties, joint probability density functions, marginal and conditional distributions

UNIT-IV   expectation of function of two random variables,conditional expectations, independent random variables, bivariate normal distribution,correlation coefficient, joint moment generating function (jmgf) and calculation of covariance(from jmgf), linear regression for two variables.

UNIT-V   Chebyshev's inequality, statement and interpretation of (weak) law of large numbers and strong law of large numbers, Central Limit theorem for independent and identically distributed random variables with finite variance, Markov Chains, Chapman-Kolmogorov equations, classification of states.

Books Recommended

1. Robert V. Hogg, Joseph W. McKean and Allen T. Craig, *Introduction to Mathematical Statistics*, Pearson Education, Asia, 2007.
2. Irwin Miller and Marylees Miller, John E. Freund, *Mathematical Statistics with Applications*, 7th Ed., Pearson Education, Asia, 2006.
3. Sheldon Ross, *Introduction to Probability Models,* 9th Ed., Academic Press, Indian Reprint, 2007.
4. Alexander M. Mood, Franklin A. Graybill and Duane C. Boes, *Introduction to the Theory of Statistics*, 3rd Ed., Tata McGraw- Hill, Reprint 2007

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GROUP WAVES, ACOUSTICS AND OPTICS

COURSE OBJECTIVE:-

1. To aware the students about various phenomena of Waves, Acoustics and Optics.
2. Describe the phenomena like Interference, Diffraction.

Syllabus:

UNIT - 1 Waves: Waves in Media Speed of transverse waves on a uniform string, speed of longitudinal waves in a fluid, gravity waves and ripples. Group velocity and phase velocity, their measurements. Superposition of waves : Linear homogeneous equations and the superposition principle, Standing waves harmonics and the quality of sound , examples. Chladni's figures and vibrations of a drum. Production and detection of ultrasonic and infrasonic waves and applications.

UNIT – II Acoustics Noise and Music , The human ear and its responses , limits of human audibility, intensity and loudness, bel and decibel, the musical scales, temperament and musical instrument. Reflection, refraction and diffraction of sound; Acoustic impedance of a medium, percentage reflection and refraction at a boundary, impedance matching for transducers, diffraction of sound, principle of a sonar system, sound ranging. Applied acoustics:Transducers and their characteristics. Recording and reproduction of sound, various systems, measurements of frequency, waveform, intensity and velocity. The acoustics of halls, reverberation period, Sabine's formula.

UNIT – III Geometrical Optics Fermat's Principle of extremum path, the aplanatic points of a sphere and other applications. General theory of image formation: cardinal points of an optical system, general relationships for thick lens and lens combinations,. Optical instruments: Entrance and exit pupils, need for a multiple lens eyepiece, common types of eyepieces.

UNIT – IV Interference of light; The principle of superposition, twoslit interference, coherence requirement for the sources, thin films, interference by a film with two non-parallel reflecting surfaces, Newton's rings. Haidinger fringes (Fringes of equal inclination). Michelson interferometer, its application for precision determination of wavelength, Intensity distribution in multiple beam interference, Fabry-Perot interferometer and etalon.

UNIT – V Fresnel Diffraction Fresnel half period zones, plates, straight edge, rectilinear propagation. Fraunhoffer Diffraction: Diffraction at a slit, phasor diagram and integral calculus methods, the intensity distribution, diffraction at a circular aperture and a circular disc, Rayleigh criterion, resolving power of telescope and microscope. Diffraction & Polarization: Diffraction gratings: Diffraction at N parallel slits, plane diffraction grating, reflection grating and blazed gratings. Concave grating and different mountings. Resolving power of a grating. Double refraction and optical rotation: Refraction in uniaxial crystals. Phase retardation plates.

COURSE OUTCOMES:-

1. Understand the Physics behind various optical phenomena.
2. Understand various natural phenomena which is happening in their surroundings.
3. Explain the relationship in between various optical phenomena.

