

PROGRAMME GUIDE

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

*Scheme of Examination (CBCS/ELECTIVE)

*Detailed Structure of Syllabus



DR. C.V.RAMAN UNIVERSITY
KARGI ROAD, KOTA, BILASPUR, CHATTISGARH (C.G.)
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BACHELOR OF SCIENCE
Duration: 36 Months (3 Years)
Eligibility: 12th Pass from PCB

COURSE STRUCTURE OF B.SC BIOLOGY SEMESTER 1st													
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													
3BCA201	Ability Enhancement	Basic Information Computer Technology - I	25	13	04	05	02	07	03	1	-	-	1
3HBHL101	Ability Enhancement	हिन्दीभाषाऔरसंरचना	50	25	08	10	04	15	06	2	-	-	2
3SBBO103	Core Course	Botany - I(Diversity of Microbes and Cryptogams)	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
3SBZO105	Core Course	Zoology - I(Invertebrates & Cell Biology)	100	50	17	20	08	30	12	4	-	-	4
Practical Group				Term End Practical Exam		Lab Performance		Sessional					
3SBBO103	Practical	Botany - I(Diversity of Microbes and Cryptogams)	50	25	08	25	08	-	-	-	-	2	2
3SBCH104	Practical	Chemistry -I (Inorganic & Organic Chemistry)	50	25	08	25	08	-	-	-	-	2	2
3SBZO105	Practical	Zoology - I(Invertebrates & Cell Biology)	50	25	08	25	08	-	-	-	-	2	2
3BCA201	Practical	Basic Information Computer Technology - I	25	10	04s	15	06	-	-	-	-	1	1
Grand Total			550							15	-	7	22

Minimum Passing Marks are equivalent to Graded 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 BIOLOGY 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
3SBBO203	Core Course	Botany – II (Cell biology and Genetics)	100	50	17	20	08	30	12	4	-	-	4
3SBCH204	Core Course	Chemistry –II (Physical Chemistry)	100	50	17	20	08	30	12	4	-	-	4
3SBZO205	Core Course	Zoology –II (Vertebrates & Developmental Biology)	100	50	17	20	08	30	12	4	-	-	4
Practical Group				Term End Practical Exam		Lab Performance		Sessional					
3SBBO203	Practical	Botany – II (Cell biology and Genetics)	50	25	08	25	08	-	-	-	-	2	2
3SBCH204	Practical	Chemistry –II (Physical Chemistry)	50	25	08	25	08	-	-	-	-	2	2
3SBZO205	Practical	Zoology –II (Vertebrates & Developmental Biology)	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	-	7	24

Minimum Passing Marks are equivalent to Grade D
 Practical Exam

L- Lectures T- Tutorials P- Practical Major- Term End Theory /

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.

BACHELOR OF SCIENCE
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COURSE STRUCTURE OF B.SC BIOLOGY 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	हिन्दीभाषासंवेदना एवंसंचारसाधन	50	25	08	10	04	15	06	2	-	-	2
3CBCA502	Ability Enhancement	Basic Information Computer Technology - II	25	13	04	05	02	07	03	1	-	-	1
3SBBO303	Core Course	Botany - III (Biodiversity & Systematic of seed plant)	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
3SBZO305	Core Course	Zoology -III (Genetics)	100	50	17	20	08	30	12	4	-	-	4
Practical Group				Term End Practical Exam		Lab Performance		Sessional					
3SBBO303	Practical	Botany - III (Biodiversity & Systematic of seed plant)	50	25	08	25	08	-	-	-	-	2	2
3SBCH304	Practical	Chemistry -III (Physical, Inorganic & Organic Chemistry)	50	25	08	25	08	-	-	-	-	2	2
3SBZO305	Practical	Zoology -III (Genetics)	50	25	08	25	08	-	-	-	-	2	2
3CBCA502	Practical	Basic Information Computer Technology - II	25	10	04	15	06	-	-	-	-	1	1
Skill Courses								Sessional					
	Skill Enhancement	Skill Enhancement Elective Course-II	50	-	-	-	-	50	20	1	-	1	2
	Grand Total		600							16	-	8	24

Minimum Passing Marks are equivalent to Graded 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.

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

COURSE STRUCTURE OF B.SC BIOLOGY 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
3SBBO403	Core Course	Botany – IV (Structure, Development & Reproduction in flowering plant)	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
3SBZO405	Core Course	Zoology –IV (Animal Physiology)	100	50	17	20	08	30	12	4	-	-	4
Practical Group				Term End Practical Exam		Lab Performance		Sessional					
3SBBO403	Practical	Botany – IV (Structure, Development & Reproduction in flowering plant)	50	25	08	25	08	-	-	-	-	2	2
3SBCH404	Practical	Chemistry –IV (Physical Inorganic & Organic Chemistry)	50	25	08	25	08	-	-	-	-	2	2
3SBZO405	Practical	Zoology –IV (Animal Physiology)	50	25	08	25	08	-	-	-	-	2	2
Grand Total			550							16		6	22

Minimum Passing Marks are equivalent to Graded 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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COURSE STRUCTURE OF B.SC BIOLOGY SEMESTER Vth													
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													
3SBES501	Ability Enhancement	Environmental Studies	50	25	08	10	04	15	06	2	-	-	2
3HBEL501	Ability Enhancement	Introduction to soft skill & Team Building	50	25	08	10	04	15	06	2	-	-	2
****	Discipline Specific Elective	Botany - V (Select any one from below given Elective I)	100	50	17	20	08	30	12	4	-	-	4
****	Discipline Specific Elective	Chemistry - V (Select any one from below given Elective- II)	100	50	17	20	08	30	12	4	-	-	4
****	Discipline Specific Elective	Zoology - V (Select any one from below Given Elective- III)	100	50	17	20	08	30	12	4	-	-	4
Practical Group				Term End Practical Exam		Lab Performance		Sessional					
****	Practical	Botany - V	50	25	08	25	08	-	-	-	-	2	2
****	Practical	Chemistry - V	50	25	08	25	08	-	-	-	-	2	2
****	Practical	Zoology - V	50	25	08	25	08	-	-	-	-	2	2
Skill Courses								Sessional					
	Skill Enhancement	Skill Enhancement Elective Course-III	50	-	-	-	-	50	20	1	-	1	2
	Grand Total		600							17	-	7	24

