PROGRAMME GUIDE

BACHELOR OF SCIENCE (PCM)
(B.Sc. PCM)

*Scheme of Examination (CBCS/ELECTIVE)
*Detailed Structure of Syllabus

DR. C.V.RAMAN UNIVERSITY
KARGI ROAD, KOTA, BILASPUR,CHATTISGARH(C.G.)
PHONE:07753-253737, Fax: 07753-253728
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BACHELOR OF SCIENCE
Duration: 36 Months (3 Years)
Eligibility: 12th Pass from PCM

COURSE STRUCTURE OF B.SC (PCM) SEMESTER Ist												
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													
3CBCA201	Ability Enhancement	Basic Information Computer Technology - I	50	25	08	10	04	15	06	1	-	1	2
3HBHL101	Ability Enhancement	हिन्दी भाषा और संरचना	50	25	08	10	04	15	06	2	-	-	2
3SBPH103	Core Course	Physics – I (Mechanics,Oscillations and Properties of Matter)	100	50	17	20	08	30	12	4	-	-	4
3SBCH104	Core Course	Chemistry –I (Physical Inorganic & Organic Chemistry)	100	50	17	20	08	30	12	4	-	-	4
3SBMA105	Core Course	Mathematics–I (Algebra, Trigonometry & Geometry)	150	75	25	30	12	45	18	4	2	-	6
Practical Group				Term End Practical Exam		Lab Performance		Sessional					
3SBPH103	Practical	Physics – I (Mechanics, Oscillations and Properties of Matter)	50	25	08	25	08	-	-	-	-	2	2
3SBCH104	Practical	Chemistry –I (Physical Inorganic & Organic Chemistry)	50	25	08	25	08	-	-	-	-	2	2
Grand Total			550							15	2	5	22

*Minimum Passing Marks are equivalent toGradeD L- Lectures T- Tutorials P-Practical

**Major- Term End Theory / Practical Exam

***Minor- Pre University Test

****Sessional weightage – Attendance 50%, Three Class Tests/ Lab Performance Assignment 50%

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COURSE STRUCTURE OF B.SC (PCM) SEMESTER IInd													
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													
3HBEL201	Ability Enhancement	English Language and Indian Culture	50	25	08	10	04	15	06	2	-	-	2
3MBFE101	Ability Enhancement	Fundamental of Entrepreneurship	50	25	08	10	04	15	06	2	-	-	2
3SBPH203	Core Course	Physics – II (Mathematical Background, Electrostatics and Steady)	100	50	17	20	08	30	12	4	-	-	4
3SBCH204	Core Course	Chemistry –II (Physical Inorganic & Organic Chemistry)	100	50	17	20	08	30	12	4	-	-	4
3SBMA205	Core Course	Mathematics–II (Calculus, Differential Equations & Vector Calculus)	150	75	25	30	12	45	18	4	2	-	6
Practical Group				Term End Practical Exam		Lab Performance		Sessional					
3SBPH203	Practical	Physics – II (Mathematical Background, Electrostatics and Steady)	50	25	08	25	08	-	-	-	-	2	2
3SBCH204	Practical	Chemistry –II (Physical Inorganic & Organic Chemistry)	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							17	2	5	24

*Minimum Passing Marks are equivalent toGradeD   L- Lectures T- Tutorials P-Practical
**Major- Term End Theory / Practical Exam
***Minor- Pre University Test
****Sessional weightage – Attendance 50%, Three Class Tests/Lab Performance Assignment 50%
*****Skill Elective I – Any other course being offered in this semester as per the list given at the end of course structure.

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	COURSE STRUCTURE OF B.SC (PCM) SEMESTER IIIrd											
	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													
3HBHL302	Ability Enhancement	हिन्दी भाषा संवेदना एवं संचार साधन	50	25	08	10	04	15	06	2	-	-	2
3CBCA502	Ability Enhancement	Basic Information Computer Technology - II	50	25	08	10	04	15	06	1	-	1	2
3SBPH303	Core Course	Physics – III (Kinetic Theory of Gases, Thermo-dynamics and Statistical Mechanics)	100	50	17	20	08	30	12	4	-	-	4
3SBCH304	Core Course	Chemistry –III (Physical, Inorganic & Organic Chemistry)	100	50	17	20	08	30	12	4	-	-	4
3SBMA305	Core Course	Mathematics–III (Calculus, Differential Equation and Mechanics)	150	75	25	30	12	45	18	4	2	-	6
Practical Group				**Term End Practical Exam**		**Lab Performance**		**Sessional**					
3SBPH303	Practical	Physics – III (Kinetic Theory of Gases, Thermo-dynamics and Statistical Mechanics)	50	25	08	25	08	-	-	-	-	2	2
3SBCH304	Practical	Chemistry –III (Physical, Inorganic & Organic Chemistry)	50	25	08	25	08	-	-	-	-	2	2
Skill Courses								**Sessional**					
	Skill Enhancement	Skill Enhancement Elective Course-II	50	-	-	-	-	50	20	1	-	1	2
	Grand Total		600							17	2	5	24

*Minimum Passing Marks are equivalent toGradeD   L- Lectures T- Tutorials P- Practical

**Major- Term End Theory / Practical Exam

***Minor- Pre University Test

****Sessional weightage – Attendance 50%, Three Class Tests/ Lab Performance Assignment 50%

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

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COURSE STRUCTURE OF B.SC (PCM) SEMESTER IVth													
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													
3HBEL402	Ability Enhancement	English Language and Scientific Temper	50	25	08	10	04	15	06	2	-	-	2
3HBHP401	Ability Enhancement	Human Values & Ethics	50	25	08	10	04	15	06	2	-	-	2
3SBPH403	Core Course	Physics – IV (Group Waves, Acoustics and Optics)	100	50	17	20	08	30	12	4	-	-	4
3SBCH404	Core Course	Chemistry –IV (Physical Inorganic & Organic Chemistry)	100	50	17	20	08	30	12	4	-	-	4
3SBMA405	Core Course	Mathematics–IV (Advanced Calculus, Partial Differential Equations, Complex Analysis and Abstract Algebra)	150	75	25	30	12	45	18	4	2	-	6
Practical Group				Term End Practical Exam		Lab Performance		Sessional					
3SBPH403	Practical	Physics – IV (Group Waves, Acoustics and Optics)	50	25	08	25	08	-	-	-	-	2	2
3SBCH404	Practical	Chemistry –IV (Physical Inorganic & Organic Chemistry)	50	25	08	25	08	-	-	-	-	2	2
Grand Total			550							16	2	4	22

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

BACHELOR OF SCIENCE
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Eligibility: 12th Pass from PCM

<table>
<tr><td colspan="16">COURSE STRUCTURE OF B.SC (PCM) SEMESTER Vth</td></tr>
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<td colspan="4">Course Details</td>
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<td>3HBEL501</td>
<td>Ability Enhancement</td>
<td>Introduction to soft skill & Team Building</td>
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<td>Physics – V (Select any one from below Given Electives)</td>
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<td>50</td>
<td>17</td>
<td>20</td>
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**Major- Term End Theory / Practical Exam
***Minor- Pre University Test
****Sessional weightage – Attendance 50%, Three Class Tests/ Lab Performance Assignment 50%
*****Skill Elective III– Any other course being offered in this semester as per the list given at the end of course structure.

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COURSE STRUCTURE OF B.SC (PCM) 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													
****	Discipline Specific Elective	Physics – VI (Select any one from below Given Electives)	100	50	17	20	08	30	12	4	-	-	4
****	Discipline Specific Elective	Chemistry –VI (Select any one from below Given Electives)	100	50	17	20	08	30	12	4	-	-	4
****	Discipline Specific Elective	Mathematics–VI (Select any one from below Given Electives)	150	75	25	30	12	45	18	4	2	-	6
Practical Group				Term End Practical Exam		Lab Performance		Sessional					
****	Practical	Physics – VI (Elective-II)	50	25	08	25	08	-	-	-	-	2	2
****	Practical	Chemistry –VI (Elective-II)	50	25	08	25	08	-	-	-	-	2	2
	Research Component	Project/Internship/Field work & Viva Voce	100	50	17	-	-	50	20	-	-	4	4
	Grand Total		550							12	2	8	22

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**Major- Term End Theory / Practical Exam
***Minor- Pre University Test
****Sessional weightage – Attendance 50%, Three Class Tests/ Lab Performance Assignment 50%
***Compulsory Project/Dissertation/Internship with choice in any Disciplinary specific elective. Compulsory one paper presentation certificate in related discipline.

SPECILIZATION WITH ELECTIVE

*Note - Students need to select any one paper from below mentioned three papers from Each Group Elective's for Fifth and Sixth semester of **B.Sc. (PCM)**

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 -IV**		
3SMPH503	Discipline Specific Elective-I	Physics-V (Quantum Mechanics, Atomic, Molecular and Nuclear Physics)	3SMPH603	Discipline Specific Elective-I	Physics-VI (Solid State Physics, Electronics and Laser)
3SMPH504	Discipline Specific Elective-II	Physics-V (Astro Physics & Atmospheric Science)	3SMPH604	Discipline Specific Elective-II	Physics-VI (Nano Technology and Material Science)
GROUP ELECTIVE -II			**GROUP ELECTIVE -V**		
3SBCH503	Discipline Specific Elective-I	Chemistry –V (Physical Inorganic and Organic Chemistry)	3SBCH603	Discipline Specific Elective-I	Chemistry-VI (Physical Inorganic and Organic Chemistry)
3SBCH504	Discipline Specific Elective-II	Chemistry-V (Industrial Chemistry)	3SBCH604	Discipline Specific Elective-II	Chemistry-VI (Nano-Chemistry)
GROUP ELECTIVE -III			**GROUP ELECTIVE -VI**		
3SBMA503	Discipline Specific Elective-I	Mathematics-V (Real Analysis, Linear Algebra & Discrete Mathematics)	3SBMA603	Discipline Specific Elective-I	Mathematics-VI (Metric Space, Numerical Analysis & Statistics)
3SBMA504	Discipline Specific Elective-II	Mathematics-V (Ring Theory and Linear Algebra II)	3SBMA604	Discipline Specific Elective-II	Mathematics-VI (Fuzzy Set Theory)

SKILL ENHANCEMENT ELECTIVE
COURSES

lective 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)

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SEMESTER- 1ˢᵗ   **Subject Code: 3CBCA201**
Course: B. Sc. Maths   **Theory Max. Marks: 25**
SUBJECT: BASIC COMPUTER & INFORMATION TECHNOLOGY-I   **Theory Min. Marks:08**

COURSE OBJECTIVE:
To educate students to analyze, design, integrate & managein formation systems using information technology.

Unit	Course Content	Methodology Adopted
Unit – I	**INTRODUCTION TO COMPUTER ORGANIZATION –I** History of development of Computer system concepts. Characteristics, Capability and limitations. Generation of computer. Types of PC's Desktop. Laptop, Notebook. Workstation & their Characteristics. कम्प्यूटर ऑर्गनाईजेशन का परिचय कम्प्यूटर का इतिहास, कम्प्यूटर सिस्टम विचारधारा, विशेषताएं,योग्यताएवंसीमाएं,कम्प्यूटरकीपीढ़ियां,पी.सी.केप्रकार,डेस्कटॉपकेप्रकार,लेपटॉप के प्रकार, नोटबुक, वर्क स्टेशन आदि की विशेषताएं।	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	INTRODUCTION TO COMPUTER ORGANIZATION –II basic components of a computer system Control Unit, ALU. Input/Output function and Characteristics,memory RAM, ROM, EPROM, PROM. कम्प्यूटरऑर्गनाईजेशनकापरिचयकम्प्यूटरसिस्टमकेआधारउपकरण,कंट्रोलयुनिट,ए.एल.यू. इनपूट/आउटपुट फंक्शन और विशेषताएं, मेमोरी रेम, रोम, इपी रोम, पी रोम, और अन्य प्रकार कीमैमोरी।	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
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 and Speakers. इनपुट तथाआउटपुट डिवाईसेस इनपुट डिवाइसः कीबोर्ड, माउस, ट्रेकबॉल, जॉयस्टीक, डिजिटाईजिंग टेबलेट, स्केनर्स, डिजिटल केमरा, एमआईसीआर, ओसीआर, ओएमआर, बार कोड रीडर, आवाज को पहचानने वाला, लाइटपेन, टचस्क्रीन। इनपुटडिवाइस मॉनीटरकीविषेषताएंएवंमोनीटरकेप्रकार,वीडियोस्टैन्डर्डVGA,SVGA, XGA, LCD स्क्रीन आदि, प्रिंटर्स, डेजी व्हील, डॉट मैट्रिक्स, इंकजेट, लेजर, लाईन प्रिंटर,प्लोटर, साउंड कार्डस एंडस्पीकर्स।	ICT based class room teaching, Case Analysis, Group Presentation

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. स्टोरेजडिवाईसेस 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।	ICT based class room teaching, Case Analysis, Individual Presentation
Unit – V	**INTRODUCTION TO OPERATING SYSTEM :** Introduction to operating systems, its functioning and types. basic commands of dos & Windows operating System. Disk Operating System (DOS) - Introduction, History and Versions of DOS. **DOS Basics -** Physical Structure of disk, Drive name, FAT, file & directory stucture and naming rules, booting process, DOS system files. **DOS Commands** - **Internal** - DIR, MD, CD, RD, Copy, DEL, REN, VOL, DATE, TIME, CLS, PATH, TYPE etc. **External** CHKDSK, SCOPE, PRINT DISKCOPY, DOSKEY, TREE, MOVE, LABEL, APPEND, FORMAT, SORT, FDISK, BACKUP, MODE, ATTRIB HELP, SYS etc. ऑपरेटिंग सिस्टम का परिचय ऑपरेटिंग सिस्टम का परिचय, उसके लक्षण एवं प्रकार, डॉसएवं विन्डोस का मूल कमांड। डॉस बेसिक्स– फिजीकल स्ट्रक्चर ऑफ डिस्क, ड्राईव नेम, फेट, फाईल एवं डायरेक्ट्री स्ट्रक्टचर एवं नेमिंग नियम, बूटिंग प्रक्रिया, डॉस सिस्टम फाईल्स। डॉस कमांडसस– •आंतरिक कमाण्डसDIR, MD, CD, RD, Copy, DEL, REN, VOL, DATE, TIME, CLS, PATH, TYPE आदि। •बाह्य कमाण्डसCHKDSK, SCOPE, PRINT, DISKCOPY, DOSKEY, TREE, MOVE, LABEL, APPEND, FORMAT, SORT, FDISK, BACKUP, MODE, ATTRIB HELP, SYS आदि।	ICT based class room teaching, Case Analysis, Group Presentation

PRACTICALS:-

DOS:
• DOS commands: Internal & External Commands.
• Special batch file: Autoexec, Bar Hard disk setup. Windows 98:
• Destop 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.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Computer Operator, Office Assistant, Training and Support in Institutions/universities, Research and Academics, System Analyst in State and Central Research organization,Consultant in Software firms,Quality Assurance and Testing in Public and Private sectors, Application Customization and Development, Start own venture	Learn basic's of Computer, Computations, Network, Internet and Programming Languages, Time, Management, Speaking, Cooperating, Presenting	No Poverty, Quality Education, Industry Innovation and Infrastructure.	Can start own Computer Assistance services.