PRACTICAL:-

1. To determine the frequency of A.C. Mains by using sonometer.

2. To determine the frequency of A.C. Mains by Melde's Experiment in transverse arrangement.
3. To Study and analysis of human ear (on the basis of physical concepts).
4. To determine the wavelength of sodium light by Newton's rings method.
5. To determine the wavelength of prominent lines of mercury light by plane diffraction grating.
6. To determine the refractive index of the material of the prism using spectrometer.
7. To determine the resolving power of the Telescope.
8. To determine the resolving power of the Prism.
9. To determine the resolving power of the Diffraction Grating.
10. To determine the focal length of the combination of two lenses separated by a distance with the help of a nodal slide and to verify the formula –

$$\frac{1}{F} = \frac{1}{f_1} + \frac{1}{f_2} - \frac{x}{f_1 f_2}$$

11. ULTRASONIC MEASUREMENT LAB

1. To study the characteristic of ultrasound.
2. To determine of the distance by using ultrasonic sensors.
3. To study the object detection by using ultrasonic sensors.
4. To determine the velocity of ultrasonic waves in a non-electrolytic liquid by ultrasonic interferometer.
5. To determine the compressibility of a non-electrolytic liquid by ultrasonic waves.

Note:-
   ❖ **One experiment will be asked in the semester practical examination.**

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CHEMISTRY-IV

Syllabus:

Physical Chemistry

UNIT – I Phase equilibrium Statement and the meaning of the terms: phase component and the degree of freedom, derivation of the Gibbs phase rule. Phase equilibria of one component system: water, CO_2 and S system. Phase equilibria of two component system: solid liquid equilibria, simple eutectic: Bi-Cd, Pb-Ag system, desiliverisation of lead.
Solid solutions: compound formation with congruent melting point (Mg-Zn) and incongruent melting point,(NaCl-H2O) (FeCl3-H2O) and (CuSO4-H2O) system. Freezing mixtures, acetone-dry ice.
Liquid-liquid mixtures: Ideal liquid mixtures, Raoult's and Henry's law. Non-ideal system azeotropes: HCl-H2O and ethanol water systems.
Partial miscible liquids: Phenol-water, trimethylamine–water and nicotine-water systems. Lower and upper consolute temperature. Effect of impurity on consolute temperature. Immiscible liquids, steam distillation, Nernst distribution law: thermodynamic derivation, applications.

UNIT – II Electrochemistry Electrical transport- conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of specific conductance and equivalent conductance with dilution.
Migration of ions and Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald's dilution law, its uses and limitations. Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only). Transport number: Definition and determination by Hittorf method and moving boundary method. Application of conductivity measurements: determination of degree of dissociation, determination of Ka of acids, determination of solubility product of sparingly soluble salt, conductometric titrations.
Types of reversible electrodes: gas-metal ion, metal-metal ion, metal- insoluble salt-anion and redox electrodes. Electrode reactions, Nernst equation, derivation of cell E.M.F and single electrode potential, standard hydrogen electrode- reference electrodes-standard electrode potential, sign conventions, electrochemical series and its significance. Electrolytic and Galvanic cells, reversible and irreversible cells. Conventional representation of electrochemical cells.
EMF of a cell and its measurements. Computation of cell EMF. Calculation of thermodynamic quantities of cell reaction (G, H and K), polarization, over potential and hydrogen over voltage.
Concentration cell with and without transport, liquid junction potential, application of concentration cells, valency of ions, solubility product and activity coefficient, potentiometric titration. Definition of pH and pK, determination of pH using hydrogen, quinhydrone and glass electrodes by potentiometric methods.