Minimum Passing Marks are equivalent to Graded 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 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 BIOLOGY 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	Botany - VI (Select any one from below given Elective-IV)	100	50	17	20	08	30	12	4	-	-	4
****	Discipline Specific Elective	Chemistry -VI (Select any one from below given Elective-V)	100	50	17	20	08	30	12	4	-	-	4
****	Discipline Specific Elective	Zoology -VI (Select any one from below given Elective-VI)	100	50	17	20	08	30	12	4	-	-	4
Practical Group				Term End Practical Exam		Lab Performance		Sessional					
****	Practical	Botany – VI	50	25	08	25	08	-	-	-	-	2	2
****	Practical	Chemistry –VI	50	25	08	25	08	-	-	-	-	2	2
****	Practical	Zoology –VI	50	25	08	25	08	-	-	-	-	2	2
	Research Component	Project/Dissertation/Internship	100	50	17	-	-	50	20	-	-	4	4
	Grand Total		550							12	-	10	22

Minimum Passing Marks are equivalent to Graded 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%

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. Biology**.

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		
3SBBO503	Discipline Specific Elective-I	Botany - V (Plant physiology and biochemistry)	3SBBO603	Discipline Specific Elective-I	Botany-VI (Plant Ecology, biodiversity and phytogeography)
3SBBO504	Discipline Specific Elective-II	Botany-V (Plant Pathology)	3SBBO604	Discipline Specific Elective-II	Botany-VI (Ethno Botany)
3SBBO505	Discipline Specific Elective-III	Botany-V (Plant Reproduction)	3SBBO605	Discipline Specific Elective-III	Botany-VI (Evolutionary And Economic Botany)
GROUP ELECTIVE -II			GROUP ELECTIVE –V		
3SBCH503	Discipline Specific Elective-I	Chemistry –V (Physical Inorganic and Organic Chemistry)	3SBCH 603	Discipline Specific Elective-I	Chemistry-VI (Physical Inorganic and Organic Chemistry)
3SBCH504	Discipline Specific Elective-II	Chemistry-V (Industrial Chemistry)	3SBCH 604	Discipline Specific Elective-II	Chemistry-VI (Nano-Chemistry)
3SBCH505	Specific Elective-III	Chemistry –V (Green Chemistry)	3SBCH 605	Discipline Specific Elective-III	Chemistry-VI (Bio-Chemistry)
GROUP ELECTIVE -III			GROUP ELECTIVE –VI		
3SBZO503	Discipline Specific Elective-I	Zoology -V (Applied Zoology)	3SBZO603	Discipline Specific Elective-I	Zoology-VI (Environmental Biology & Evolution)
3SBZO504	Discipline Specific Elective-II	Zoology- V (Wild Life Conservation)	3SBZO604	Discipline Specific Elective-II	Zoology-VI (Aquaculture)
3SBZO505	Discipline Specific Elective-III	Zoology-V (Industrial Biology)	3SBZO605	Discipline Specific Elective-III	ogy- (VI Economic) Zoology

SKILL ENHANCEMENT ELECTIVE COURSES

Non-Technical			
Elective No.	Department/ Faculty Name		
	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)



DR. C.V.RAMAN UNIVERSITY

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

SEMESTER- 1st

Course: B. Sc. Biology

SUBJECT: BASIC COMPUTER & INFORMATION TECHNOLOGY-I

Subject Code: 3BCBA201

Theory Max. Marks: 25

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	<p>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.</p> <p>कम्प्यूटर ऑर्गनाइजेशन का परिचय कम्प्यूटर का इतिहास, कम्प्यूटर सिस्टम विचारधारा, विशेषताएं, योग्यताएं व सीमाएं, कम्प्यूटर की पीढ़ियां, पी.सी. के प्रकार, डेस्कटॉप के प्रकार, लेपटॉप के प्रकार, नोटबुक, वर्क स्टेशन आदि की विशेषताएं।</p>	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	<p>INTRODUCTION TO COMPUTER ORGANIZATION –II basic components of a computer system Control Unit, ALU. Input/Output function and Characteristics, memory RAM, ROM, EPROM, PROM.</p> <p>कम्प्यूटर ऑर्गनाइजेशन का परिचय कम्प्यूटर सिस्टम के आधार उपकरण, कंट्रोल युनिट, ए.एल.यू. इनपुट/आउटपुट फंक्शन और विशेषताएं, मेमोरी रेम, रोम, इपी रोम, पी रोम, और अन्य प्रकार की मेमोरी।</p>	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
Unit – III	<p>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.</p> <p>इनपुट तथा आउटपुट डिवाइसेस इनपुट डिवाइस: कीबोर्ड, माउस, ट्रैकबॉल, जॉयस्टिक, डिजिटाइजिंग टेबलेट, स्कैनर्स, डिजिटल केमरा, एमआईसीआर, ओसीआर, ओएमआर, बार कोड रीडर, आवाज को पहचानने वाला, लाइटपेन, टचस्क्रीन। इनपुट डिवाइस मॉनीटर की विशेषताएं एवं मॉनीटर के प्रकार, वीडियो स्टैंडर्ड VGA, SVGA, XGA, LCD स्क्रीन आदि, प्रिंटेर्स, डेजी व्हील, डॉट मैट्रिक्स, इंकजेट, लेजर, लाईन</p>	ICT based class room teaching, Case Analysis, Group Presentation