Dr. C.V. Raman University
Kargi Road, Kota, Bilaspur (C.G.)

SEMESTER- 1ˢᵗ
Course:BSc-
SUBJECT: हिन्दी भाषा और संरचना

SubjecCode: 3HBHL-101
Theory Max. Marks: 25
Theory Min. Marks: 08

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।

Unit	Unit wise course contents	Methodology Adopted
इकाई–1	भारत वंदना - (काव्य) त्रिपाठी निराला जाग तुझको दूर जाना - सुश्री महादवी वर्मा स्वतंत्रता पुकारती जयशंकर प्रसाद - (काव्य) हम अनिकेतन -(काव्य) बालकृष्ण शर्मा नवीन भाषा की महत्ता और उसके विविध रूप भाषा-कौशल	व्याख्यान एवं काव्य मंच
इकाई–2	करूणा)निबंध- (आचार्य रामचन्द्र शुक्ल समन्दवय की प्रक्रिया (निबंध) - रामधारी सिंह दिनकर बिच्छी बुआ लक्ष्मण.डॉ - (कहानी)बिष्ट'बटरोही' अनुवाद -परिभाषा प्रकार, महत्व, विशेषताएँ हिन्दी की शब्दसंपदा- पारिभाषिक शब्दावली	ग्रीन बोर्ड
इकाई–3	विलायत पहुंच ही गया - (आत्मकथांश) महात्मा गांधी अफसर (व्यंग्य) . शरद जोशी तीर्थयात्रा(कहानी) . डॉ.मिथलेश कुमार मिश्र मकड़ी का जाला (व्यंग्य) . डॉ. रामप्रकाश सक्सेना वाक्य - संरचना : तत्सम,तद्रव देशज विदेशी	व्याख्यान, ,यू–ट्यूब लिंक से
इकाई–4	अप्प दीपो भव)वक्तृव्य कलास्वामी श्रद्धानंद - (भारत का सामाजिक व्यक्तित्व (प्रस्तावना) - जवाहरलाल नेहरू पत्र मैसूर के महाराजा को (पत्र–लेखन) . स्वामी वववेकानंद बनी रहेंगी किताबेंसुनीता रानी घोष .डॉ - (आलेख) पत्र–लेखन महत्व और उसके विविध रूप	सत्रीय कार्य

	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) – भाषाविद डॉ. हरिदेव बाहरी से प्रो. त्रिभुवननाथ शुक्ल नीग्रो सैनिक से भेंट (यात्रा -संस्मरण) - डॉ. देवेन्द्र सत्याथी यदि बा न होती तो शायद गांधी को यह ऊँचाई न मिलती (साक्षात्कार) कथाकार - गिरिराज किशोर से सत्येन्द्र शर्मा सार लेखन भाव-पल्लवन साक्षात्कार और कौशल	प्रश्न मंच

अपेक्षित परिणाम :

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

पाठ्य पुस्तक   –   हिन्दी भाषा और संरचना त्रिभुवन नाथ शुक्ल हिन्दी ग्रन्थ अकादमी भोपाल म.प्र।

संदर्भ ग्रंथ – हिन्दी भाषा और संरचना त्रिभुवन नाथ शुक्ल हिन्दी ग्रन्थ अकादमी भोपाल म.प्र।

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
शिक्षक,उद्घोषक	प्रातियोगी परीक्षा में लाभ कारी	उच्च गुणवता	साहित्य के क्षेत्र में रूचि

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KARGI ROAD, KOTA, BILASPUR (C.G.)

SEMESTER- 1st   **Subject Code: 3SBPH103**
Course: B. Sc. Maths   **Theory Max. Marks: 50**
SUBJECT: PHYSICS-I   **Theory Min. Marks: 17**
(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.

Units	Unit Wise Course Content	Methodology Adopted
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.	ICT & Green Board based Class Room Teaching, individual presentation and though Microscope
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.	ICT & Green Board based Class Room Teaching, individual presentation and though Microscope
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;	ICT & Green Board based Class Room Teaching, individual presentation and though Microscope
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.	ICT & Green Board based Class Room Teaching, individual presentation and though Microscope
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).	ICT & Green Board based Class Room Teaching, individual presentation and though Microscope

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:-

1. To determine the acceleration due to gravity (g) at a place with the help of Bar pendulum. (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. $Iz = Ix + Iy$
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 & Compound Logic Gates.

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

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Lecturer, scientist, Researcher, Consultant.	Developing Commercial awareness, able to understand and manage competition, able to plan different course of action.	Goal -04 (quality Education)	Service counsultancy

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SEMESTER- 1ˢᵗ   **Subject Code: 3SBCH 104**
Course: Maths/Bio/micro/biotech   **Theory Max. Marks: 50**
SUBJECT: CHEMISTRY-I (PHYSICAL, INORGANIC & ORGANIC CHEMISTRY)   Theory Min.
Marks : **17**

Course Objective:
- To develop an understanding on the basics of mathematical concept, gaseous, liquid and colloidal states.
- To understand chemical kinetics, structure bonding and stereochemistry.

Units	Unit Wise Course Contents	Methodology Adopted
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 behavior, 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 vander Waals constants, the law of corresponding states, reduced equation of states.	Usage of ICT techniques (PowerPoint, PDF and video lectures), Google classroom and black board (traditional) as per requirement of the topic. Use of Mathematical Models
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.	Usage of ICT enabled techniques (Power Point, PDF and video lectures), Google classroom and black board (traditional) as per requirement of the topic. Usage of Chemical modeling methods.
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.	Usage of ICT (Power Point, PDF and video lectures) and black board (traditional) as per requirement of the topic.
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.	Usage of ICT (PowerPoint, PDF and video lectures) and black board (traditional) as per requirement of the topic. NPTEL lecture video. E-UG Pathshala

	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	**Stereochemistry** : Concept of isomerism, types of isomerism, optical isomerism, elements of symmetry, molecular chirality, enantiomers, stereogenic centres, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, 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.	Usage of ICT (Power Point, PDF and video lectures) and black board (traditional) as per requirement of the topic. NPTEL video lecture

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

 Text And Reference Book
- Inorganic Chemistry (Part-I, Part-II), R.L. Dutta, NBS Publication.
- Unified Chemistry, Dr.M.M.Tandon, ShivlalAgrawal& Comp.
- Synthetic Organic Chemistry, O.P.Agrawal, Krishna Prakashan Media Ltd.
- Physical Chemistry, K.L.Kapoor, Macmillan Pub. India, Ltd

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Chemist, Scientist, Analyst,Academic ,food industries	Able to prepare chemical and understanding on the basics of mathematical concept	Goal04(quality education) Goal13 (climate action), Goal 15(Life on land),Goal03 (Good health & well being)	Food, cosmetic & water purification expert, good academician etc.

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KARGI ROAD, KOTA, BILASPUR (C.G.)

SEMESTER- 1st   **Subject Code: 3SBCH104**
Course: Maths/Bio/micro/biotech   **Theory Max. Marks: 25**
SUBJECT: CHEMISTRY-I   **Theory Min. Marks** : 08
(PHYSICAL, INORGANIC & ORGANIC CHEMISTRY) PRACTICAL

Physical Chemistry

A. (Any one experiment will be asked in examination form the following carrying 06 Marks)
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.

Inorganic chemistry
B. (Any one experiment will be asked in examination form the following carrying 05 Marks)

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

C. (Any one experiment will be asked in examination form the following carrying 04 Marks)
   1. Distillation
   2. Crystallization
   3. Decolourisation and crystallization using charcoal
   4. Sublimation

Viva: 5 marks
Records: 5 marks
Text And Reference Book
   - Unified Practical Chemistry, Dr. M.M.Tandon, Shivalal Agrawal & Com.
   - Unified Chemistry, Tandon, Rathore, Agrawal, Shivalal Agrawal & Com.

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SEMESTER- 1st　　　　　　　　　　　　　　　**Subject Code: 3SBMA105**
Course: B. Sc. Maths　　　　　　　　　　　　　**Theory Max. Marks:**
SUBJECT: MATHEMATICS – I　　　　　　　　　**Theory Min. Marks**
(ALGEBRA, TRIGONOMETRY & GEOMETRY)
COURSE OBJECTIVE:

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

Unit	Course Content	Methodology Adopted
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 ofsigns.	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	De Moivre's theorem and its application. Direct and inverse circular and hyperbolic functions, Expansion of trignometrical function. Gregory's Series, Summation ofSeries,	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
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, quotientgroups.	ICT based class room teaching, Case Analysis, Group Presentation
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 andexamples.	ICT based class room teaching, Case Analysis, Individual Presentation
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 ofConicoids.	ICT based class room teaching, Case Analysis, Group Presentation

COURSE OUTCOMES

- Understanding the ideas of matrices and ability to solve system of linearequations.
- The student will be able to acquire sound knowledge of matrices and techniques in solving equations with the help of

theory ofequations
- Fluency in solvingequations.
- Understanding the concepts of algebra, trigonometry andgeometry

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Teachers, Statistician, Researcher, Civil Officer	Able to Improve Decision making and problem solving skills	Goal 4 (Decent work),Goal 8 (Quality Education	Academician

. Dr C.V. Raman University
Kargi Road, Kota, Bilaspur (C.G.)

Semester- II	Subject Code: 3HBEL201
Course: BSc- Maths	Theory Max. Marks: 25
Subject: Foundation Course	Theory Min. Marks: 08

Paper I: English Language and Indian Culture

Course Objective:

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

	Course content	Methodology Adopted
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	Reading , Usage of ICT(Power point, PDF, and video lectures) and black board (traditional) as per requirement of the topic
Unit – II	Comprehension	Reading aloud with expression
Unit – III	Composition and Paragraph Writing (Based on expansion of an idea).	Lectures , Usage of ICT(Power point, PDF, and video lectures) and black board (traditional) as per requirement of the topic
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.	Discussion method, Usage of ICT(Power point, PDF, and video lectures) and black board (traditional) as per requirement of the topic
Unit – V	Basic Language Skills: Grammar and usage – The Tense Forms, Propositions, Determiners and Countable/Uncountable Nouns, Verb, Articles, Adverbs.	

Course Outcome:

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.

Text Books:

1. English Language and Indian culture Dr. Neeraj Agnihatri, Dr. Sameera Nayeer Publisher Madhay Pradesh Hindi Granth Academy, Bhopal.
2. English Grammar and Composition Wren & Martin S.CHAND & COMPANY LTD. New Delhi

Reference Books:
1. Junior English Grammar Lucent Sharma R.K. Publication Patna.
2. A Senior English Grammar and composition Aggarwala N.K. Goyal Prakashan New Delhi.
3. A comprehensive Approach to English Grammar Shrivastava Avinash Pratap Indra Publishing House BPL.
4. Essentials of English Grammar Raymond Murphy Cambridge University press.
5. Learner's English Grammar and Composition N. D. V. Prasada Rao S. Chand & Company Ltd. New Delhi.

Job Opportunities	Employability Skill developed	UNDP Goal Achieved	Entrepreneurship Opportunity
Writer Asst. Professor Lecturer	Command on language Develop LSRW skills Research skill	Quality education Goal achieved	Research Guide Critic Publisher Novelist, Socialist

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SEMESTER-2nd   **Subject Code:** 3MBFE101
Course: B.Sc. Math   **Theory Max. Marks: 25**
SUBJECT: FUNDAMENTALS OF ENTREPRENEURSHIP   **Theory Min. Marks**: 08

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

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Entrepreneurship-Definition, Characteristics and importance, Types and functions of an entrepreneur, merits of a good entrepreneur motivational factors of entrepreneurship.	Usage of ICT like PPT, Video Lectures, Black board.
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.	Usage of ICT like PPT, Video Lectures, Black board.
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.	Usage of ICT like PPT, Video Lectures, Black board.
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.	Usage of ICT like PPT, Video Lectures, Black board.

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.	Usage of ICT like PPT, Video Lectures, Black board.
	Understanding basic concepts of entrepreneurship and key steps in the elaboration of business ideas, Developing personal creativity and	

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- 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
- Fundamentas of Entrepreneurship : Principles, Policies and Programmes by K.K. Patra
- Mumbai Himalaya Publishing House
- Fundamentals of Entrepreneruship by Sangram Keshari Mohanty New Delhi PHI Learning

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

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Manager, Purchase Officer, Project Auditor,	• Self-confidence, Leadership, Creativity, Time Management	No poverty, No Hunger, Quality Education, Decent work and Economic Growth, Sustainable Cities and Communities, Responsible Consumption and production	Entrepreneur, Project report developer

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SEMESTER- 2nd
Course: B. Sc. Maths
SUBJECT: PHYSICS-II
(MATHEMATICAL BACKGROUND, ELECTROSTATICS AND STEADY)

Subject Code: 3SBPH203
Theory Max. Marks: 50
Theory Min. Marks: 17

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 solvingskills.