UNIT - III (a) Chemistry of Lanthanides Elements: electronic structure, oxidation states, ionic radii and lanthanide contraction, complex formation, occurrence and isolation of lanthanide compounds.
(**b**) Chemistry of Actinides: General features and chemistry of actinides, chemistry of sepatration of Np, Pu and Am from U, Similarities between the later actinides and later lanthanides.
(**c**) Acids and Bases: Arrhenius, BrØnsted-Lowry, Lux-Flood, Solvent system and Lewis concepts of acids and bases.
(**d**) Non-aqueous Solvents: Types of solvents and their general characteristics, reaction in non-aqueous solvents with reference to liquid NH3 and liquid SO2

Organic Chemistry

UNIT – IV **(a)** Aldehydes and ketones: Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes and ketones from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties. Mechanism of nucleophillic additions to carbonyl group with particular emphasis on benzoin, aldol perkin and knovenagel condensations. Condensation with ammonia and its derivatives. Wittig reaction, Mannich reaction.

Use of acetals as protecting group. Oxidation of aldehydes, Baeyer-Villiger oxidation of ketones, Cannizzaro reaction. Meerwine-Pondrof-Verlay (MPV), Clemmensen, Wolf-Kishner, LiAlH4 and NaBH4 reductions, Halogenation of enolizable ketones. An introduction of alpha, beta unsaturated aldehydes and ketones

(b) Carboxylic Acids: Nomenclature, structure and bonding, physical properties, acidity of carboxylic acids, effects of substituents on acid strength. Preparation of carboxylic acids, reactions of carboxylic acids. Hell-Volhard-Zelinsky reaction.

Synthesis of acid chlorides, esters and amides. Reduction of carboxylic acids. Mechanism of decarboxylation. Methods of formation and chemical reactions of unsaturated monocarboxylic acids. Dicarboxylic acids: Methods of formation and effect of heat and dehydrating agents. Methods of formation and chemical reactions of halo acids, hydroxyl acids, malic, tartaric and citric acids.

Carboxylic acid derivatives Structure and nomenclature of acid chlorides, esters, amides (urea) and acid anhydrides. Relative stability of acyl derivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution. Preparation of carboxylic acid derivatives, chemical reactions. Mechanism of esterfication and hydrolysis (acidic and basic).

UNIT – V Organic Compounds of Nitrogen Preparation of nitroalkanes and nitroarenes. Chemical reaction of nitroalkanes. Mechanism of nucleophillic substitution in nitroarenes and their reductions in acidic, neutral and alkaline media, Picric acid.

Halonitroarenes: reactivity, structure and nomenclature. Structure and nomenclature of amines, physical properties and stereochemistry of amines. Separation of mixture of primary, secondary and tertiary amines. Structural features affecting basicity of amines. Amine salt as phase transfer catalysts. Preparation of alkyl and aryl amines (reduction of nitro compounds, nitriles), reductive amination of aldehydic and ketonic compounds. Gabriel-Phthalamide reaction, Hoffmann bromamide reaction, Reactions

of amines, electrophilic aromatic substitution in aryl amines, reaction of amines with nitrous acid. Synthetic transformation of aryl diazonium salts, azo coupling.

PRACTICAL:-

Organic Chemistry
Qualitative analysis
Identification of an organic compound through the functional group analysis, determination of melting point and preparation of suitable derivatives.

Physical Chemistry
Transition temperature
1. Determination of transition temperature of given substance by thermometric, dialometric method (e.g.) (MnCl2×4H2O/SrBr2×2H2O). Phase equilibrium.
2. To study the effect of solute (e.g. NaCl, scenic acid) on the critical solution temperature of two partially miscible liquid (e.g., phenol water system) and to determine the concentration of that soluble in phenolwater system.
3. To construct the phase diagram of two component (e.g., diphenyl aminebenzophenone) by cooling curve method.
1. To determine the enthalpy of neutralization of weak acid/weak base versus strong acid/ strong base and determine the enthalpy of ionization of the weak acid/ base.

Inorganic chemistry-Quantitative Volumetric Analysis:
5. Estimation of ferrous and ferric by dichromate method.