	प्रिंटर, प्लॉटर, साउंड कार्ड्स एंव स्पीकर्स।	
Unit – IV	<p>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.</p> <p>स्टोरेज डिवाइसेस स्टोरेज फंडामेंटल्स प्रईमेरी विरूद्ध भिन्न स्टोरेज डिवाइजेस मेग्नेटिक टेप, कार्टेरेज टेप, डाटा ड्राइव्स, हार्ड डिस्क ड्राइव्स फ्लोपी डिस्कस, सी.डी., वी.सी.डी., सी.डी. –आर.सी.डी– आर. डब्ल्यू, जीप ड्राइव, डी.वी.डी., डी.वी.डी., – आर. डब्ल्यू।</p>	ICT based class room teaching, Case Analysis, Individual Presentation
Unit – V	<p>INTRODUCTION TO OPERATING SYSTEM : Introduction to operating systems, its functioning and types. basic commands of dos & Windows operating System.</p> <p>Disk Operating System (DOS) - Introduction, History and Versions of DOS.</p> <p>DOS Basics - Physical Structure of disk, Drive name, FAT, file & directory structure and naming rules, booting process, DOS system files.</p> <p>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.</p> <p>ऑपरेटिंग सिस्टम का परिचय ऑपरेटिंग सिस्टम का परिचय, उसके लक्षण एवं प्रकार, डॉस एवं विन्डोज का मूल कमांड। डॉस बेसिक्स— फिजीकल स्ट्रक्चर ऑफ डिस्क, ड्राइव नेम, फेट, फाईल एवं डायरेक्ट्री स्ट्रक्चर एवं नेमिंग नियम, बूटिंग प्रक्रिया, डॉस सिस्टम फाईल्स। डॉस कमांडस— •आंतरिक कमाण्डस DIR, MD, CD, RD, Copy, DEL, REN, VOL, DATE, TIME, CLS, PATH, TYPE आदि। •बाह्य कमाण्डस CHKDSK, SCOPE, PRINT, DISKCOPY, DOSKEY, TREE, MOVE, LABEL, APPEND, FORMAT, SORT, FDISK, BACKUP, MODE, ATTRIB HELP, SYS आदि।</p>	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-Biology

Subject Code: 3HBHL-101
Theory Max. Marks: 25

SUBJECT: हिन्दी भाषा और संरचना

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	करुणा)निबंध- (आचार्य रामचन्द्र शुक्ल समन्द्वय 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, तद्भव 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 किताबें सुनीता रानी घोष.डॉ - (आलेख)	सत्रीय कार्य

	पत्र-लेखन महत्व और उसके विविध रूप सड़क पर दौड़ते ईहा मृग)निबंधश्यामसुन्दर .डॉ - (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 सकेंगे।
- 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 होंगे।

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 रुचि



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

SEMESTER- 1st

Course: B. Sc. Biology

SUBJECT: BOTANY-1

(DIVERSITY OF MICROBES AND CRYPTOGRAMS)

Subject Code: 3SBB0103

Theory Max. Marks: 50

Theory Min. Marks: 17

COURSE OBJECTIVE:

- To make the student know the outline of origin and evolution of life. Understand the structure of Bacteria & viruses and plant diseases caused by Bacteria & viruses and their control
- To make students learn the general characters and economic importance of Algae & Fungi.
- To make the students understand the vegetative and reproductive features of different algae and fungi through the study of representative types of various classes.
- To help the students identify and understand plant diseases caused by fungi and their Control measures.
- To make the students know the formation of lichens and their economic and ecological importance.
- To help the students know the systematic position of the two Cryptogamic groups (Bryophyta & Pteridophyta) and their classification.
- To make the students understand the life histories of Bryophyta & Pteridophyta through the study of representative types.
- To enable the students to assess the phylogenetic aspects of the above two groups.
- To help the students to get an insight into the geological past, extinct plants and their preservation.

Units	Unit Wise Course Content	Methodology Adopted
Unit-I	Viruses, Mycoplasma and Bacteria: characteristics of viruses and mycoplasma, general account of TMV and T4 bacteriophage. Bacterial structure, nutrition, reproduction and economic importance; general account of Cyanobacteria.	ICT & Green Board based Class Room Teaching, individual presentation and through Microscope
Unit-II	Algae: General characters, classification and economic importance; important features and life history of Chlorophyceae- volvox, oedogonium, Charophyceae-chara, Xanthophyceae - vaucheria, Phaeophyceae-ectocarpus, sargassum, Rhodophyceae - polysiphonia.	ICT & Green Board based Class Room Teaching, individual presentation and through Microscope
Unit-III	Fungi: general characters, classification and economic importance, important features and life history of Mastigomycotina- Phytophthora, Zygomycotina-Mucor. Ascomycotina: Aspergillus, Peziza, Basidiomycotina - puccinia, Deuteromycotina- Cercospora, Colletotrichum, general account of lichens.	ICT & Green Board based Class Room Teaching, individual presentation and through Microscope
Unit-IV	Bryophyta: classification, study of morphology, anatomy, reproduction of Hepaticopsida Riccia, Marchantia, Anthocerotopsida Anthoceros, Bryopsida- Polytrichum.	ICT & Green Board based Class Room Teaching, individual presentation and through Microscope
Unit-V	Pteridophyta: Important characters and classification. Stelar organization. Morphology and anatomy of Rhynia. Structure, anatomy and reproduction in Lycopodium, Selaginella, Equisetum and Marsilea.	ICT & Green Board based Class Room Teaching, individual presentation and through Microscope

COURSE OUTCOMES:

On completion of this course, the students will be able to:

- Study of Pteridophytes and Gymnosperms will help the students understand the connecting link between the lower and higher organisms in the plant kingdom.
- The anatomy imparts a thorough knowledge about the internal structure and relationship between tissues and evolution.
- Most of the techniques in biotechnology uses bacteria, viruses and fungi. This course will make the students adept in the structure and functions of these microbes which in turn will give them confidence to work using these organisms.