Unit	Course Content	Methodology Adopted
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, Jacobianapplications.	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
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-Mossottiequation.	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
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, powerfactor,	ICT based class room teaching, Case Analysis, Group Presentation
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 (linearcases).	ICT based class room teaching, Case Analysis, Individual Presentation
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 theionosphere.	ICT based class room teaching, Case Analysis, Group Presentation

COURSE OUTCOME:-
To study the basics of Mathematical Background and to introduce concepts of Electrostatics and magnetism.

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:-
   To determine the ballistic constant by steady deflection method by using ballistic galvanometer.
   To determine the charge sensitivity of a moving coil ballistic galvanometer using a known capacitor.
   To study the comparison of the capacitance of two condensers by using ballistic galvanometer.
   To determine the logarithmic decrement for a ballistic galvanometer.
9. Electrostatics Measurement Lab:-
   To study the charge induction in electrostatics.
   To study the charge conduction in electrostatics.
   To study the pith ball pendulum with the help of Electroscope.
   To study the relative charges of different rods with the help of Digital Display in millivolt.
   To study the electrostatic charge with the help of Charge Demonstration Tube.
   To study the electrostatics charge by the combination of different rods &clothes.

Note:-

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

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity

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SEMESTER- 2nd   **Subject Code: 3SBCH 204**
Course: Maths/Bio/micro/biotech   **Theory Max. Marks: 50**
Chemistry –II (Physical, Inorganic & Organic Chemistry)   **Theory Min. Marks** :17
Course Objective:
Study of Chemical bonding , Noble gases ,S-block and P-block element .Brief discussion of   Arenes and Aromaticity, cycloalkens, dienes and alkynes.

Units	Unit Wise Course Contents	Methodology Adopted
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. Molecular Orbital theory for homonuclear and heteronuclear (CO and NO) diatomic molecules	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.
Unit-II	**A. Solid State :** Definition of space lattice, Unit cell, Laws of crystallography - (i) Law of constancy of interfacial angles (ii) Law of rationality of indices (iii) Laws of symmetry, Symmetry elements in crystals. Diffraction : X-ray diffraction by crystals, Derivation of Bragg's equation. Determination of crystal structure of NaCI, KC1 and CsCI (Laue's method and powder method). **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.	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.
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.	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.
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, Mechanism of nitration, halogenation, sulphonation, 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	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.Nptel lecture video

	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.	
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, hydroboration oxidation 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.	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.NPTEL video lecture

Course Outcome Upon successful completion of this course, students will understand theories of chemical bonding and determine the molecular geometry of molecules using VSEPR theory. Understand the general and physical properties of matter.

Text And Reference Book
- Inorganic Chemistry (Part-I, Part-II), R.L. Dutta, NBS Publication.
- Unified Chemistry, Dr.M.M.Tandon, ShivlalAgrawal& Comp.
- Synthetic Organic Chemistry, O.P.Agrawal, Krishna Prakashan Media Ltd.
- Physical Chemistry, K.L.Kapoor, Macmillan Pub. India, Ltd

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Chemist, Quantum mechanics, Scientist, Academic ,food industries	Analysis and Production of organic chemicals	Goal04(quality education) Goal13 (climate action), Goal 15(Life on land),Goal03 (Good health & well being)	Food, cosmetic & water purification expert, good academician etc.

PRACTICAL
Max. Marks 50
Duration of practicals during the entire semester: 90 hours
Duration of practical during the semester examination: 4 hours
Inorganic chemistry
Inorganic mixture analysis 12 Marks
Macro/Semi-micro Analysis- Cation analysis, separation and identification of ions fromgroup I-VI, anion analysis
Separation of cations by paper chromatography. 4 marks
Preparation of ferrous alum. 8 marks
Organic Chemistry: (12 marks)

    1. Detection of elements (N, S and halogens) 2 elements, 4 marks
    2. Functional groups (phenolic, carboxylic, carbonyl, esters, carbohydrates, amines, amides, nitro and aniline) in simple organic compounds.

2 functional groups: 8 marks
Viva: 6 marks
Records: 8 marks

COURSE OUTCOME:-

Upon successful completion of this course, students will understand theories of chemical bonding and determine the molecular geometry of molecules using VSEPR theory. Understand the general and physical properties of matter.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity

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SEMESTER- 2nd	**Subject Code: 3SBCH104**
Course: B. Sc. Maths/Bio/micro/biotech	**Theory Max. Marks: 25**
SUBJECT: CHEMISTRY-II	**Theory Min. Marks** : **08**
(INORGANIC & ORGANIC CHEMISTRY) PRACTICAL	

Duration of practical during the entire semester: 90 hours
Duration of practical during the semester examination: 4 hours

Inorganic chemistry Inorganic mixture analysis 7Marks
Macro/Semi-micro Analysis- Cation analysis, separation and identification of ions from group I-VI, anion analysis
Separation of cations by paper chromatography. 4 marks
Preparation of ferrous alum. 3 marks

Organic Chemistry: (7 marks)
1. Detection of elements (N, S and halogens) 2 elements, **4 marks**
2. Functional groups (phenolic, carboxylic, carbonyl, esters, carbohydrates, amines, amides, nitro and aniline) in simple organic compounds.
2 functional groups: **3 marks**

Viva: 5 marks
Records: 5 marks
Text And Reference Book
- Unified Practical Chemistry, Dr. M.M.Tandon, Shivalal Agrawal & Com.

- Unified Chemistry, Tandon, Rathore, Agrawal, Shivalal Agrawal & Com.

- A text book of Quantitative Inorganic Analysis-A.I.Vogel.

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SEMESTER- 2ⁿᵈ

Course: B. Sc. Maths

SUBJECT: MATHEMATICS – II

(CALCULUS, DIFFERENTIAL EQUATIONS & VECTOR CALCULUS)

Subject Code: 3SBMA205

Theory Max. Marks:

Theory Min. Marks

COURSE OBJECTIVE:
- To solve problem using expansion offunctions.
- Familiar with curvetracing.
- Apply integral calculus in solvingproblems.
- To make the student acquire sound knowledge of techniques in solvingdifferential quations.
- Familiar with physical interpretation of divergence and curl of avector.

Unit	Course Content	Methodology Adopted
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 polarco-ordinates	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	Integration of irrational algebraic functions and transcendental functions. Reduction formulae. Definite Integrals. Quadrature, Rectification, Volumes and Surfaces of solids of revolution ofcurves.	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
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.	ICT based class room teaching, Case Analysis, Group Presentation
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.	ICT based class room teaching, Case Analysis, Individual Presentation
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.	ICT based class room teaching, Case Analysis, Group Presentation

COURSE OUTCOMES
- Understanding the ideas and concept of calculus and facility in solving standardexamples.
- Fluency in integration using standard methods, including the ability to find anappropriate method for a givenintegral.
- Fluency in solving differential equations and facility in solving standardexamples.
- Understanding the ideas of vector calculus and facility in solving standardexamples.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Teachers, Statistician, Researcher, Civil Officer	Able to Improve Decision making and problem solving skills	Goal 4 (Decent work),Goal 8 (Quality Education	Academician

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SEMESTER- IIIrd
Course:BSc-Maths
SUBJECT: हिन्दी भाषा संवेदना एवं संचार साधन

SubjectCode: 3HBHL-302
Theory Max. Marks: 25
Theory Min. Marks: 08

पाठ्यक्रम के उद्देश्य:

1. विद्यार्थियों को भारतीय संवेदना, संस्कृति, वैश्विक चेतना से परिचित कराना।
2. धर्म, दर्शन, न्याय, नीति,साहित्य की प्राचीन व नवीन मान्यताओं से परिचित करवाना।
3. संचार संसाधनों से परिचित करवाना।
4. सिनेमा, रंगमंच,संगीत, चित्रकला इत्यादि से परिचित करवाना।

Unit	Unit wise course contents	Methodology Adopted
इकाई–1	1. भारतीय संस्कृति 2 भारतीय समाज व्यवस्था 3. सभ्यता एवं संस्कार 4. वैश्विक चेतना 5. समन्वयीकरण भारतीय अंतर्राष्ट्रीय संदर्भ में	व्याख्यान एवं नाट्य मंचन
इकाई–2	1. धर्म 2. न्याय 3. दर्शन 4. वैश्विक चेतना 5. साहित्य	ग्रीन बोर्ड
इकाई–3	1. संचार संसाधन : संपर्क के नए क्षितिज 2. समाचार पत्र 3. भारतीय प्रेस परिषद् 4. रेडियो 5. दूरदर्शन	व्याख्यान
इकाई–4	1. सिनेमा 2. रंगमंच 3. संगीत 4. चित्र,मूर्ति,स्थापत्य कला 5. शिल्प कला	सत्रीय कार्य
इकाई–5	1. कम्प्यूटर 2. दूरभाष सौगात विज्ञान की 3. मंत्र (कहानी) प्रेमचंद 4. मातृ भूमिगुप्त मैथिलीशरण : (कविता) 5. साहित्यकपाम का दायित्व डॉ. भारती प्रेम	प्रश्न मंच

अपेक्षित परिणाम : 1. विद्यार्थी आधुनिक संचार संसाधनों के प्रयोग में कुशल हो सकेगें।

संवेदनशील नागरिक बन सकेगें।

पाठ्य पुस्तक – हिन्दी

भाषा और संरचना त्रिभुवन नाथ शुक्ल हिन्दी ग्रन्थ अकादमी भोपाल म.प्र।

संदर्भ ग्रंथ – हिन्दी भाषा और संरचना त्रिभुवन नाथ शुक्ल हिन्दी ग्रन्थ अकादमी .भोपाल म.प्र।

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity

शिक्षक,उद्घोषक	प्रातियोगी परीक्षा में लाभकारी	उच्च गुणवता	साहित्य के क्षेत्र में रूचि

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SEMESTER- 3rd   **Subject Code: 3CBCA502**
Course: B. Sc. Maths   **Theory Max. Marks: 25**
SUBJECT: BASIC COMPUTER & INFORMATION TECHNOLOGY-II   **Theory Min. Marks:08**

COURSE OBJECTIVE:-
To educate students to analyze , design , integrate & manage information systems using information technology.

Unit	Course Content	Methodology Adopted
Unit – I	**Word Processing: Word** **Introduction to word Processing.** 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.	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	**Introduction to Excel** **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.	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
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.	ICT based class room teaching, Case Analysis, Group Presentation

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.	ICT based class room teaching, Case Analysis, Individual Presentation
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 Browers.	ICT based class room teaching, Case Analysis, Group Presentation

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.

Note- Minimum laboratory timing of six hours in a week.

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.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Computer Operator, Office Assistant, Training and Support in Institutions/universities, Research and Academics, System Analyst in State and Central Research organization,Consultant in Software firms,Quality Assurance and Testing in Public and Private sectors, Application Customization and Development, Start own venture	Learn basic's of MS-word improve their skills with advanced features	No Poverty, Quality Education, Industry Innovation and Infrastructure.	Can start own Computer Assistance services.

DR. C.V.RAMAN UNIVERSITY
KARGI ROAD, KOTA, BILASPUR (C.G.)

SEMESTER- 3rd   **Subject Code: 3SBPH303**
Course: B. Sc. Maths   **Theory Max. Marks: 50**
SUBJECT: PHYSICS-III   **Theory Min. Marks: 17**
(KINETIC THEORY OF GASES, THERMO-DYNAMICS AND STATISTICAL MECHANICS)

COURSE OBJECTIVE:-
1. To express the basic assumption of the kinetic theory of gases.
2. Students learn the different laws of thermodynamics.
3. To learn Thermodynamically function and their relations.

Unit	Course Content	Methodology Adopted
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 ofefficiency.	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
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 lowtemperatures.	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
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	ICT based class room teaching, Case Analysis, Group Presentation

	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.	ICT based class room teaching, Case Analysis, Individual Presentation
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 andits. 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.	ICT based class room teaching, Case Analysis, Group Presentation

COURSE OUTCOMES:-

1. Understand the concept of Thermodynamics and their laws.
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 IP 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.**

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity

DR. C.V.RAMAN UNIVERSITY
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SEMESTER- 3rd   **Subject Code: 3SBCH404**
Course: B. Sc. Maths/Bio/micro/biotech   **Theory Max. Marks: 50**
SUBJECT: CHEMISTRY –III (PHYSICAL, INORGANIC & ORGANIC CHEMISTRY)   **Theory Min. Marks** :17

Course Objective: Study of efficiency and terms as well as thermodynamic process, spectrum , transition elements and coordination compounds

Unit	Course Content	Methodology Adopted
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.	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
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.	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
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	ICT based class room teaching, Case Analysis, Group Presentation
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 H_2O: Frost, Latimer and Pourbaix diagram. Principles involved in the extraction of elements.	ICT based class room teaching, Case Analysis, Individual Presentation

Unit – V	**(a) 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, pinacole-pinacolone rearrangement. Trihydric alcohols-nomenclature and methods of formation, chemical reactions of glycerol. **(b) 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 and Riemer- Tiemann reaction **(c) 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.	ICT based class room teaching, Case Analysis, Group Presentation

Course Outcomes
- 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.

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Text And Reference Book
- Inorganic Chemistry (Part-I, Inorganic Chemistry (Part-I, Part-II), R.L. Dutta, NBS Publication.
- Unified Chemistry, Dr.M.M.Tandon, ShivlalAgrawal& Comp.
- Synthetic Organic Chemistry, O.P.Agrawal, Krishna Prakashan Media Ltd.
- Physical Chemistry, K.L.Kapoor, Macmillan Pub. India, Ltd
  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

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Chemist, Quantum mechanics, Scientist, Academic ,food industries	Knowledge of valable chemical and thermochemistry	Goal04(quality education) Goal13 (climate action), Goal 15(Life on land),Goal03 (Good health & well being)	Food, cosmetic & water purification expert , good academician etc.