6.   Estimation of copper using thiosulphate.

COURSE OUTCOME:

Upon successful completion of this course students will describe the bonding and properties of transition metal coordination compounds

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SYLLABUS

B.SC. MATHEMATICS (HONORS)- 5TH SEM

<u>**CORE COURSE 09: 3SBMA501H**</u>

<u>**REAL ANALYSIS**</u>

Unit – I   Riemann Integral, Integrability of continuous and monotonic functions, Fundamental theorems of integral calculus, Mean Value theorems of integral calculus.

Unit-II   Improper integrals and their convergence. Comparison test, Abel's and Dirichlet's test, Integral as a function of a parameter and its applications.

Unit-III Sequences, Theorems on limits of sequences, Monotone convergence theorem, Cauchy's convergence criterion.

Unit-IV Infinite series, series of non-negative terms. Comparison test, Ratio test, Rabbe's, logarithmic, De Morgan and Bertrand's tests.

Unit-V Alternating series, Leibnitz's theorem.

Recommended Books:
1. Shanti Narayan, A Course of Mathematical Analysis. S. Chand & Co. New Delhi.
2. T. M. Apostol, Mathematical Anslysis, Narosa Publishing House, New Delhi, 1985.
3. R.R. Goldberg, Real Analysis, Oxford & IBH Publishing Co., New Delhi, 1970.
4. S. Lang, Undergraduate Analysis, Springer-Verlag, New York, 1983.
5. P.K. Jain and S.K. Kaushik, An Introduction to Real Analysis, S. Chand & Co., New Delhi, 2000.

CORE COURSE 10:   3SBMA502H
LINEAR ALGEBRA

Unit-I   Vector spaces, subspaces and linear spans, linear dependence and independence. Finite dimensional vector spaces.

Unit-II   Linear transformations and their matrix representations. Algebra of linear transformations, the rank and nullity theorem.

Unit-III Change of basis. Dual spaces, bi dual space and natural isomorphism. Eigen values and eigen vectors of LT.

Unit-IV Diagonalization, Cayley Hamilton theorem. Inner product spaces, Cauchy-Schwarz inequality.

Unit-V Orthogonal vectors, Orthonormal basis, Bessel's inequality, Gram-Schmidt orthogonalization process.

Recommended Books:
1. N. Herstain, Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975.
2. K. Hoffman and R. Kunze, Linear Algebra, 2nd edition, Prentice-Hall of India, New Delhi, 1971.
3. N. Jacobson, Basic Algebra, Vols I & II, W.H. Freeman, 1980 (also published by Hindustan Publishing Company).
4. K.B. Dutta, Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd, New Delhi, 2000.
5. I.S. Luther and I.B.S. Passi, Algebra, Vol. I - Groups, Narosa Publishing House, Vol. I 1996.

CORE COURSE 11: (3SBMA503H)

NUMERICAL ANALYSIS

Unit-I Finite differences of different orders, Δ, E and D operators, factorial representation of a polynomial, separation of symbols, sub-division of intervals, differences of zero.

Unit-II Concept of interpolation and extrapolation: Newton Gregory's forward and backward interpolation formulae for equal intervals, divided differences and their properties, Newton's formula for divided difference.

Unit-III Lagranges formula for unequal intervals, central difference formula due to Gauss, Stirling, Bessel, Laplace and Everett, concept of error terms in interpolation formula.

Unit-IV Numerical differentiation. Numerical Quadrature : trapezoidal rule, Simpson's one-third and three-eight rules, weddle's rule.

Unit-V Numerical solutions of differential equations: Euler's method, Milne's method, Picard's method and Runge-Kutta method.

Recommended Books:
1. Scarborough J.B.: Numerical Mathematical Analysis, Oxford University, Press and Oxford Book Co.
2. Saxena, H.C.: Calculas of finite Differences,
3. Freeman. H.: Finite Differences for Actuarial Students, Cambridge University Press.
4. Aitkinson U.: Eementary Numerical Analysis.
5. Sastry S.S.: Introductory Methods of Numerical Analysis, Fourth Edition, Prentice Hall of India.
6. Kunz, K.S.: Numerical Analysis, McGraw Hill.