PRACTICAL

- Study of volvox by preparing temporary slide.
- Study of oedogonium by preparing temporary slide.
- Study of chara by preparing temporary slide.
- Study of vaucheria by preparing temporary slide.
- Study of external morphology of sargassum.
- Study of polysiphonia by preparing temporary slide.
- Study of phytophthora by preparing temporary slide.
- Study of mucor by preparing temporary slide.
- Study of Aspergillus by preparing temporary slide.
- Study of peziza by preparing temporary slide.
- Study of puccinia by preparing temporary slide.
- Study of cercospora by preparing temporary slide.
- Study of colletotricum by preparing temporary slide.
- Study of external morphology and internal structure of lichen thallus.
- To study external morphology of ricciathallus.
- To study thallus anatomy by preparing temporary slide.
- To study external morphology of Marchantiathallus.
- To study internal structure and thallus anatomy by preparing temporary slide.
- Study of morphology and anatomy of Rhynia.
- Study of external morphology and anatomy of seleginella. Study of external morphology and anatomy of Lycopodium.
- Plant disease.
 - (a) Tobacco mosaic disease.
 - (b) Leaf curl disease of papaya.
 - (c) Late blight disease of potato.
 - (d) Tikka disease of ground nut.
 - (e) Red rot of sugarcane

Job opportunity	Employability skill	Local/National/UNDP Goal Achieved	Enterprenurship Opportunity
Microbiologists, Academician,	Identification of Microorganisms	Goal 04(quality Education) Goal 14(Life below water) Goal 15(Life on Land) Goal 03(Good health &well being)	Academician, Microbiologist



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

SEMESTER- 1st

Course: Maths/Bio/micro/biotech

SUBJECT: CHEMISTRY-I (PHYSICAL, INORGANIC & ORGANIC CHEMISTRY)

Subject Code: 3SBCH 104

Theory Max. Marks: 50

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	<p>A. Mathematical Concepts : Logarithmic relations, curves stretching, linear graphs and calculation of slopes, Differentiation of functions like Kx, ex, xn, $\sin x$, $\log x$; maxima and minima, partial differentiation and reciprocity relations. Integration of some useful/relevant functions; permutations and combinations. Factorials, Probability.</p> <p>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.</p>	<p>Usage of ICT techniques (PowerPoint, PDF and video lectures), Google classroom and black board (traditional) as per requirement of the topic.</p> <p>Use of Mathematical Models</p>
Unit-II	<p>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.</p> <p>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.</p>	<p>Usage of ICT enabled techniques (Power Point, PDF and video lectures), Google classroom and black board (traditional) as per requirement of the topic.</p> <p>Usage of Chemical modeling methods.</p>
Unit-III	<p>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.</p>	<p>Usage of ICT (Power Point, PDF and video lectures) and black board (traditional) as per requirement of the topic.</p>
Unit-IV	<p>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,</p>	<p>Usage of ICT (PowerPoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.</p>

	hydrogen bonding. B. Mechanism of Organic reactions : Curved arrow notations, drawing electron movements with arrows, half-headed and double headed arrows, homolytic and heterolytic bond breaking. C. Types of Reagents : Electrophiles and nucleophiles. Types of organic reactions. Energy consideration. Reactive intermediates- carbocations, carbanions, free radicals and carbenes. Methods of determination of reaction mechanism.	NPTEL lecture video. E-UG Pathshala
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, ShivalAgrawal& 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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DR. C.V.RAMAN UNIVERSITY
KARGI ROAD, KOTA, BILASPUR (C.G.)

SEMESTER- 1st

Course: Maths/Bio/micro/biotech

SUBJECT: CHEMISTRY-I

(PHYSICAL, INORGANIC & ORGANIC CHEMISTRY) PRACTICAL

Subject Code: 3SBCH104

Theory Max. Marks: 25

Theory Min. Marks : 08

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, H₂SO₄.

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 H₂SO₄ by studying the kinetics of hydrolysis of ester.
4. To study kinetically the reaction rate of decomposition of iodide by H₂O₂.
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

Course: B. Sc. Biology

Subject Code: 3SBZ0105

Theory Max. Marks: 50

SUBJECT: ZOOLOGY-I (INVERTEBRATES & CELL BIOLOGY)

Theory Min. Marks: 17

COURSE OBJECTIVE:

This paper is aimed to introducing the students for the salient features of all Invertebrates, cell organization and cell division.

Unit	Course Content	Methodology Adopted
Unit – I	Classification of Non Chordates upto classes according to Parker and Heswell. (7th Edition) 1. Classification of lower Invertebrates. 2. Classification of higher invertebrates. 3. Protozoa – Type study of Plasmodium. 4. Porifera – Type study of Sycon.	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	1. Coelenterata – Type study of Obelia. 2. Helminthes – Type study of Liver Fluke. 3. Annelida – Type study of Earthworm, Metamerism, Trochophore Larva.	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
Unit – III	1. Arthropoda – Type study of Prawn. 2 Mollusca – Type study of Pila. 3. Echinodermata – External Features of Star Fish and Echinoderm Larvae.	ICT based class room teaching, Case Analysis, Group Presentation
Unit – IV	1. The cell – History of Cell Biology, Cell theory, Prokaryotic and Eukaryotic cell. 2. Microscopy : Compound and Electron Microscopy.	ICT based class room teaching, Case Analysis, Individual Presentation
Unit – V	1. Nuclear Organization of cell. 2. Extra nuclear organization of cell. 3. Cell reproduction – Amitosis, mitosis, meiosis.	ICT based class room teaching, Case Analysis, Group Presentation

COURSE OUTCOMES

The student have a knowledge of Classification and life cycle of invertebrates and cell division.