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SEMESTER- 3rd   **Subject Code: 3SBCH404**
Course: B. Sc. Maths/Bio/micro/biotech   **Theory Max. Marks: 25**
SUBJECT: CHEMISTRY-III (INORGANIC & ORGANIC CHEMISTRY) PRACTICAL **Theory Min. Marks** : 08

PRACTICAL
Time: 6 hours
Inorganic Chemistry 7 marks
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 7 marks
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.

Text and Reference Book
- Experiments & calculations in chemistry, Dr.S.S.Dara, S.Chand & Company Lmt.
- Unified Chemistry, Dr. M.M.N. Tandon, Shivalal Agrawal & Com.

DR. C.V.RAMAN UNIVERSITY
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SEMESTER- 3rd
Course: B. Sc. Maths
SUBJECT: MATHEMATICS-III
(CALCULUS, DIFFERENTIAL EQUATION AND MECHANICS)

Subject Code: 3S
Theory Max. Marks:
Theory Min. Marks

COURSE OBJECTIVE:
- The goal of this course is for students to gain proficiency in calculuscomputations..
- To make the student acquire sound knowledge of sequences, series andtheir convergence.
- To familiarize the student with Laplace and inverse Laplace transforms as wellas applications of Laplace transformation in solving linear differentialequations.
- To acquaint the student withmechanics.

Unit	Course Content	Methodology Adopted
Unit – I	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 conditionalconvergence.	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
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 twovariables.	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
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	ICT based class room teaching, Case Analysis, Group Presentation
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 constantcoefficients.	ICT based class room teaching, Case Analysis, Individual Presentation
Unit – V	Analytical conditions of equilibrium of Coplanar forces. Catenary. Forces in three dimensions. Velocities and accelerations along Radial and transversedirection.	ICT based class room teaching, Case Analysis, Group Presentation

COURSE OUTCOMES
- Understanding the ideas of sequences and series and ability to find theirconvergence.
- Understanding of the ideas of limit and continuity and an ability to calculate with them and apply them for function of one and twovariables.
- Understanding of the ideas of differential equation and facility in solving standard examples.
- Understanding the ideas of Laplace and inverse Laplace transforms facility insolving standard examples and applythem.
- Understanding of the ideas of Mechanics and facility in solving simple standardexamples.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Teachers, Statistician, Researcher, Civil Officer	Able to Improve Decision making and problem solving skills	Goal 4 (Decent work),Goal 8 (Quality Education	Academicia

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Semester- IV	**Subject Code: 3HBEL402**
Course: B.Sc. Math	**Theory Max. Marks: 25**
Subject: English fc II	**Theory Min. Marks: 08**

Paper I: English Language and Scientific Temper
Course Objective:
1. To Study the basic language skills (speaking, listening, reading, and writing) and grammar
2. Comprehensive study of different kinds of letters and applications.
3. To study the different kinds of prose and poetry

	Course content	Methodology Adopted
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	Reading , Usage of ICT(Power point, PDF, and video lectures) and black board (traditional) as per requirement of the topic
Unit – II	Comprehension of an unseen passage.	Reading aloud with expression
Unit – III	I Letter Writing: Formal Letters, Informal letters, Applications.	Lectures , Usage of ICT(Power point, PDF, and video lectures) and black board (traditional) as per requirement of the topic
Unit – IV	Report Writing.	Discussion method, Usage of ICT(Power point, PDF, and video lectures) and black board (traditional) as per requirement of the topic
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 Outcome:
1. Student will be able to understand correct use of grammar and language skills.
2. Student will be familiar with different prose and poetry.
3. Student should be able to write analytically in a variety of formats, including essays, report writing and application.

Text Book
1. English language and Scientific Temper- Dr. Padam Kumar Jain, Chawdhry Madhya Pradesh Hindi Granth Academy, Bhopal.
2. English Grammar and Composition Wren & Martin. S.Chand & Company Ltd New Delhi.
3. Descriptive English (For Competitive Examinations) S.J.Thakur, S.K. Rout. B.K Publication Private Limited

Reference Books:
1. A Senior English Grammar and composition Aggarwala N.K Goyal Prakashan New Delhi.
2. A comprehensive Approach to English Grammar Shrivastava Avinash Pratap Indra Publishing House- Bhopal.
3. General English Thakur A.k- Lucent Publication- Patna.
4. Essentials of English Grammar Raymond Murphy Cambridge University press.
5. Learner's English Grammar and Composition N.D.V.Prasada Rao (S. Chand & Company Ltd.) New Delhi.
6. Strengthen your Writing V.R Narayana Swami (Orient Longman) New Delhi.

Job Opportunities	Employability Skill developed	UNDP Goal Achieved	Entrepreneurship Opportunity
Writer Asst. Professor Lecturer	Command on language Develop LSRW skills Research skill	Quality education Goal achieved	Research Guide Critic Publisher Novelist, Socialist
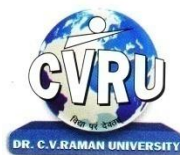
DR. C.V.RAMAN UNIVERSITY
KARGI ROAD, KOTA, BILASPUR (C.G.)

SEMESTER- 1st
COURSE: B.A.
SUBJECT:-
PAPER TITLE- **HUMAN VALUES AND ETHICS**

Subject Code: 3HBHP401
THEORY MAX. MARKS: 25
Theory Min. Marks: 08

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

	Unit wise course content	Methodology Adopted
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.	Usage of ICT (PowerPoint, Pdf and video lectures) and black board (traditional) as per requirement of the topic
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. Continuous Happiness and Prosperity- A look at basic Human Aspirations	Usage of ICT (PowerPoint, Pdf and video lectures) and black board (traditional) as per requirement of the topic
UNIT-III	*Moral Values in Profession.* 1. What is Profession? 2. Professional Ethos 3. Code of Professional Ethics 4. Corporate social Responsibility	Usage of ICT (PowerPoint, Pdf and video lectures) and black board (traditional) as per requirement of the topic
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.	Usage of ICT (PowerPoint, Pdf and video lectures) and black board (traditional) as per requirement of the topic
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	Usage of ICT (PowerPoint, Pdf and video lectures) and black board (traditional) as per requirement of the topic

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COURSE OUTCOMES:

1. **On completion of this course, the students will be able to:**
2. Understand the significance of value inputs in a classroom and start applying them in their life and profession.
3. Understand the value of harmonious relationship based on trust and respect in their life and profession.
4. Students will develop a sense of appreciation of women in all walks of life .
5. Understand the role of a human being in ensuring harmony in society

Text Books-

- *Human Values*,   Tripathy   International Publishers
- मूल्य, पर्यावरण और मानव अधिकार की शिक्षा   A.N.   New Age
  बी.एल. षर्मा   आर. लाल बुक डिपो मेरठ
- Human Values in Education   N.L. Gupta Concept Publishing New Delhi
  company

References

- A foundation course in Human Values Delhi and   Professional Ethics   Gaur R.R, Sangal R, Bagaria G P,   Excel books, New ,
- *Indian Ethos and Modern Management*   Bajpai B L,New Royal BoLucknow
- Human values   Mishra Dr. RajanLaxmi PublicatiPVT Delhi
- Professional Ethics and Human values Delhi   S. Dinesh Babu   Laxmi Publications PVT.LTD
- Business Ethics and Communication   Rathore , P.S.,   S. Chand Publishing Co. New Delhi
  Jeevan Vidya ek Parichay   Nagraj, A,   Divya Path Sansthan, Amarkantak

ECOMMENDED BOOKS –

Job Opportunities	Employability Skill Developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
	Action planning human value skills gender sensitization	Goal 04 (Quality Education Decent work economic growth achieved	Consultant for human values

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SEMESTER- 4th   **Subject Code: 3SBPH403**
Course: B. Sc. Maths   **Theory Max. Marks: 50**
SUBJECT: PHYSICS-IV   **Theory Min. Marks: 17**
(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.

Unit	Course Content	Methodology Adopted
Unit – I	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.	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
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'sformula.	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
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.	ICT based class room teaching, Case Analysis, Group Presentation
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 andetalon.	ICT based class room teaching, Case Analysis, Individual Presentation
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.	ICT based class room teaching, Case Analysis, Group Presentation

COURSE OUTCOMES:-
1. Understand the Physics behind various optical phenomena.
2. Understand various natural phenomena which are happening in their surroundings.
3. Explain the relationship in between various optical phenomena.

PRACTICAL:-

1.   To determine the frequency of A.C. Mains by usingsonometer.
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 physicalconcepts).
4.   To determine the wavelength of sodium light by Newton's ringsmethod.
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 usingspectrometer.
7.   To determine the resolving power of theTelescope.
8.   To determine the resolving power of thePrism.
9.   To determine the resolving power of the DiffractionGrating.
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
   (i).   To study the characteristic of ultrasound.
   (ii). To determine of the distance by using ultrasonic sensors.
   (iii). To study the object detection by using ultrasonic sensors.
   (iv). To determine the velocity of ultrasonic waves in a non-electrolytic liquid by ultrasonic interferometer.
   (v).   To determine the compressibility of a non-electrolytic liquid by ultrasonic waves.

Note:-

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

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity

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KARGI ROAD, KOTA, BILASPUR (C.G.)

SEMESTER- 4th
Course: B. Sc. Maths/Bio/micro/biotech
SUBJECT: CHEMISTRY-IV(Physical, Inorganic & Organic chemistry)

Subject Code: 3SBCH404
Theory Max. Marks: 50
Theory Min. Marks : 17

Unit	Course Content	Methodology Adopted
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-H_2O) (FeCl$_3$-H_2O) and (CuSO$_4$-H_2O) system. Freezing mixtures, acetone-dry ice. **Liquid-liquid mixtures**: Ideal liquid mixtures, Raoult's and Henry's law. Non-ideal system azeotropes: HCl-H_2O and ethanol water systems.	ICT based class-room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	**Electrochemistry Electrical transpor**t- 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: Application of conductivity measurements: determination of degree of dissociation, determination of Ka of acids, determination of solubility product of sparingly soluble salt, conductometric titrations. Definition of pH and pK, determination of pH using hydrogen, quinhydrone and glass electrodes by potentiometric methods.	ICT based class room teaching, Case Analysis, Individual Presentation, Use of chemical modeling.
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 NH_3 and liquid SO_2	ICT based class room teaching, Case Analysis, Group Presentation
Unit – IV	**(a) Aldehydes and ketone**s: Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes and ketones. Physical properties. Mechanism of nucleophillic additions to carbonyl group aldol perkin and knovenagel condensations. Condensation with	ICT based class room teaching, Case Analysis, Individual Presentation

	ammonia and its derivatives. Wittig reaction, Mannich reaction.Oxidation of aldehydes, Baeyer-Villiger oxidation of ketones, Cannizzaro reaction. Clemmensen, ,Wolf-Kishner, LiAlH4 and NaBH$_4$ reductions. **(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.. Synthesis of acid chlorides, esters and amides. Reduction of carboxylic acids. Mechanism of decarboxylation. Methods of formation and chemical reactions of unsaturated monocarboxylic acids.	
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.	ICT based class room teaching, Case Analysis, Group Presentation

Course Outcomes

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

Text And Reference Book

- Inorganic Chemistry (Part-I, Part-II), R.L. Dutta, NBS Publication.
- Unified Chemistry, Dr.M.M.Tandon, ShivlalAgrawal& Comp.
- Synthetic Organic Chemistry, O.P.Agrawal, Krishna Prakashan Media Ltd.
- Physical Chemistry, K.L.Kapoor, Macmillan Pub. India, Ltd

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Steel industries, pharmaceutical industries, food industries	Applied knowledge , Catalysis in industry	Goal04(quality education) Goal13 (climate action), Goal 15(Life on land),Goal03 (Good health & well being)	Food, cosmetic & water purification expert, subject course expert, Self-Coaching class expert & as a good academician etc.

DR. C.V.RAMAN UNIVERSITY
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SEMESTER- 4th   **Subject Code: 3SBCH104**
Course: B. Sc. Maths/Bio/micro/biotech   **Theory Max. Marks: 25**
SUBJECT: CHEMISTRY-III   **Theory Min. Marks** : 08
(INORGANIC & ORGANIC CHEMISTRY) PRACTICAL

PRACTICAL
Time: 6 hours
Organic Chemistry 5 marks
Qualitative analysis
Identification of an organic compound through the functional group analysis,determination of melting point and preparation of suitable derivatives.
Physical Chemistry 5 marks
Transition temperature
1. Determination of transition temperature of given substance bythermometric, dialometric method (e.g.) ($MnCl_2 \times 4H_2O$/$SrBr_2 \times 2H_2O$).
Phase equilibrium
1. To study the effect of solute (e.g. NaCl, succinic 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 phenol water system.
2. To construct the phase diagram of two component (e.g., diphenyl aminebenzophenone) by cooling curve method.
Thermochemistry
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
1. Estimation of ferrous and ferric by dichromate method.
2. Estimation of copper using thiosulphate.
Viva 5 Marks
Sessional 5 Marks

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SEMESTER- 4th   **Subject Code: 3SBMA405**
Course: B. Sc. Maths   **Theory Max. Marks: 75**
SUBJECT: MATHEMATICS-IV (ADVANCED CALCULUS, PARTIAL   **Theory Min. Marks:25**
DIFFERENTIAL EQUATIONS, COMPLEX ANALYSIS
AND ABSTRACT ALGEBRA)
COURSE OBJECTIVE:
- 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.
- To familiarize the student with complexanalysis.
- To acquaint the student with AbstractAlgebra.