ELECTIVE PAPER- I   (3SBMA504H)

Dynamics

Unit-I Degrees of freedom. Moments and productsnof inertia. Momental ellipsoid. Equimomental systems.

Unit-II Principal axes. D'Alembert's principle. The general equation of motion. Motion of the centre of inertia.

Unit-III Motion relative to the centre of inertia. Motion about a fixed axis. Compound pendulum.

Unit-IV Motion of a rigid body in two dimensions under finite and impulsive forces. Conservation of momentum and energy.

Unit-V Lagrange's equation in generalized coordinates. Theory of small oscillations.

Recommended Books:
1. Chakraborty, J. G., and Ghosh, Advanced Higher Algebra.
2. Chakraborty, J. G., and Ghosh, P. R., Advanced Analytical Dynamics.
3. Loney, S. L., An Elementary Treatise on the Dynamics of 1'article and of Rigid Bodies

ELECTIVE PAPER- II (3SBMA505H):

Number Theory

Unit-I   Primes and factorization. Division algorithm.

Unit-II Congruence and modular arithmetic. Chinese remainder theorem.

Unit-III Euler phi function. Primtive roots of unity.

Unit-IV Quardratic law of reciprocity, application. Arithmetical functions.

Unit-V Mobius inversion formula. The Diophantine equations $x^2 + y^2 = z^2$, $x^4 + y^4 = z^4$. Farey sequences.

Recommended Books:
1 David M. Burton, Elementary Number Theory, Wm. C. Brown Publishers, Dubuque, Iowa 1989.
2 K. Ireland, and M. Rosen, A Classical Introduction to Modern Number Theory, GTM Vol. 84, Springer-Verlag, 1972.
3 G.A. Jones, and J.M. Jones, Elementary Number Theory, Springer-Verlag, 1998.
4 W. Sierpinski, Elementary Theory of Numbers, North-Holland, Ireland, 1988.
5 Niven, S.H. Zuckerman, and L.H. Montgomery, An Introduction to the Theory of Numbers, John Wiley, 1991.
6 H.B. Mann, Addition Theorems, Krieger, 1976.
7 Melvyn B. Nathanson, Additive Number Theory: Inverse Problems and the Geometry of Sumsets, Springer-Verlag, 1996.

Discrete Mathematics

Unit-I Lattices and Boolean algebra: Logic: propositional and predicate.

Unit-II Lattices as partially ordered sets and as algebraic systems. Duality, Distributive, complemented and complete lattices.

Unit-III Lattices and Boolean Algebra. Boolean functions and expressions. Application of Boolean algebra to switching circuits(using AND, OR and NOT gates)

Unit-IV Graphs and Planar Graphs: Graph, Multigraph, Weighted Graphs, Directed graphs. Paths and circuits.

Unit-V Matrix representation of graphs. Eulerian Paths and Circuits. Planar graphs.

Recommended Books:
1. C.L. Liu, Elements of Discrete Mathematics, (Second Edition), McGraw Hill, International Edition, 1986.
2. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, McGraw-Hill Book Co., 199
3. S. Wiitala, Discrete Mathematics: A Unified Approach, McGraw-Hill Book Co.
4. N. Deo, Graph Theory with Applications to Computer Science, Prentice-Hall of India.

ELECTIVE PAPER- IV   (3SBMA507H):

Metric spaces

Unit-I   Definition and examples, neighbourhoods, limit points, interior, and boundary points.

Unit-II   Open and closed sets. Closure, interior, and boundary of a set. Subspaces.

Unit-III Cauchy sequences and complete spaces. Cantor's intersection theorem and the contraction mapping principle.

Unit-IV   Dense and nowhere dense subsets. Baire Category Theorem.

Unit-V   Compactness: Sequential compactness and Heine-Borel property, totally bounded spaces, finite intersection property, continuous functions on compact sets.