PRACTICALS

The Practical's work will be based on theory syllabus and the candidates will be required to show knowledge of the following –

1. Study of Museum Specimens, slides relevant to the type study in theory

2. Mounting (Temporary)
 - a. Mouth parts of insects
 - b. Statocyst of Prawn
 - c. Ctenidium and Osphradium of Pila
 - d. Scales of Teleost fish
 - e. Mounting Material
3. Major Dissection
 - a. Earthworm: Digestive system, nervous system and reproductive system.
 - b. Cockroach : Digestive system,Nervoussystem,.
 - c. Prawn : Nervous System, Appendages.
- 4 Minor Dissection
 - a. Hastate plate and appendages of Prawn.
 - b. Salivary glands of Cockroach.
 - c. Radula of Pila.
5. Cell Biology
 - a. Study of Prokaryotic and eukaryotic cell.
 - b. Study of DNA and RNA models.
 - c. Squash preparation of chromosomes from onion root tip.
 - d. study of meiosis in grasshopper testis.

Practical

1. Major Dissection
2. Minor Dissection
3. Mounting
4. Spotting (Representative of Each phylum)
5. Cytological exercise (any two)
6. Viva
7. Record & Collection

Job opportunity	Employability skill	Local/National/UNDP Goal Achieved	Enterprenurship Opportunity
Taxonomist,Scientist, Academician,	Zoo Management	Goal 04(quality Education) Goal 14(Life below water) Goal 15(Life on Land) Goal 03(Good health &well being)	Academician, Taxonomist



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

Subject Code: 3HBEL201
Theory Max. Marks: 25
Theory Min. Marks: 08

Semester- II

Course: BSc- Biology

Subject: Foundation Course

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



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

SEMESTER-2nd
Course: B.Sc. Biology
SUBJECT: FUNDAMENTALS OF ENTREPRENEURSHIP

Subject Code: 3MBFE101
Theory Max. Marks: 25
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. Understanding basic concepts of entrepreneurship and key steps in the elaboration of business ideas, Developing personal creativity and	Usage of ICT like PPT, Video Lectures, Black board.



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

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

Reference Books:

- Entrepreneurial Development : Dr. S.S. Khanka (S. Chand)
- Entrepreneurship Dvelopment : 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,	<ul style="list-style-type: none"> • 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



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

SEMESTER- 2nd

Course: B. Sc. Biology

SUBJECT: BOTANY-II (CELL BIOLOGY AND GENETICS)

Subject Code: 3SBB0203

Theory Max. Marks: 50

Theory Min. Marks: 17

COURSE OBJECTIVE:

- Outline the structure of the biomolecules found in all living organisms.
- Describe the function and structure of cells including the metabolic reactions that occur in cells.
- Explain the process of inheritance.
- Describe how RNA, DNA and proteins are synthesized.
- Explain the process of cell division in both somatic and germ cells.
- Explain the processes by which animals acquire nutrients, water and oxygen, eliminate wastes, protect against foreign substances, acquire information about their environment and reproduce.
- Generate a hypothesis from a set of observations and then design experiments to test the hypothesis.

Unit	Course Content	Methodology Adopted
Unit – I	The cell envelopes; plasma membrane, bilayer lipid structure, function of the cell wall. Structure and function of cell organelles: Golgibodies, ER, Peroxisome, Vacuole, Chloroplast and Mitochondrion.	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	Ultrastructure and function of nucleus: Nuclear membrane, Nucleolus, Extranuclear genome, Presence and functions of mitochondrial and plastid-DNA, Plasmids. chromosomal organization; morphology, centromere and telomere, special types of chromosome, Mitosis and Meiosis	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
Unit – III	Variations in chromosomes structure: Deletions, duplications, translocations, inversions; variation in chromosome number, aneuploidy, polyploidy, DNA the genetic material, DNA structure and replication, the nucleosome model, satellite and repetitive DNA.	ICT based class room teaching, Case Analysis, Group Presentation
Unit – IV	Structure of gene, genetic code, transfer of genetic information; transcription, translation, protein synthesis, tRNA, and ribosomes. Regulation of gene expression in prokaryotes and eukaryotes.	ICT based class room teaching, Case Analysis, Individual Presentation
Unit – V	Genetic inheritance; Mendelism; laws of segregation and independent assortment; linkage analysis; interactions of genes. Genetic variations; mutations, spontaneous and induced; transposable elements; DNA damage and repair.	ICT based class room teaching, Case Analysis, Group Presentation

COURSE OUTCOME:-

- The course aims to develop students understanding of three areas of widely used and advanced scientific methods – spectroscopic tools, molecular imaging and bioinformatics. This is achieved via lectures, classes, seminars and a bioinformatics problem based learning exercise.
- To help students develop successful strategies for learning how to learn and communicate complex information in cell biology, we developed a quarter-long cell biology class based on team projects.

- Each team researches a particular human disease and presents information about the cellular structure or process affected by the disease, the cellular and molecular biology of the disease, and recent research focused on understanding the cellular mechanisms of the disease process.

PRACTICAL

- To prepare the temporary slide of onion membrane and to study the plantcell.
- To study the cell structure of onion hydrilla andspirogyra.
- To study the cyclosis in tradescantia stamialcell.
- To study the plastid distribution inplants.
- To examine the electron micrograph of an eukaryoticcell.
- To examine the electron micrograph of anchloroplast.
- To examine the electron micrograph of an endoplasmicreticulum.
- To examine the electron micrograph of anGolgibody.
- To examine the electron micrograph of anRibosome.
- To examine the electron micrograph of anNucleus.
- To make a temporary acetocarmine stained slides of root tip of onion and to study various stages ofmitosis.
- To make a temporary acetocarmine stained slides of Floral bud of onion and to study various stages ofmeiosis.
- Cytological examination oflampbrushchromosome.
- Cytological examinationofPolytenechromosome.
- Cytological examination of barrbody.
- To demonstrate the phenomenon of segregation by yellow and green colour peaseeds.
- To demonstrate the independent assortment by various type of peaseeds.