Unit	Course Content	Methodology Adopted
Unit – I	Partial differentiation. Change of variables. Euler's Theorem on homogeneous function, Taylor's theorem for functions of two variables. Jacobians, Envelopes,Evolutes.	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	Maxima, minima and saddle points of functions of two variables. Beta and Gammafunctions. Double and triple integrals. Dirichlet's integrals.	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
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.	ICT based class room teaching, Case Analysis, Group Presentation
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, crossratio.	ICT based class room teaching, Case Analysis, Individual Presentation
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 QuotientRings.	ICT based class room teaching, Case Analysis, Group Presentation

COURSE OUTCOMES
- Understanding the ideas of advanced calculus and series and an ability to calculate with them and applythem.
- 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 withthem.
- Improved facility in abstractalgebra.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Teachers, Statistician, Researcher, Civil Officer	Able to Improve Decision making and problem solving skills	Goal 4 (Decent work),Goal 8 (Quality Education	Academician

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SEMESTER- 5th   **Subject Code: 3SBES501**
Course: B. Sc. Biology   **Theory Max. Marks: 25**
SUBJECT: ENVIRONMENTAL STUDIES   **Theory Min. Marks 08**

COURSE OBJECTIVE:
Student will be able to become proficient in the natural and physical sciences, as well as to be aware of social and cultural influences upon environmental problems facing society today.

Unit	Course Content	Methodology Adopted
Unit – I	**Scope and importance of environmental studies. Natural resources:** Renewable and renewable resources, Natural resources and associated problems . Forest, Water, Food, energy and land resources.	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	**Ecosystems:** Definition, concept, structure and functions. Producers, consumers and decomposers of an ecosystem. Energy flow in the ecosystem. Types of ecosystems. Bio-diversity: Definition, classification, threats to biodiversity and its conservation.	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
Unit – III	**Environmental pollution:** Causes, effects and control of air, water, soil, thermal, noise and marine pollution. Causes, effects and management of soil nuclear hazards. Solid waste management : Causes ,effects and Control measures of urban industrial waste.	ICT based class room teaching, Case Analysis, Group Presentation
Unit – IV	**The Environment Protection Act,** The Air Act, The water Act, The Wildlife Protection. Act and Forest Conservation Act. Woman and child welfare, HIV/AIDS and Role of information technology on environment and human health.	ICT based class room teaching, Case Analysis, Individual Presentation
Unit – V	Social issues and the environment, unsustainable to sustainable development. Urban problem related to energy, water conservation ,rain water harvesting, watershed management Disaster types and Disaster management, Floods, earthquakes, cyclones and land slides.	ICT based class room teaching, Case Analysis, Group Presentation

Course Outcome:-
▪ The Environmental Studies minor supplements other majors to facilitate students' understanding of complex environmental issues from a problem-oriented, interdisciplinary perspective.
▪ Enable the student to acquire basic ideas about environment and emerging issues about environment problems.
▪ Aware about the need and importance of Natural Resources.
▪ Develop knowledge and understanding of the environment and enable the students to contribute towards maintaining and improving the quality of the environment.

- **Textbook and Reference Book**

- Environmental Pollution Control in Process Industries, S.P.Mahajan

- Introduction to Air Pollution P.K.Trivedi
- Environmental Pollution Analysis, S.M.Kharpkar
- Environmental Pollution Engineering and Control, C.S.Rao

- Environmental Chemistry, B.K. Sharma &H.Kaur.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Teaching, Environmental-Officer/Chemist, Scientist, Environmental scientist.	Able to solve Problem related Enzyme Peptide, Air and Water. Able to Understand Radiation Pollution	Goal 3: (UNDP) Good health and well-being Goal 6: (UNDP) Clean water and Sanitation Goal 15: Life on Land	Health & Environment Protection Service, Environmental Analyst/specialist with Eco-friendly approach & environmental initiatives

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SEMESTER- 5th
Course: B.Sc. Math
SUBJECT: INTRODUCTION TO SOFT SKILL & TEAM BUILDING

Subject Code: 3HBEL501
Theory Max. Marks: 25
Theory Min. Marks: 8

COURSE OBJECTIVE:
By the end of the soft skills training program, the students should be able to:
- Develop effective communication skills (spoken and written).
- Develop effective presentation skills.
- Conduct effective business correspondence and prepare business reports which produce results.
- Become self-confident individuals by mastering inter-personal skills, team management skills, and leadership skills.
- Develop all-round personalities with a mature outlook to function effectively in different circumstances.
- Develop broad career plans, evaluate the employment market, identify the organizations to get good placement, match the job requirements and skill sets.
- Take part effectively in various selection procedures adopted by the recruiters.

Unit	Unit wise course contents	Methodology Adopted
Unit – I	General Introduction of self by students, Importance of the Training sessions, Importance of Presentation Skills, Public Speaking, Basic English Grammar Vocabulary, Kinds of Sentences, Verb, Adverb, Tenses, Preposition, Conjunction, Formation of Sentences, Sentence Making, Translation, Communication Skills Communication meaning, Function, Process, Types of communication, Barriers of communication, Guidelines for effective communication, Purpose of	Usage of ICT like PPT, Video Lectures, Black board.

	Good communication, Importance of right Pronunciation	
Unit – II	Listening and Writing Skills Importance of effective listening, Importance of effective writing skills, Conversation Practice, Guidelines for Effective writing, Body Language Gestures, Voice Modulation, Eye Contact, Facial Expression, Posture, Dressing Sense, Attire, Hand, movements, General Etiquette, Mannerism, Smiling Gestures, Confidence building, Exit walk, Behavioral skills Team Management, Time Management, Stress Management, Decision Making, Positive Thinking Attitude, self actualization, Working style	Usage of ICT like PPT, Video Lectures, Black board.
Unit – III	Email Skills Email Etiquette, Email Drafting, Creating a Resume/ Resume writing tips Format and Content Resume, Fresher's Resume, Helpful Tips For Resume Writing, Things to avoid in Resume, Group Discussion Introduction "what is GD", Ability to Influence, Importance of Active Listening, Key Steps to succeed in GD Do's and Don'ts of GD.	Usage of ICT like PPT, Video Lectures, Black board.
Unit – IV	Interview Skills/ Tips Groundwork before the Interview, Greeting Etiquettes, Self Introduction, Tips to answer "questions" Do's and Don'ts of Interview, Preparing a day before the interview, Things to remember during the Interview. Telephonic Interview and Video Conferencing Interview Tips Treat the Interview like a face to face Interview, Telephone Etiquette, Flow of Conversation.	Usage of ICT like PPT, Video Lectures, Black board.
Unit - V	Corporate Etiquette Professional Attitude at work, Punctuality, Meeting etiquettes, Professional Dressing sense, Cordial Relation with Fellow workers	Usage of ICT like PPT, Video Lectures, Black board.

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COURSE OUTCOME:-
- The teaching methods in the soft skills training include lectures, projects, role plays, quizzes, and various other participatory sessions. The emphasis will be on learning by doing.
- Since the method of training is experiential and highly interactive, the students imbibe the skills and attributes in a gradual and subtle way over the duration of the program. The students will not only learn the skills and attributes but also internalize them over a period of time.
- Internalization ensures that the skills and attributes become part of the students' nature. Subtle changes are bound to occur in their behavior and outlook, and these will make them more self-assured and confident. Moreover, the behavior changes will be gradual and natural and will not appear artificial or put on. Thus, the changes in them will be genuine and positive.
- The Soft Skills training program is a credit course and the evaluation of the students takes place on a continuous basis. Active participation in activities, interest displayed by the students in acquiring the necessary attributes and skills and the commitment
- shown by them to improve in terms of attitudes are the main criteria for evaluation.

Text Books:
- Business Communication, Universal Pub. Agra – Dr. Ramesh Mangal

Reference Books:
- English Grammar- Wren & Martin
- Putting your best foot forward- Lt. Co. (Dr.) Pramod Deogirikar

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Soft Skill Trainer, HR Executive	• Writing skills, Communication skills, Soft skills, Stress management, Team working	No Poverty, Zero hunger, Quality Education and Decent work and Economic Growth	Soft Skill Trainer

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SEMESTER- 5th   **Subject Code: 3SMPH503**
Course: B. Sc. Maths   **Theory Max. Marks: 50**
SUBJECT: DISCIPLINE SPECIFIC ELECTIVE-I   **Theory Min. Marks: 17**
PHYSICS-V (QUANTUM MECHANICS, ATOMIC, MOLECULAR
AND NUCLEAR PHYSICS)

COURSE OBJECTIVE:-
1. To introduce student to the concept of special relativity and its application to physical sciences.
2. To express the basic postulates of Quantum Mechanics and Atomic Physics.

Unit	Course Content	Methodology Adopted
Unit – I	Theory of Relativity Reference systems, inertial frames, Galilean Invariance and conservation laws, Michelson-Morley experiment; Postulates for the special theory of relativity, Lorentz transformations, length contraction, time dilation, variation of mass with velocity, mass - energy equivalence, particle with zero rest mass. Origin of Quantum Theory: photoelectric effect , Ritz combination principle in spectra. stability of an atom, Planck's radiation law, Einstein's explanation of photoelectriceffect..	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	Quantum Mechanics Wave-particle duality and uncertainty principle; de Broglie's hypothesis for matter waves; the concept of wave and group velocities, evidence for diffraction and interference of particles, experimental demonstrations of matter waves. Consequence of de Broglie's concepts; quantization in hydrogen atom; energies of a particle in a box, wave packets, Heisenberg's uncertainty relation for p and x, its extension to energy and time. Consequence of the uncertainty relation; gamma ray microscope, diffraction at a slit, particle in a box, position of an electron in a Bohr's orbit, Schrödinger's equation. Postulates of quantum mechanics; operators, expectationvalues.	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
Unit – III	Atomic Physics natural occurrence of quantum numbers-n, l and m, the related physical quantities. Spectra of hydrogen, deuteron and alkali atoms spectral terms, doublet fine structure. screening constants for alkali spectra for s,p,d and f states, selection rules, Singlet and triplet fine structure in alkaline earth spectra. L-S and J-J couplings. Weak Spectra: Continuous X-ray spectrum and its dependence on voltage, Duane and Hundt's law. Characteristic X-rays. Moseley's law; doublet structure of X-ray spectra. X-ray absorption spectra.	ICT based class room teaching, Case Analysis, Group Presentation
Unit – IV	Molecular Spectra Quantization of vibrational and rotational energies, pure rotational and rotation-vibration spectra Dissociation limit for the ground and other electronic states, transition rules for pure vibration and electronic vibration spectra. Spectroscopy: Raman Effect, Stokes and anti-stokes lines, experimental arrangements for Raman Spectroscopy. Spectroscopic techniques: Sources of excitation, prism and grating spectrographs for visible, UV and IR, absorption spectroscopy, double beam instruments, different recording systems.	ICT based class room teaching, Case Analysis, Individual Presentation

Unit – V	Nuclear Physics Working of nuclear detectors, G-M counter, proportional counter, scintillation counter, cloud chamber, spark chamberand emulsions technique. Structure of nuclei, basic properties (I, μ, Q and binding energy), energy, p-p and n-p scattering and general concepts of nuclear forces. Beta decay, range of alpha particle, Geiger- Nuttal law. Gamow's explanation of alpha decay, beta decay, Nuclear reactions,compound nucleus,). Shell model, Liquid drop model, Nuclear fission and fusion (concepts), energy production in stars by p-p and carbon - nitrogen cycles (concepts).	ICT based class room teaching, Case Analysis, Group Presentation

COURSE OUTCOME:-

1. Explain the nature of Quantum Mechanics and Lorentz Transformation equations.
2. Understand the concept of constant relative motion of different bodies in different frames of references.
3. Describe theories explaining the structure of atoms and the origin of the observed spectra.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity

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SEMESTER- 5ʰ **Subject Code: 3SMPH504**
Course: B. Sc. Maths **Theory Max. Marks: 50**
SUBJECT: DISCIPLINE SPECIFIC ELECTIVE-II **Theory Min. Marks: 17**
PHYSICS-V (ASTRO PHYSICS & ATMOSPHERIC SCIENCE)

COURSE OBJECTIVE:-
1. To gain knowledge of modern techniques, theory and observation results in astrophysics and cosmology.
2. Introduce the physics of planetary atmospheres with special emphasis on the atmosphere of the earth.

Unit	Course Content	Methodology Adopted
Unit – I	Our Universe Introduction, Constituents of the universe, Atmosphere, Planets, Stars, Solar energy, Asteroids, Meteors or Meteoroids, Comets, Pole Star, Galaxies.	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	Solar System and Stars Celestial mechanics, Elliptical orbits, Kepler's laws, Earth - Moon system, Tidal forces, Terrestrial Planets, Solar activity, Helio seismology, Binary stars, White dwarfs, Neutron stars, Formation of proto stars, Degenerate remnants of stars, Chandrasekhar Kimit, pulsars.	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
Unit – III	Physical Meteorology & Radar Meteorology Atmosphere; atmospheric composition; law of thermodynamics of the atmosphere; adiabatic process; law of black body radiation; solar and terrestrial radiation; albedo; green house effect; heat balance of earth-atmosphere system. Basic meteorology-radar principles; use of weather radar in aviation.	ICT based class room teaching, Case Analysis, Group Presentation
Unit – IV	Dynamic Meteorology & Monsoon Dynamics Fundamental forces; structure of static atmosphere; momentum; thermodynamics of dry atmosphere; voracity; potential vorticity. Wind; temperature & pressure distribution over India in the lower, middle, and upper atmosphere during pre/ post/and mid-monsoon season; energy cycle of monsoon; dynamics of monsoon; depressions and easterlywaves.	ICT based class room teaching, Case Analysis, Individual Presentation
Unit – V	Atmospheric Pollution & Instrumentation System Role of meteorology on atmospheric pollution; atmospheric boundary layer; air stability; wind structure; ekman spiral; turbulence boundary layer scaling; residence time and reaction rates of pollutants; sulpher compounds; nitrogen compounds; organic compounds; aerosol; radioactive particles. Ground based instruments for the measurement of temperature, pressure, humidity, wind and rainfallrate.	ICT based class room teaching, Case Analysis, Group Presentation

COURSE OUTCOMES:-
Students will have understanding of:
1. To understand binary stars as well as our solar system and the associated processes occurring in the Milky Way and other galaxies.
2. To describe the basic structure of an atmosphere and the climate system.
3. The concept of potential temperature and how it relates to static stability.