Recommended Books:
1. Kolmogorov, A. N., and Fomin, S. V., Elements of the Theory of Functions and Functional Analysis, Vot 1, Metric and normed spaces, Graylock, Rochester; Dover, New York.
2. Kolmogorov, A. N., and Fbmin, S. V., Introductory Real Analysis, Dover, New York.
3. Goldberg, Methods of Real Analysis.
4. Rudin, Principles of Mathematical Analysis.
5. Simmons, Introduction to Topology and Modern Analysis

Communication Skill & Personality Development

Objective: To make the students understand the basics of personality, public speaking, language, Listening, conversation & writing skills, along with the communication process Syllabus

THEORY –

Unit- I:

Basics of Personality, Do's and Dont's in Personality, Salutations and Greetings, Presenting Yourself, Proper Introduction of Oneself.

Unit- II:

Administration- your work style, Overcoming Phobias, Public Speaking, General Etiquettes and Mannerism, Time Management, Attire, Attitude, Self Actualization, Magic of Positive Thinking.

Unit- III :

Tips of Preparing CV, Interviews tips.

Unit-IV:

Language Skill, Writing Skill, Speaking Skill, Listening Skill, Conversation Practice, Mysticism of Body Language, Basics of Grammar.

Unit- V :

Communication- Meaning, Functions, Channels, Process, Barriers and Interpersonal Skills.

PRACTICAL –

1. To present self introduction of yours.
2. Mock interview.
3. Group discussions.
4. SWOT analysis of self.
5. Extempore.
6. Debate.
7. Preparation of CV.
8. Role play.
9. Present a speech.
10. Make a power point presentation of communication.

Reference Books:
1. Business Communication, Universal Pub. Agra – Dr. Ramesh Mangal
2. English Grammar- Wren & Martin
3. Putting your best foot forward- Lt. Co. (Dr.) Pramod Deogirikar

    Chairperson   Dean (Academics)

    (Board of studies)   (Academic Council)
(Registrar) Seal

Outcome- After the completion of this subject the learners will understand the basics of personality, public speaking, language, Listening, conversation & writing skills, along with the communication process.

CORE COURSE 12: (3SBMA601H)

SPECIAL FUNCTIONS

Unit-I   Series solution of differential equations – Power series method.

Unit-II   Definitions of Beta and Gamma functions. Bessel equation and its solution: Bessel functions and their properties.

Unit-III Convergence, recurrence, Relations and generating functions, Orthogonality of functions.

Unit-IV Legendre and Hermite differentials equations and their solutions: Legendre and Hermite functions and their properties-Recurrence Relations and generating functions.

Unit-V Orthogonality of Legendre and Hermite polynomials. Rodrigues' Formula for Legendre & Hermite Polynomials, Laplace Integral Representation of Legendre polynomial.

Recommended Books:
1. Erwin Kreyszing : Advanced Engineering Mathematics, John Wiley & Sons, Inc., New York, 1999
2. A.R. Forsyth : A Treatise on Differential Equations, Macmillan and Co. Ltd.
3. I.N. Sneddon : Special Functions on mathematics, Physics & Chemistry.
4. W.W. Bell : Special Functions for Scientists & Engineers.

CORE COURSE 12: (3SBMA602H)

OPERATION RESEARCH

Unit-I Linear Programming: Simplex Method, Revised simplex method.

Unit-II Duality in Linear programming, Application of Linear Programming to Economic and Industrial Problems.

Unit-III Nonlinear Programming: The Kuhn-Tucker conditions, Quadratic programming, Convex programming.

Unit-IV Replacement Models: Introduction, Replacement policies for items whose efficiency deteriorates with time, Replacement policies for items that fail completely.

Unit-V Sequencing Model: Classification of self problems, processing of n jobs through two machines,three machines, processing of two jobs through m machines.

Recommended Books:
1. Taha, Operations Research, Macmillan.
2. B.E. Gillet, Introduction to Operations Research, McGraw-Hill.
3. S.S.Rao, Optimization Theory and Applications, Wiley Eastern.
4. G.Hadley, Linear programming, Addison-Wesley

CORE COURSE 12: (3SBMA603H)

NUMERICAL METHOD USING C PROGRAMMING

Unit-I Numerical Methods Programming in C of the following set of problems:
- Bisection method.
- Regula Falsi method.
- Newton-Raphson method.