Job opportunity	Employability skill	Local/National/UNDP Goal Achieved	Enterprenurship Opportunity
Cell biologist, Geneticist	Genetics	Goal 04(quality Education) Goal 14(Life below water) Goal 15(Life on Land) Goal 03(Good health &well being)	Academician, Genetic engineer



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

SEMESTER- 2nd

Course: Maths/Bio/micro/biotech

Chemistry –II (Physical, Inorganic & Organic Chemistry)

Course Objective:

Study of Chemical bonding , Noble gases ,S-block and P-block element .Brief discussion of Arenes and Aromaticity, cycloalkens, dienes and alkynes.

Subject Code: 3SBCH 204

Theory Max. Marks: 50

Theory Min. Marks :17

Units	Unit Wise Course Contents	Methodology Adopted
Unit-I	<p>A. Atomic Structure : Idea of de Broglie's matter waves, Heisenberg uncertainty principle, atomic orbitals, Schrödinger wave equation, significance of n and l, quantum numbers, radial and angular wave functions and probability distribution curves, effective nuclear charge.</p> <p>B. Periodic Properties : Atomic and ionic radii, ionization energy, electron affinity and electronegativity : definition, method of determination, trends in periodic table and applications.</p> <p>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</p>	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.
Unit-II	<p>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 NaCl, KCl and CsCl (Laue's method and powder method).</p> <p>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.</p>	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.
Unit-III	<p>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.</p> <p>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.</p>	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.
Unit-IV	<p>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</p>	Usage of ICT (Powrpoint, PDF and video lectures) and black board

	<p>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 alkylbenzenes and biphenyl.</p> <p>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.</p>	(traditional) as per requirement of the topic.Nptel lecture video
Unit-V	<p>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.</p> <p>B. Alkyl and Aryl Halides : Nomenclature and classes of alkyl halides, methods of formation, chemical reactions; mechanisms of nucleophilic substitution reaction of alkyl halides, SN2 and SN1 reactions with energy profile diagrams.</p>	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, ShivrulAgrawal& 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 from group 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



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

SEMESTER- 2nd

Course: B. Sc. Biology

SUBJECT: ZOOLOGY-II

(VERTEBRATES & DEVELOPMENTAL BIOLOGY)

Subject Code: 3SBZ0205

Theory Max. Marks: 50

Theory Min. Marks:17

COURSE OBJECTIVE:

This paper is aimed to introducing the students for the salient features of all Vertebrates, and developmental biology

Unit	Course Content	Methodology Adopted
Unit – I	1. Origin of Chordates. Classification of phylum Chordata upto orders according to Parker and Haswell (Latest edition). 2. Hemichordata – External features and affinities of Balanoglossus.	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	1. Urochordata – Type study of Herdmania (excluding Development). Cephalochordata – Type study of Amphioxus. Affinities of Amphioxus.	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
Unit – III	1. Comparison between Petromyzon and Myxine. 2. Comparative account of limb bones and girdles of vertebrates (Amphibia, Reptiles, Birds and Mammals).	ICT based class room teaching, Case Analysis, Group Presentation
Unit – IV	1. Parthenogenesis. 2. Gametogenesis. 3. Fertilization, Patterns of cleavage	ICT based class room teaching, Case Analysis, Individual Presentation
Unit – V	1. Frog and chick embryology upto the formation of three germinal layers. 2 Fate map construction in frog & chick Gastrulation in frog and chick upto the formation of germinal layers. 3. Concept of competence, determination and differentiation. 4. Extra embryonic membranes in chick. 5. Concept of regeneration	ICT based class room teaching, Case Analysis, Group Presentation

PRACTICALS

The practical work will be based on theory syllabus and the candidates will be required to show knowledge of the following:

1. Study of museum specimens and slides relevant to theory paper.
2. Osteology
 - a. Girdles and limb bones of : Frog, Varanus, Fowl and Rabbit
3. Cell Biology.
 - a. Study of DNA and RNA Models.
 - b. Preparations of polytene chromosome in chironomous larva
 - c. Squash preparation of chromosome from Onion root tip.
 - d. Study of Meiosis in Grasshopper testis.

4 Embryology : Study of different developmental stages of frog and chick – whole mounts and sections.

COURSE OUTCOME:-

The student have a knowledge of Classification and life cycle of Vertebrates, gametogenesis and formation of three germinal layers

Job opportunity	Employability skill	Local/National/UNDP Goal Achieved	Enterprenurship Opportunity
Taxonomist, Scientist, Academician,	Zoo Management ,Embryologist	Goal 04(quality Education) Goal 14(Life below water) Goal 15(Life on Land) Goal 03(Good health &well being)	Academician, Taxonomist,Embryologist



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

SEMESTER- IIIrd

Course: BSc-Biology

SUBJECT: हिन्दी भाषा संवेदना एवं संचार साधन

Subject Code: 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. सम्यता 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 सकेंगे।
2. भारत की धर्म, दर्शन, नीति, संस्कृति, सम्यता, संस्कारों इत्यादि के प्रति ज्ञान प्राप्त कर कुशल एवं संवेदनशील नागरिक बन सकेंगे।

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 गुणवत्ता	साहित्य के क्षेत्र में रुचि



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

SEMESTER- 3rd

Course: B. Sc. Biology

SUBJECT: BASIC COMPUTER & INFORMATION TECHNOLOGY-II

Subject Code: 3CBCA502

Theory Max. Marks: 25

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	<p>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.</p>	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	<p>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.</p>	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
Unit – III	<p>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.</p>	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 Browsers.	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

Course: B. Sc. Biology

SUBJECT: BOTANY-III

(BIODIVERSITY & SYSTEMATIC OF SEED PLANT)

Subject Code: 3SBB0303

Theory Max. Marks: 50

Theory Min. Marks: 17

COURSE OBJECTIVE:

- Discuss the type of seeds produced by gymnosperms, as well as other characteristics of gymnosperms
- State which period saw the first appearance of gymnosperms and explain when they were the dominant plant life
- List the four groups of modern-day gymnosperms and provide examples of each
- To appreciate the fantastic commonness existing among organisms.
- The student will be able to appreciate the uniqueness of different groups and the way they are classified
- To develop curiosity in observing and identifying different types of gymnosperms.
- To observe and differentiate the variations existing in the internal structure of plants.
- To create interest in plant anatomy and to appreciate the function of a particular tissue or organ correlated with its structure.
- To enable the student understand the anatomical features within the system instead of merely memorizing the technical terms and the text book figures.