4. Know the components of the earth radiation balance and understand optical depth and transmission function.
5. Derive a simple model of "green house effect".

PRACTICAL:-

1. To determine the value of specific charge e/m of an electron by Thomson's Method.
2. To study and verify the Inverse Square Law by using photocell.
3. To study and analysis the properties of photocell.
4. To study of colour thin film of given Sample.
5. To study and analysis of long form of the periodic table
6. To study of the time dilation by the concept of twin paradox.
7. Experiments with Abbey's Refract meter:-
    (i).   To find the Refractive Index of the given liquid sample by using Abbey's Refract meter.
    (ii). To determine the Polaris ability of the given liquid samples at a given temperature.
    (iii). To study the variation of refractive index with:-
        (a) Temperature of liquid sample.
        (b) Wavelength of the light source.
8. Experiments with GM COUNTER:-
    (i).   To draw the plateau characteristics of GM Counter using radioactive source ($55Cs^{137}$).
    (ii). To study the pulse height with the applied voltage to the GM Tube.
    (iii). To study the absorption of beta and gamma radiation.
    (iv). To study and verify the Inverse Square Law by using GM Counter.
    (v).   To study of GM Counter.
    (vi). To study of design structure of GM Counter.
9. Experiments with Lissajous Pattern:-
    (i).   To study of the Lissajous figures.
    (ii). To determine the unknown frequency calculation by using Lissajous figures.
    (iii). To determine the RLC resonance frequency calculation by using Lissajous figures.
    (iv). To determine the phase difference calculation by using Lissajous figures.

Note:-

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

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity

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Kargi Road, Kota, Bilaspur (C.G.)

SEMESTER- 5th	**Subject Code: 3SBCH503**
Course: B.Sc. Maths/Bio/micro/biotech	**Max. Marks: 50**
SUBJECT: Chemistry-V (Physical Inorganic & Organic Chemistry)	**Min. Marks:17**

Course Objective: To Study the concepts of UV and IR spectroscopy and Bio-Organic & Bioinorganic Chemistry

Units	Unit Wise Course Contents	Methodology Adopted
Unit-I	Spectroscopy – I (a) Electromagnetic radiation, regions of the spectrum, basic features of different spectrometers, statement of the Born-Oppenheimer approximation, degrees of freedom. (b) Rotational spectrum of diatomic molecules. Raman spectrum, application of Raman spectrum. Spectroscopy - II (a) UV Spectroscopy : Electronic excitation, elementary idea of instrument used, Applications to structure determination of organic molecules. Woodward-Fieser rule for determining max of , -unsaturated carbonyl compounds. (b) Infrared Spectrum : Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant and qualitative relation of force constant and bond energies, effect of anharmonic motion and isotope on the spectrum, idea of vibrational frequencies of different functional groups.	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic, E-UG Pathshala, Google Classroom,
Unit-II	**Bioinorganic Chemistry - I** Essential and trace elements in biological processes, metalloporphyrins with special reference to haemoglobin and myoglobin, Biological role of alkali and alkaline earth metal ions with special reference to Ca^{2+}. Nitrogen fixation. **Bioinorganic Chemistry - II** Role of metal ions in biological process, Na/K pump, metal complexes as therapeutic agents anticancer agents, antiarthirits drugs and chelation therapy	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.
Unit-III	Inorganic Chemistry **Hard and Soft Acids and Bases** (HSAB) Classification of acids and bases as hard and soft, Pearson's HSAB concept, acid-base strength and hardness and softness, Symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness. **Gravimetric Analysis** Principles of gravimetric estimation, supersaturation, co-precipitation, post-precipitation and Ash treatment with respect to the estimation of Ba, Zn and Cu. **Water Analysis** Hardness, types of hardness-Temporary, permanent and total hardness, acidity and alkalinity, BOD, COD and DO.	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.
Unit-IV	**Carbohydrates - I Classification and nomenclature, monosaccharide, mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharide, erythro and threo diasterioisomers. Conversion of glucose into mannose. Formation of glycosides, ethers and esters, determination of ring size of**	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.Nptel lecture video E ug Pathshala

	monosaccharide, cyclic structure of D(+) glucose, mechanism of mutarotation. Structures of ribose and deoxyribose. Carbohydrates - II An introduction to glycosidic linkages in di- and poly-saccharides. Reducing and non reducing sugars. Structure determination of maltose, sucrose, starch and cellulose.	

Unit-V	**Fat and oil** -Elementary Idea of Fats, Oils and Detergents Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides, hydrogenation of unsaturated oils. Soapnification value, iodine value, acid value. Soaps and Detergents : Soaps, synthetic detergents, alkyl and aryl sulphonates **Synthetic Dyes**: Colour and constitution (electronic concept). Classification of dyes. Chemistry and synthesis of methyl orange, Congo red, Malachite green, Crystal violet, Phenolphthalein, Fluorescein, Alizarin and Indigo	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.NPTEL video lecture

Course Outcomes – After completion of the course student will able to Understand the Spectroscopy ,acid/base reactions, their products, and how buffer systems work

Text And Reference Book

- Inorganic Chemistry (Part-I, Part-II), R.L. Dutta, NBS Publication.
- Unified Chemistry, Dr.M.M.Tandon, ShivlalAgrawal& Comp.
- Synthetic Organic Chemistry, O.P.Agrawal, Krishna Prakashan Media Ltd.
- Physical Chemistry, K.L.Kapoor, Macmillan Pub. India, Ltd

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Steel industries, pharmaceutical industries, food industries, Rubber industry,Thermal insulation	Chemical analysis. Applied chemistry knowledge chemical production	Goal04(quality education) Goal13 (climate action), Goal 15(Life on land),Goal03 (Good health & well being)	Food, cosmetic & water purification expert good academician etc.

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SEMESTER- 5th　　　　　　　　　　　　　　　　　Subject Code: 3SBCH504
Course: B.Sc. Maths/Bio/micro/biotech　　　　　　　Max. Marks: 50
SUBJECT: Chemistry-V (Elective –I) Industrial Chemistry　Min. Marks: 17

Course Objective: Study of basic concept of distillation, evaporation, absorption, filtration and drying catalysis Microwave and Ultrasound assisted green synthesis, Green catalysis and its application. .

Units	Unit Wise Course Contents	Methodology Adopted
Unit-I	**1. Distillation:** Introduction, batch and continuous distillation, separation of azeotropes, plate columns and packed columns. **2. Absorption:** Introduction, equipments, packed columns, spray columns, bubble columns, mechanically agitated contactors.	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.
Unit-II	**1.Energy Balance**: Heat capacity of pure gases and gaseous mixtures at constant pressures, sensible heat changes in liquids, Enthalpy changes.**2. Drying:** Introduction, free moisture, bound moisture, drying curve, equipments– traydryer, rotary dryer, flash dryer, fluid bed dryer, drum dryer, spray dryer. .	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.
Unit-III	**1.Energy Balance**: Heat capacity of pure gases and gaseous mixtures at constant pressures, sensible heat changes in liquids, Enthalpy changes.**2. Drying:** Introduction, free moisture, bound moisture, drying curve, equipments– traydryer, rotary dryer, flash dryer, fluid bed dryer, drum dryer, spray dryer.	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.
Unit-IV	**Catalysis:** Introduction, Types, Basic principles, mechanisms, factors affecting the performance, introduction to phase transfer catalysis, Enzymes catalyzed reactions- rate model, industrially important reactions.**2.Renewable Natural resources:** Cellulose, Starch: - properties, modification, important industrial chemicals derived from them. Alcohols, oxalic acid and Furfura.	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.Nptel lecture video
Unit-V	**Utilities in Industry:** **Fuel:** Types of fuels – advantages and disadvantages. **Boilers:** Types of boilers and their functioning. **Water:** Specifications for Industrial use, various water treatments. **Steam:** Generation and use.**Fluid Flow:** Fans, Blowers, Compressors, vacuum pumps, Ejectors. **Pumps:** Reciprocating pumps, Gear pumps, Centrifugal pumps.**Heat Transfer:** Heat **exchangers-** shell and tube type, finned tube heat exchangers, plateheat exchangers, refrigeration cycles.	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.NPTEL video lecture

Course Outcomes - Knowlwdge of industrial chemistry and its application.

- **Reference books:**
- 1. Catalysis, Heterogeneous and Homogeneous. Delmon Elsevier Science publisher.
- 2.Stoichiometry, B.T. Bhatt and S.N. Vora—Tata McGraw Hill Publishing Co. Ltd., New Delhi.

- 3.Chemical Process Principles—Part-I, D.A. Hougen, K.M. Watson, R.A. Regatz Asia publishing House, Bombay.
- 4. Introduction to Chemical Engineering, W.L. Budger and I.T. Banchero, McGraw HiII Book Co. of U.S.A.
- 5. Industrial chemistry: B. K. Sharma
- 6. Riegel's Handbook of Industrial Chemistry: J. A. Kent CBS Publishers, New Delhi.
- 7. A Textbook of Engineering Chemistry, S. S. Dara: S. Chand & Company Ltd. New Delhi.
- 8. Environmental Chemistry: A. K. De, New Age International Pvt, Ltd, New Delh

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Steel industries, pharmaceutical industries, food industries. Power plant	Application and Production of chemical	Goal04(quality education) Goal13 (climate action), Goal 15(Life on land),Goal03 (Good health & well being)	Food, cosmetic & water purification expert good academician, chemical business etc.

Dr. C.V. RAMAN UNIVERSITY
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SEMESTER- 5ᵗʰ   Subject Code: 3SBCH505
Course: B.Sc. Maths/Bio/micro/biotech   Max. Marks: 50
SUBJECT: Chemistry-V (Elective –I) Green Chemistry   Min. Marks: 17

Course Objective: To Study the basic concepts of Green Chemistry, Green Reactions, Microwave and Ultrasound assisted Green synthesis, Green Catalysis and its application.

Units	Unit Wise Course Contents	Methodology Adopted
Unit-I	**Green Chemistry:** Introduction- Definition of green Chemistry, need of green chemistry, basic principles of green chemistry. Green synthesis-Evalution of the type of the reaction i) Rearrangements (100% atom economic), ii) Addition reaction (100% atom economic). Organic reactions by Sonication method: apparatus required examples of sonochemical reactions (Heck, Hundsdiecker and Wittig reactions).	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.
Unit-II	**Selection of solvent:** i) Aqueous phase reactions ii) Reactions in ionic liquids, Heckreaction, Suzuki reactions, epoxidation. iii) Solid supported synthesis Super critical CO_2: Preparation, properties and applications, (decaffeination, dry cleaning)	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.
Unit-III	**Microwave and Ultrasound assisted green synthesis:** Apparatus required, examples of MAOS (synthesis of fused anthro quinones, Leukart reductive amination of ketones) - Advantages and disadvantages of MAOS. Aldol condensation-Cannizzaro reaction, Diels-Alder reactions-Strecker's synthesis	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.
Unit-IV	**Green Catalysis:** Heterogeneous catalysis, use of zeolites, silica, alumina, supported catalysis- biocatalysis: Enzymes, microbes Phase transfer catalysis (micellar/surfactant)	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.Nptel lecture video
Unit-V	**Examples of green synthesis / reactions and some real world cases**: 1. Green synthesis of the following compounds: adipic acid , catechol , disodium imino di acetate (alternative Strecker's synthesis) 2. Microwave assisted reaction in water – Hoffmann elimination – methyl benzoate to benzoic acid – oxidation of toluene and alcohols – microwave assisted reactions in organic solvents. Diels-Alder reactions and decarboxylation reaction. 3.Ultrasound assisted reactions – sonochemical Simmons –Smith reaction (ultrasonic alternative to iodine)	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.NPTEL video lecture

Course Outcomes: After completion of the course the learners will be able to know about the reaction of Green catalysis, Microwave and Ultrasound assisted green synthesis and its modern application in Green Chemistry.

Reference books:
- Green Chemistry Theory and Practice. P.T.Anatas and J.C. Warner
- Green Chemistry V.K. Ahluwalia Narosa, New Delhi.
- Real world cases in Green Chemistry M.C. Cann and M.E. Connelly
- Green Chemistry: Introductory Text M.Lancaster: Royal Society of Chemistry (London)

- Green Chemistry: Introductory Text, M.Lancaster
- Principles and practice of heterogeneous catalysis, Thomas J.M.,Thomas M.J., John Wiley
- Green Chemistry: Environmental friendly alternatives R S Sanghli and M.M Srivastava,
- Environmental Chemistry: A. K. De, New Age International Pvt, Ltd, New Delhi

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Pharmaceutical industries, food industries. Power plant, pollution controlling device	Green chemistry and catalysis information	Goal04(quality education) Goal13 (climate action), Goal 15(Life on land),Goal03 (Good health & well being)	Food, cosmetic & water purification expert good academician, chemical business etc.

Dr. C.V. RAMAN UNIVERSITY
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SEMESTER- 5th
Course: B.Sc. Biology/Maths/Microbio/Biotech
SUBJECT: Chemistry Practical - V

Subject Code: 3SBCH503
Practical Max. Marks: 25
Practical Min. Marks: 08

Time: 6 hour

Inorganic Chemistry 05 Marks

Analysis of inorganic mixture containing five radicals with at least one interfering radical (phosphate, borate, oxalate or fluoride).

Organic Chemistry 05Marks

Preparation:

(i) Acetylation

(ii) Benzoylation

(iii) meta-Dinitrobenzene

(iv) Picric acid

Physical Chemistry 05 Marks

(i) Effluent Analysis

Identification of cations and anions in different water samples.