Unit-II Numerical Methods Programming in C of the following set of problems:
- Lagrange interpolation.
- Newton's forward and backward interpolation.
- Trapezoidal and Simpson one-third rules.

Unit-III Numerical Methods Programming in C of the following set of problems:
- Gauss Quadrature.
- Gauss elimination method.
- LU decomposition.

Unit-IV Numerical Methods Programming in C of the following set of problems:

- Gauss-Siedel method.
- Jacobi's method (eigenvalue).

Unit-V Numerical Methods Programming in C of the following set of problems:
- Euler's method.
- Runge-Kutta's method.
- Predictor-corrector method.

Recommended Books:

1. Kernighan, B. W., and Ritchie, D. M., The C Programming Language, 2nd ed., Prentice Hall, 1989
2. Mullish, Henry, and Herbert, L., Spirit of C: An Introduction to Modern Programming, Jaico publishers.
3. Hancock, Les, and Krieger, Morris, The C primer, McGraw Hill, 1998.
4. Gottfried, Byron S., Theory and Problems of Programming with C, Tata McGraw Hill, 1998.
5. Deitel, H. N., and Deitel, P. J., C How to Program, Prentice Hall.

DIFFERENTIAL GEOMETRY

Unit-I Theory of space curves: Space curves, Planer curves, Serret-Frenet formulae.

Unit-II Osculating circles and spheres. Existence of space curves and evolutes and involutes.

Unit-III Theory of surfaces: Parametric curves on surfaces. Direction coefficients. First and second Fundamental forms.

Unit-IV Principal and Gaussian curvatures. Lines of curvature, Euler's theorem.

Unit-V Rodrigue's formula, Conjugate and Asymptotic lines. Developable, Developable associated with space curves, Developable associated with curves on surfaces. Minimal surfaces.

Recommended Books:
1. T.J. Willmore - An Introduction to Differential Geometry. Oxford University Press.1965.
2. B. B. Sinha, Differential Geometry, An Introduction. Shyam Prakashan Mandir Allahabad, 1978.
3. J.A. Thorpe, Introduction to Differential Geometry, Springer-Verlog.
4. M. Docarmo, Differential Geometry of Curves and Surfaces, Prentice-Hall, 1976.
5. C.E. Weatherburn, Differential Geometry of Three Dimensions, Cambridge Univ. Press, 1955.

ELECTIVE PAPER II
CORE COURSE 12: (3SBMA604H)

HYDROSTATICS

Unit-I Pressure of heavy fluid. Conditions of equilibrium for homogeneous, heterogeneous, and elastic fluid.

Unit-II Lines of force. Surfaces of equal pressure. Centre of pressure.

Unit-III Thrusts on plane and curved surfaces. Rotating fluid.

Unit-IV Floating bodies, Stability, Meta-centre. Curves of buoyancy. Surface of buoyancy.

Unit-V Vessel containing liquid. Oscillation of floating bodies.

Recommended Books:
1. Maliur Rahman, Md., Hydrostatics.
2. Ramsey, A. S., Dynamics (Part I).
3. Sharma, B. D., Hydrostatics
4. Kar, J. M.t Hydrostatics
5. Besant, W. H., Ramsey, A. S., A Treatise on Hydromechanics (Part I).

ELECTIVE PAPER III
CORE COURSE 12: (3SBMA608H)

PROJECT AND VIVA-VOCE

Some innovation in form of the written project, in Mathematics/application of Mathematics, based on the knowledge gained during the under graduate course of studies in view of the developments in Mathematics.

A project report shall clearly state the problem addressed, the methodology adopted, the assumptions and the hypotheses formulated, any previous reference to the study undertaken, statistical analyses performed and the broad conclusion drawn.0