Unit	Course Content	Methodology Adopted
Unit – I	Characteristics and Classification of Gymnosperms, Heterospory and Origin of Seed Habit, Evolution and Diversity of Gymnosperms, Geological Time Scale, and Fossilization. Fossil Gymnosperms: Lyginopteris and Lagenostoma.	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	Morphology, Anatomy Reproduction and life cycle of Cycas, Pinus and Ephedra.	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
Unit – III	Origin and Evolution of Angiosperms, Fundamental components of 6, 7, 8 taxonomy, Plant Identification, Principles and rules of Botanical Nomenclature, Herbarium and Botanical gardens; Classification of Angiosperms: Bentham and Hooker, and Hutchinson, Modern trends in Taxonomy.	ICT based class room teaching, Case Analysis, Group Presentation
Unit – IV	Diagnostic characteristics and Economic Importance of Families – Ranunculaceae, Brassicaceae, Malvaceae, Rutaceae, Fabaceae, and Apiaceae.	ICT based class room teaching, Case Analysis, Individual Presentation
Unit – V	Diagnostic characteristics & Economic Importance of Families – Asteraceae, Asclepiadaceae, Solanaceae, Lamiaceae, Euphorbiaceae, Liliaceae and Poaceae.	ICT based class room teaching, Case Analysis, Group Presentation

COURSE OUTCOMES

- An understanding of major patterns in the evolution of seed plants
- Study of Gymnosperms will help the students understand the connecting link between the lower and higher organisms in the plant kingdom. The anatomy imparts a thorough knowledge about the internal structure and relationship between tissues and evolution.
- An appreciation of seed plant diversity.
- A basic understanding of the principles of phylogenetic systematic.

- An overview of the diagnostic characters of the main lineages of seed plants.
- An understanding of the methods and principles of classification and nomenclature

PRACTICALS

- Study of microscope.
- Study of prepared slide of T.S. of young root Cycas.
- Study of prepared slide of T.S. of stem Cycas.
- Study of prepared slide of V.S of leaflets cycas.
- Study of prepared slides of T.S of young root pinus.
- Study of prepared slide of T.S. of young stem pinus.
- Study of prepared slide of T.S of dwarf shoot of pinus.
- Study of prepared slide of T.S. of root Ephedra.
- Study of prepared slide of T.S of stem Ephedra.
- Study of prepared slide of V.S of leaf Ephedra.
- Study of permanent slides of cycas, pinus and Ephedra.
- Study of different types of inflorescence and flowers. Method of Describing a flowering plant in botanical language Floral for mula of plants and economic importance.
- Study of Bracaceae family (Brassica Campestris) up to family level.
- Study of Malvaceae family (Hibiscus rosasinensis) up to family.
- Study of Papilionaceae family (Pisum sativum) up to family.
- Study of family Asclepiadaceae (Calotropis procera) up to family level .
- Study of family solanaceae (Solanum nigrum) up to family level.
- Study of family Lamiaceae (Ocimum Sanctum) up to family level.
- Study of family Asteraceae (Helianthus annuus) up to family level.

Job opportunity	Employability skill	Local/National/UNDP Goal Achieved	Enterprenurship Opportunity
Seed biologist, Taxonomist	Plant identification, Seed expert	Goal 04(quality Education) Goal 14(Life below water) Goal 15(Life on Land) Goal 03(Good health & well being)	Academician, Genetic engineer



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

SEMESTER- 3rd

Course: B. Sc. Maths/Bio/micro/biotech

SUBJECT: CHEMISTRY –III (PHYSICAL, INORGANIC & ORGANIC CHEMISTRY Theory Min. Marks :17

Subject Code: 3SBCH404

Theory Max. Marks: 50

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-I 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 ₂ O: Frost, Latimer and Pourbaix	ICT based class room teaching, Case Analysis, Individual Presentation

	diagram. Principles involved in the extraction of elements.	
Unit – V	<p>(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.</p> <p>(b) Phenols: Nomenclature, structure and bonding. Preparation of phenols, physical properties and acidic character. Comparative acidic strengths of alcohols and phenols: resonance stabilization of phenoxide ion. Reactions of phenols: electrophilic aromatic substitution, acylation and carboxylation. Mechanisms of Fries rearrangement, Claisen rearrangement, Gatterman synthesis and Reimer-Tiemann reaction</p> <p>(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.</p>	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.

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, ShivalAgrawal& 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 valuable 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.



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

SEMESTER- 3rd

Course: B. Sc. Maths/Bio/micro/biotech

SUBJECT: CHEMISTRY-III (INORGANIC & ORGANIC CHEMISTRY) PRAC. Theory Min. Marks : 08

Subject Code: 3SBCH404

Theory Max. Marks: 25

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 R_f 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 R_f values and identification of organic compounds

- (a) Separation of a mixture of phenylalanine and glycine, alanine and aspartic acid, leucine and glutamic acid. Spray reagent ninhydrin.
- (b) Separation of a mixture of DL-alanine, glycine and L-leucine 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
KARGI ROAD, KOTA, BILASPUR (C.G.)

SEMESTER- 3rd

Course: B. Sc. Biology

SUBJECT: ZOOLOGY-III (GENETICS)

Subject Code: 3SBZ0305

Theory Max. Marks:50

Theory Min. Marks:17

COURSE OBJECTIVE:

This paper is aimed to introducing the students for Genetics and applied Genetics.