(ii) Water analysis

To determine the amount of dissolved oxygen in water samples in ppm units.

Viva 05 Marks

Sessional 05 Marks

Books:

- Unified Chemistry, Dr. M.M.N.Tandon, Shivlal Agrawal & Company.
- Experiment & Calculations in Engineering Chemistry, Dr. S.S. Dara, S.Chand & Com. Ltd.

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SEMESTER- 5th **Subject Code: 3SBMA503**
Course: B. Sc. Maths **Theory Max. Marks: 75**
SUBJECT: DISCIPLINE SPECIFIC ELECTIVE-I **Theory Min. Marks:25**
MATHEMATICS-V (REAL ANALYSIS, LINEAR ALGEBRA & DISCRETE MATHEMATICS)

COURSE OBJECTIVE:
- The goal of this course is for students to gain proficiency in computation of realanalysis.
- To make the student acquire sound knowledge of linearalgebra.
- To familiarize the student with discretemathematics.

Unit	Course Content	Methodology Adopted
Unit – I	Riemann integral, Integrability of continuous and monotonic functions, The fundamental theorem of integral calculus, Mean value theorems of integral calculus, Partial derivatives and differentiability of real-valued functions of twovariables.	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	Schwarz and Young's theorem, Implicit function theorem, Fourier series of half and full intervals, Improper integrals and their convergence, Comparison test, Abel's and Dirichlet's tests, Frullani's integral, Integral as a function of aparameter.	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
Unit – III	Definition and examples of vector spaces, subspaces, Sum and direct sum of subspaces. Linear span, Linear dependence, independence and their basic properties. Basis, Finite dimensional vector spaces, Existence theorem for basis, Invariance of the number of elements of a basis set, Dimension, Dimension of sums of vectorsubspaces.	ICT based class room teaching, Case Analysis, Group Presentation
Unit – IV	Linear transformations and their representation as matrices, The Algebra of linear transformations, The rank- nullity theorem, Eigen values and eigen vectors of a linear transformation, Diagonalisation. Quotient space and itsdimension.	ICT based class room teaching, Case Analysis, Individual Presentation
Unit – V	Binary Relations, Equivalence Relations, Partitions and Partial Order Relation . Graphs, Multigraphs, Weighted Graphs, Paths and Circuits, Shortest Paths. Trees and their properties.	ICT based class room teaching, Case Analysis, Group Presentation

Course Outcomes
- Understanding the ideas of real analysis and series and an ability to calculate withthem.
- Understanding of the ideas of linear algebra and facility in solving standardexamples.
- Understanding of the ideas of discrete mathematics. and facility in solving standard examples.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Teachers, Statistician, Researcher, Civil Officer	Able to Improve Decision making and problem solving skills	Goal 4 (Decent work),Goal 8 (Quality Education	Acdemician

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Teachers, Statistician, Researcher, Civil Officer	Able to Improve Decision making and problem solving skills	Goal 4 (Decent work),Goal 8 (Quality Education	Acdemician

DR. C.V.RAMAN UNIVERSITY
KARGI ROAD, KOTA, BILASPUR (C.G.)

SEMESTER- 5th   **Subject Code: 3SBMA504**
Course: B. Sc. Maths   **Theory Max. Marks: 75**
SUBJECT: DISCIPLINE SPECIFIC ELECTIVE-II   **Theory Min. Marks:25**
MATHEMATICS-V (RING THEORY AND LINEAR ALGEBRA II)

Unit	Course Content	Methodology Adopted
Unit – I	Definition, examples and basic properties of ordered sets, maps between ordered sets, duality principle, maximal and minimal elements, lattices as ordered sets, complete lattices, lattices as algebraic structures, sublattices, products andhomomorphisms.	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	Definition, examples and properties of modular and distributive lattices, Boolean algebras, Boolean polynomials, minimal forms of Boolean polynomials	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
Unit – III	Quinn-McCluskey method, Karnaugh diagrams, switching circuits and applications ofswitchingcircuits.	ICT based class room teaching, Case Analysis, Group Presentation
Unit – IV	Definition, examples and basic properties of graphs, pseudographs, complete graphs, bi-partite graphs, isomorphism of graphs, paths andcircuits,	ICT based class room teaching, Case Analysis, Individual Presentation
Unit – V	Eulerian circuits,Hamiltonian cycles, the adjacency matrix, weighted graph, travelling salesman's problem, shortest path, Dijkstra's algorithm, Floyd-Warshallalgorithm.	ICT based class room teaching, Case Analysis, Group Presentation

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Teachers, Statistician, Researcher, Civil Officer	Able to Improve Decision making and problem solving skills	Goal 4 (Decent work),Goal 8 (Quality Education	Academician

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KARGI ROAD, KOTA, BILASPUR (C.G.)

SEMESTER- 6th **Subject Code: 3SMPH603**
Course: B. Sc. Maths **Theory Max. Marks: 50**
SUBJECT: DISCIPLINE SPECIFIC ELECTIVE-I **Theory Min. Marks: 17**
PHYSICS-VI (SOLID STATE PHYSICS, ELECTRONICS AND LASER)

COURSE OBJECTIVE:-
1. Describe the difference between crystalline and non crystalline materials.
2. Describe the arrangements of atoms and ions in crystalline structure,
3. Explain basic Laser principle Laser behavior properties of Laser radiations, different types of Lasers and Laser applications.

SYLLABUS

Unit	Course Content	Methodology Adopted
Unit – I	Overview: Crystalline and glassy forms, liquid crystals, glass transition. Crystal structure: Periodicity, lattices and bases, unit cell, Wigner-Seitz cell, lattice types, lattice planes. Common crystal structures. Laue's theory of X-ray diffraction, Bragg's law, Laue patterns. Bonding: Potential between a pair of atoms; Lennard-Jones potential, concept of cohesive energy, covalent, Vander Waal, ionic and metallic crystals Magnetism: Atomic magnetic moment, magnetic susceptibility, Dia, Para and Ferromagnetism, Ferro magnetic domains	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	Thermal properties Lattice vibrations, simple harmonic oscillator, Concept of phonons, density of modes (1-D). Debye model; Lattice specific heat low temperature limit, extension (conceptual) to 3-D. Band Structure: Electrons in periodic potential; nearly free electron model (qualitative), energy band, energy gap, metals, insulators, semiconductors. Motion of electrons: Free electrons, conduction electrons, electron collisions, mean free path, conductivity and Ohm's law. Fermi energy, Fermi velocity, Fermi-Diracdistribution.	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
Unit – III	Semiconductors Semiconductors electrons and holes, Fermi Level, Temperature dependence of electron and hole concentrations. Doping: conductivity, mobility, Hall Effect, Hall Coefficient. Semiconductor devices: Metal-semiconductor junction, p-n junction, majority and minority carriers, diode, Zener and tunnel diodes, light emitting diode, transistor, solar cell. Power supply: Diode as a circuit element, load line concept, rectification, ripple factor, Zener diode, voltage stabilization, Transistors : Characteristics of a transistor in CB, CE and CC mode, thermal runaway. FETs: Field effect transistors, JFET volt-ampere curves, biasing JFETMOSFET, biasingMOSFET.	ICT based class room teaching, Case Analysis, Group Presentation
Unit – IV	Amplifiers- I Small signal amplifiers ; General Principle of operation, classification, distortion, RC coupled amplifier, input and output impedance, multistage amplifiers. Amplifier- II: Transformer coupled amplifiers, Noise in electronic circuits. Oscillators Hartley, Colpitt and Wein bridgeoscillators.	ICT based class room teaching, Case Analysis, Individual Presentation

Unit – V	Laser Laser system: Purity of a spectral line, coherence length and coherence time, spatial coherence of a source, Einstein's A and B coefficients. Spontaneous and induced emissions, conditions for laser action, population inversion. Types of Lasers (gas and solid state), Pulsed lasers and tunable lasers, spatial coherence and directionality, estimates of beam intensity, temporal coherence and spectral energydensity.	ICT based class room teaching, Case Analysis, Group Presentation

Outcomes:-

1. Demonstrate an understanding of the crystal lattice and how the main lattice types or described.
2. Explain different laser used and make a comparison between them.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity

DR. C.V.RAMAN UNIVERSITY
KARGI ROAD, KOTA, BILASPUR (C.G.)

SEMESTER- 6ᵗʰ   **Subject Code: 3SMPH604**
Course: B. Sc. Maths   **Theory Max. Marks: 50**
SUBJECT: DISCIPLINE SPECIFIC ELECTIVE-II   **Theory Min. Marks: 17**
PHYSICS-VI (NANO TECHNOLOGY AND MATERIAL SCIENCE)

COURSE OBJECTIVE:-
1. To give comprehensive exposures to the students regarding various materials, crystiline, non – crystalline materials, crystal structure and their defects the concept of phase and different type of phase diagram.
2. Experimental and computational characterization of nano materials.

Unit	Course Content	Methodology Adopted
Unit – I	Core Concept of Nanotechnology Nanotechnology, nanotech generation, nano science, nano composites, nano materials, carbon nano tubes, nanohorns, inorganic nanotubes, nanowires.	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	Impact of Nanotechnology and its Applications Privacy, social denide, communication, risk, social and ethical impacts, Health & environmental impacts, negative impacts. Types of application, nanotechnology forenergy.	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
Unit – III	Properties of Nanomaterials Optional properties, mechanical properties, magnetic properties, electrical properties etc.	ICT based class room teaching, Case Analysis, Group Presentation
Unit – IV	Classification of Materials Crystalline, Polycrystalline, Amorphous (Introduction and their structure),Elementary idea of polymers (Structure and properties, Methods of polymerization), Glasses: Structure and properties, Type of Glasses, Fracture in glasses, Composite Materials: Introduction, their types and properties, Different types of bonding.	ICT based class room teaching, Case Analysis, Individual Presentation
Unit – V	Transport Properties of Solids Electrical conductivity of metals and alloys, Extrinsic & intrinsic semiconductors and amorphous semiconductors, Scattering of electrons by phonons, Impurity, Carrier mobility and its temperature dependence, Mathiessio's rule for resistivity, Temperature dependence of metallicresistivity.	ICT based class room teaching, Case Analysis, Group Presentation

COURSE OUTCOMES:-
Students will have understanding of:
1. Different type of materials and their structure.
2. Structure dependence of various thermal, optical and mechanical properties.
3. Explain the fundamental principles of nano technology and their application to medical science.

PRACTICAL:-

1. To study and verify the De-Morgan's Theorem.
2. To study and prove the Laws of Boolean Algebra.
3. To study and verify the truth table of Compound logic gates.
4. To study and draw the characteristics curve of P-N Junction diode.
5. To study and draw the characteristics curve of Zener diode.
6. To study and draw the characteristics curve of Tunnel diode.
7. To determine the energy band gap of a semiconductor by using P-N Junction diode.
8. To study and draw the characteristics curve of transistor in CB/CC/CE mode.
9. To determine the wavelength of given laser light.
10. To determine the beam divergence of a laser beam.
11. Study of crystal faces & structure by using given model.
12. Experiment with Malus Law Apparatus:-
    (i).   Study of polarization of light by reflection and thus verify Brewster's law.
    (ii). Study and verify Malus Law using a plain glass plate and a Polaroid.
13. Experiments with solar cells:-
    (i).   To study the voltage and current of the solar cells.
    (ii). To study the voltage and current of the solar cells in series and parallel combinations.
    (iii). To determine the efficiency (η) of the solar cell.

Note:-

❖ One experiment will be asked in the semester practical examination.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity

Dr. C.V. RAMAN UNIVERSITY
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SEMESTER- 6th   Subject Code: 3SBCH 603
Course: B.Sc. Maths/Bio/micro/biotech   Max. Marks: 50
SUBJECT: Chemistry-VI   Min. Marks-17
(Physical Inorganic & Organic Chemistry)

Course Objective: **To** Study the basic concepts of photochemistry, solution, Inorganic polymer, preparation and properties of organometallic compounds.

Units	Unit Wise Course Contents	Methodology Adopted
Unit-I	(a) Photochemistry Interaction of radiation with matter, difference between thermal and photochemical process. Law of photochemistry-Grotthus-Draper law, Stark-Einstein law, Beer-Lambert's law. Determination of rate constant of unimolecular reactions. Electronic transitions, Jablonski diagram depicting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions-energy transfer processes	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic .E-UG Pathshala
Unit-II	(a) **Solutions, dilute solutions and colligative properties**-I Ideal and non ideal solutions, methods of expressing concentrations of solutions, activity and activity coefficient. Dilute solutions- colligative properties. Raoult's law, relative lowering of vapour pressure, molecular weight determination. Osmosis, law of osmotic pressure and its measurements, determination of molecular weight from osmotic pressure. **(b) Solutions, dilute solutions and colligative properties-II** Elevation of boiling point and depression of freezing point. Thermodynamic derivation of relation between molecular weight and elevation of boiling point and depression in freezing point. Experimental methods of determining various colligative properties. Abnormal molar mass, degree of dissociation and association of solute.	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.
Unit-III	Inorganic polymers:Introduction and scope of inorganic polymers, special characteristics, classification, homo and hetero atomic polymers and their applications. Silicones and phosphazenes as examples of inorganic polymers, nature of bonding in triphosphazenes.	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.
Unit-IV	Organometallic chemistry (a) Definition, nomenclature and classification of organometallic compounds. Preparation, properties, bonding and applications of alkyls and aryls of Li, Al, Hg, Sn and Ti. (b) A brief account of metal-ethylenic complexes and homogeneous hydrogenation; mononuclear carbonyls and the nature of bonding in metal carbonyls. Transition metal organometallic compounds with bonds to hydrogen and boron. (c) Metal nitrosyls: modes of coordination, nature of bonding and probable applications.	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.Nptel lecture video E ug Pathshala
Unit-V	(a) **Organometallic compounds**: Organomagnesium compounds, The Grignard reagents-formation, structure and synthetic applications, organozinc compounds, formation and chemical reactions,	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per

Organolithium compounds-formation and chemical reactions. **(b) Organic synthesis via enolates** Organic synthesis via enolates, acidity of -hydrogens, alkylation of diethylmalonate and ethylacetoacetate. Synthesis of ethylacetoacetate, the Claisen condensation, keto-enol tautomerism of ethylacetoacetate. Alkylation of 1, 3-dithianes, alkylation and acylation of enamines. **(c) Organosulphur compounds** Nomenclature, structural features. **(d) Amino acids** Classification, structure, stereochemistry of amino acids, acid base behaviour, isoelectric point, general methods of preparation and properties of -amino acids	requirement of the topic, NPTEL video lectures, Use of chemical models with structural elucidation, Google Classroom, other digital tools along with Chem-draw Softwares.

Course Outcomes – After completion of the course student will able to understand the physical photochemistry, application of inorganic polymers and organometallic compounds.

Text And Reference Book
- Inorganic Chemistry (Part-I, Part-II), R.L. Dutta, NBS Publication.
- Unified Chemistry, Dr.M.M.Tandon, ShivlalAgrawal& Comp.
- Synthetic Organic Chemistry, O.P.Agrawal, Krishna Prakashan Media Ltd.
- Physical Chemistry, K.L.Kapoor, Macmillan Pub. India, Ltd

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Steel industries, pharmaceutical industries, food industries, Rubber industry,Thermal insulation officer	Analysis and problem-solving. time management and organization. Applied knowledge chemical production	Goal04(quality education) Goal13 (climate action), Goal 15(Life on land),Goal03 (Good health & well being)	Food, cosmetic & water purification expert good academician etc.

Dr. C.V. RAMAN UNIVERSITY
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SEMESTER- 6th   Subject Code: 3SBCH 604
Course: B.Sc. Biology/Maths/Microbio/Biotech   Theory Max. Marks: 50
SUBJECT: Discipline Specific Elective-II (Bio-Chemistry)   Theory Min. Marks: 17

Course Objective: To Study & know about the basic concepts of biochemistry, Cellular mechanisms,cell biology, chemical entities supporting life, Vitamins, Carbohydrates, lipids, proteins, enzymes, DNA, RNA, and their Structure and classification as well as their physical, chemical and optical properties.

Units	Unit Wise Course Contents	Methodology Adopted
Unit-I	**Introduction: The foundations of biochemistry and Vitamins** Cellular and chemical foundations of life . Structure and active forms of water soluble and fat soluble vitamins, deficiency diseases and symptoms, hypervitaminosis.	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.
Unit-II	Unique properties, weak interactions in aqueous systems, ionization of water, buffers, water as a reactant and fitness of the aqueous environment.	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.
Unit-III	**Carbohydrates and glycobiology** Monosaccharides - structure of aldoses and ketoses, ring structure of sugars, conformations of sugars, mutarotation, anomers, epimers and enantiomers, structure of biologically important sugar derivatives, oxidation of sugars. Formation of disaccharides, reducing and non-reducing disaccharides. Polysaccharides – homo- and heteropolysaccharides, structural and storage polysaccharides. Structure and role of proteoglycans, glycoproteins and glycolipids (gangliosides and lipopolysaccharides). Carbohydrates as informational molecules, working with carbohydrates	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.
Unit-IV	Building blocks of lipids - fatty acids, glycerol, ceramide. Storage lipids -triacyl glycerol and waxes. Structural lipids in membranes – glycerophospholipids, galactolipids and sulpholipids, sphingolipids and sterols, structure, distribution and role of membrane lipids. Plant steroids. Lipids as signals, cofactors and pigments	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.Nptel lecture video
Unit-V	Structure and classification, physical, chemical and optical properties of amino acids Nucleic acids Nucleotides - structure and properties. Nucleic acid structure – Watson-Crick model of DNA. Structure of major species of RNA - mRNA, tRNA and rRNA. Nucleic acid chemistry - UV absorption, effect of acid and alkali on DNA. Other functions of nucleotides - source of energy, component of coenzymes, second messengers	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic. NPTEL video lecture

Course outcome- The Students will able to understand the biochemistry of organisms, the building blocks of life & all the relevant biochemical processes including the properties and synthesis.

Reference books:
- 1.Fundamentals of Biochemistry: A. C. Deb

- 2.Biochemistry : U. Satyanarayana ·
- 3.Biochemistry : Lubest Stryer ·
- 4. Textbook of Biochemistry : Jain & Jain

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Steel industries ,pharmaceutical industries, food industries,Narmada coldrink plant	Analysis and problem-solving. time management Biochemical Knoledge	Goal04(quality education) Goal13 (climate action), Goal 15(Life on land),Goal03 (Good health & well being)	Food, cosmetic & water purification expert good academician, chemical business etc.

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SEMESTER- 6th	**Subject Code: 3SBCH 605**

SEMESTER- 6th   **Subject Code: 3SBCH 605**
Course: B.Sc. Biology/Maths/Microbio/Biotech   **Theory Max. Marks: 50**
SUBJECT: Discipline Specific Elective-II (**NanoChemistry**)   **Theory Min. Marks: 17**

Course outcome- To understand preparation of nanoparticle, organic nanoparticle and about the role of nanoparticle in environmental protection.

Units	Unit Wise Course Contents	Methodology Adopted
Unit-I	**Introduction:** Nanoscale Science and Technology-Applications for Physics, Chemistry, Biology and Engineering; Classifications of nanostructured materials, nano particles; 3 quantum dots, nanowires, ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties:	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.
Unit-II	**Preparation methods**: Bottom-up Synthesis-Top-down Approach: Precipitation, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy.	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.
Unit-III	**Nanoporous materials:** Zeolites, mesoporous materials, nanomembranes - Carbon nanotubes and graphene - Core shell and hybrid nanocomposites..	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.
Unit-IV	Organic Nanoparticles: Introduction, definition, structure, types of NP, analytical methods (Extraction and isolation, Separation, Characterization and Imaging), general method of preparation, properties, detection, and characterization of organic nanoparticles: hydrophobic drugs, protein, peptide, lipid, cyclodextrine, polysaccharides. Nanocochleates, Prospects and Future Challenges.	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic. Nptel lecture video
Unit-V	Nanomaterials for Environmental Protection: Nano technology processes – Nano Engineering materials for Pollution Prevention, Green Chemistry, Energy efficient resources and materials, Nano technology products- Nanomaterials (nanostructures) Nanodevices and nanosystems.	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.NPTEL video lecture

Course Outcome- After the completion of course learner is able to understand about:

- Nanochemistry of Nanomaterials and its types
- Preparation methods of Nanomaterials/Nanoparticles & nanosynthesis
- Nanoscience affecting environment
- Organic nanoparticles & their characterization techniques.
- Nanomaterials for Environmental Protection

References:

1. Environanotechnology by Mao Hong fan, Chin-pao Huang, Alan E Bland, Z Honglin Wang, Rachid Sliman, Ian Wright. Elsevier, 2010.
2. Nanotechnology: Importance and Application by M.H. Fulekar, IK International, 2010.
3. Nanotechnologies, Hazards and Resource efficiency by M. Steinfeldt, Avon Gleich, U. Petschow, R. Haum. Springer, 2007.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Steel industries ,pharmaceutical industries, food industries nanoindustry	Environmental Problem determination and its solution	Goal04(quality education) Goal13 (climate action), Goal 15(Life on land),Goal03 (Good health & well being)	Food, cosmetic & water purification expert good academician, chemical business etc.

SEMESTER- 6th **Subject Code: 3SBCH 603**
Course: B.Sc. Biology/Maths/Microbio/Biotech **Practical Max. Marks: 25**
SUBJECT: Chemistry Practical - VI **Practical Min. Marks: 08**

Time: 6 hour M.M: 30

Inorganic Chemistry 05 Marks

Complex Compound Preparation:
1. Diaquabis(methyl acetoacetato)nickel(II)
2. Diaquabis(ethyl acetoacetato)cobalt(II)
3. Bis(methyl acetoacetato)copper(II) monohydrate
4. Potassium chlorochromate(IV)
5. Tetraamminecopper(II) sulphate monohydrate
6. Mercury(II) tetrathiocyanatocobaltate(II)
7. Hexaamminenickel(II) chloride

Organic Chemistry 05 Marks
Binary mixture analysis containing two solids: Separation, identification and preparation of derivatives.

Physical Chemistry Instrumentation 05 Marks
(iii) Job's method
(iv) Mole-ratio method.
Viva 05 Marks
Sessional 05 Marks
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Books:
- Experiments & Calculations in engineering chemistry, Dr. S.S. Dara, S.Chand & Company Ltd.

- Practical Chemistry, Dr. M.M.N.Tandon, Shivlal Agrawal & Company

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SEMESTER- 6th　　　　　　　　　　　　　　　　**Subject Code: 3SBMA603**
Course: B. Sc. Maths　　　　　　　　　　　　　**Theory Max. Marks: 75**
SUBJECT: DISCIPLINE SPECIFIC ELECTIVE-I　　**Theory Min. Marks: 25**
MATHEMATICS-VI (METRIC SPACE, NUMERICAL ANALYSIS & STATISTICS)

COURSE OBJECTIVE:
- To introduce the concept of metric space to the students and to make them understand various familiar concept of real analysis with the help of metric space.
- To introduce the concept of compactness and connectedness w.r.t. metric space and to study some useful properties of continuous function.
- To introduce various numerical techniques to the students of solving equation and also introduce the concept of numerical differentiation and integration.

Unit	Course Content	Methodology Adopted
Unit – I	Definition and examples of metric spaces, Neighborhoods, Limit points, Interior points, Open and closed sets, Closure and interior, Boundary points, Subspace of a metric space, Cauchy sequences, Completeness, Cantor's intersection theorem, Contraction principle, Real numbers as a complete ordered field, Dense subsets, Baire Category theorem, Separable, first and second countable spaces.	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	Continuous functions, Extension theorem, Uniform continuity, Compactness, Sequential compactness, Totally bounded spaces, Finite intersection property, Continuous functions and compact sets, Connectedness.	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
Unit – III	Solution of Equations: Bisection method, Secant method, Regula-Falsi method, Newton- Raphson method, Roots of second degree Polynomials, Interpolation, Lagrange's interpolation formula, Divided Differences method, Interpolation formulae using Differences, Newton-Cote's Quadrature Formulae.	ICT based class room teaching, Case Analysis, Group Presentation
Unit – IV	Linear Equations: Direct Methods for Solving Systems of Linear Equations (Guass elimination method , LU Decomposition), Iterative methods (Jacobi, Gauss - Seidel iteration method), Ordinary Differential Equations: Euler's method, Euler's Modified method, Runge-Kutta method, Milne's method, Methods based on Numerical Integration, Methods based on numerical Differentiation.	ICT based class room teaching, Case Analysis, Individual Presentation
Unit – V	Introduction of Numerical solution of P.D.E., Classification of P.D.E., Solution of Elliptic equation, Solution of Laplace equation, Solution of Poisson's equation, Solution of Elliptic equations by Relaxation method, Solution of one and two dimensional heat equations, Hyperbolic equation, Solution of wave equations.	ICT based class room teaching, Case Analysis, Group Presentation

COURSE OUTCOMES:-
- The concept of metric space would help them to generalize this notion on some other spaces.
- The idea of compactness and connectedness would help them to work on some other useful properties of sets and continuous function.
- The techniques of numerical solution of equation of different kind (algebraic/differential/integral) would help them to find the solution of practical problems.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity

Teachers, Statistician, Researcher, Civil Officer	Able to Improve Decision making and problem solving skills	Goal 4 (Decent work),Goal 8 (Quality Education	Academician

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SEMESTER- 6th
Course: B. Sc. Maths
SUBJECT: DISCIPLINE SPECIFIC ELECTIVE-II
MATHEMATICS-VI (FUZZY SET THEORY)

Subject Code: 3SBMA604
Theory Max. Marks: 75
Theory Min. Marks: 25

COURSE OBJECTIVE:
- To introduce the basic types and concepts of fuzzy sets.
- To introduce different operations on fuzzy sets.
- To introduce the concept of fuzzy arithmetic.
- To introduce the concept of fuzzy relation.
- To introduce the concept of fuzzy relation equations.

SYLLABUS

Unit	Course Content	Methodology Adopted
Unit – I	Basic types and concepts of fuzzy sets, Additional properties of - cuts, Representations of fuzzy sets, Extension principle for fuzzy sets.	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	Operations on Fuzzy Sets Types of operations, Fuzzy complements, Fuzzy intersections; t- norms, Fuzzy unions; t-co-norms, Combinations of operations.	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
Unit – III	Fuzzy Arithmetic Fuzzy numbers, Linguistic variables, Arithmetic operations on intervals, Arithmetic operations on fuzzy numbers.	ICT based class room teaching, Case Analysis, Group Presentation
Unit – IV	Fuzzy Relations Crisp and fuzzy relations, Binary fuzzy relations, Binary relations on a single set, Fuzzy equivalence relations, Fuzzy compatibility relations, Fuzzy ordering relations.	ICT based class room teaching, Case Analysis, Individual Presentation
Unit – V	Fuzzy Relation Equations Partition, Solution method, Fuzzy relation equations based on sup-i compositions and inf-w_i compositions.	ICT based class room teaching, Case Analysis, Group Presentation

COURSE OUTCOME:-
On completion of this course students will be able to:-
- Understand the basic concept of Fuzzy sets.
- Apply the operations on Fuzzy Sets.
- Solve the Fuzzy arithmetic.
- Understand the Fuzzy relations and Fuzzy relation equations.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity

Teachers, Statistician, Researcher, Civil Officer	Able to Improve Decision making and problem solving skills	Goal 4 (Decent work),Goal 8 (Quality Education	Academician