Unit	Course Content	Methodology Adopted
Unit – I	<p>Heredity & Variation, Gene and Genetic Material</p> <ol style="list-style-type: none"> 1. Chromosome: The Physical basis of heredity and transmitters of heredity. 2. Types of chromosomes: Lampbrush, salivary gland and Beta Chromosomes. 3. Nucleocytoplasmic interactions : Ultra structure of nucleus, nucleolus, Role of nucleus and nucleolus in nucleocytoplasmic interactions including Synthesis & Export of RNA, transport of Proteins 4. Heredity and Variation : Sources of variation, Genotype, phenotype and environmental variations (elementary idea) -Mendel's laws of heredity -Kinds of variations -Genetic basis of variation. 5. Chemistry of Gene; (a) Nucleic Acids and their structure. (b) Concept of DNA replication. (c) Nucleosome (Solenoid model). (d) Split genes, overlapping genes and Pseudo genes. (e) Genetic Code. 	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	<p>Cytoplasmic Inheritance, Gene Expression and Regulation</p> <ol style="list-style-type: none"> 1. Cytoplasmic inheritance: Maternal effect on limnea (Shell Coiling), Kappa particles in Paramecium. 2. Transcription in Prokaryotes and Eukaryotes 3. Translation in Eukaryotes 4. Gene Expression: Regulation of protein synthesis, transcription in Prokaryotes and Eukaryotes. 5. Gene Expression: Operon model 	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
Unit – III	<p>Linkage and Chromosomal Aberrations</p> <ol style="list-style-type: none"> 1. Gene Linkage: Kinds and Theories of linkage, significance of linkage. 2. Gene linkage, Mechanism of genetic recombination. 3. Sex Chromosomes System: Sex differentiation, chromosome theory of sex determination. 4. Sex linked inheritance (Haemophilia, Colour blindness) 5. Structural changes in chromosomes. 6. Numerical changes in chromosomes. 	ICT based class room teaching, Case Analysis, Group Presentation

Unit – IV	Mutation and Applied Genetics <ol style="list-style-type: none"> Types of Mutation. Causes of mutation. Mutagens- classification, Types & effects. Gene therapy. DNA finger printing. 	ICT based class room teaching, Case Analysis, Individual Presentation
Unit – V	Human Genetics & Genetic Engineering <ol style="list-style-type: none"> Human chromosomes, Elementary idea of Human Genome Project Common genetic diseases in man (Autosomal syndromes, sex chromosome syndromes, diseases due to mutation-Sickle cell anaemia, Albinism & Alkaptonuria. Multiple factors and blood groups. Twins- physical traits, mental traits. Techniques used in recombinant DNA technology. Construction of Chimeric DNA, Elementary idea of plasmids & vectors. Gene cloning and Polymerase Chain Reaction (PCR) ,Gel Electrophoresis, Northern & Southern Blotting. 	ICT based class room teaching, Case Analysis, Group Presentation

PRACTICAL

- Identification of spots related to theory.
- Squash preparation of onion root tip / Chironomous larva salivary gland/grass hopper testis.
- Study of instruments techniques related to applied genetics – PCR, Gel electrophoresis, DNA fingerprinting etc.
- Problems based on genetics.

COURSE OUTCOMES

The student have a knowledge of Gene, genetic code ,diseases and treatment.

Job opportunity	Employability skill	Local/National/UNDP Goal Achieved	Enterprenurship Opportunity
Taxonomist,Scientist, Academician,	Genetics Expert	Goal 04(quality Education) Goal 15(Life on Land) Goal 03(Good health &well being)	Academician, Genetic Engineer



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

Semester- IV

Course: B.Sc. Biology

Subject: 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

Subject Code: 3HBEL402

Theory Max. Marks: 25

Theory Min. Marks: 08

	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- IV

COURSE: B.SC. BIO

SUBJECT:- 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	<p><i>Concept of value and value crisis in contemporary Indian Society.</i></p> <ol style="list-style-type: none"> 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. 	<p>Usage of ICT (PowerPoint, Pdf and video lectures) and black board (traditional) as per requirement of the topic</p>
UNIT-II	<p><i>Moral and Ethical Human values.</i></p> <ol style="list-style-type: none"> 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 	<p>Usage of ICT (PowerPoint, Pdf and video lectures) and black board (traditional) as per requirement of the topic</p>
UNIT-III	<p><i>Moral Values in Profession.</i></p> <ol style="list-style-type: none"> 1. What is Profession? 2. Professional Ethos 3. Code of Professional Ethics 4. Corporate social Responsibility 	<p>Usage of ICT (PowerPoint, Pdf and video lectures) and black board (traditional) as per requirement of the topic</p>
UNIT-IV	<p>Gender sensitization.</p> <ol style="list-style-type: none"> 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. 	<p>Usage of ICT (PowerPoint, Pdf and video lectures) and black board (traditional) as per requirement of the topic</p>

UNIT-V	<i>Co-Curricular Activities and value Education.</i> <ol style="list-style-type: none"> 1. Games and sports 2. Literary and cultural Activities 3. NSS, NCC activities 4. A New Approach to Human Value Freedom, Creativity Love & Wisdom 	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
- *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 Delhi
 - *Indian Ethos and Modern Management* Bajpai B L, New Royal BoLucknow
 - Human values Mishra Dr. Rajan Laxmi Publicati PVT Delhi
 - Professional Ethics and Human values S. Dinesh Babu Laxmi Publications PVT.LTD Delhi
 - Business Ethics and Communication Rathore , P.S., S. Chand Publishing Co. New Delhi
- Jeevan Vidya ek Parichay* Nagraj, A, Divya Path Sansthan, Amarkantak

RECOMMENDED 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



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

SEMESTER- 4th

Course: B. Sc. Biology

SUBJECT: BOTANY-IV

(STRUCTURE, DEVELOPMENT & REPRODUCTION IN FLOWERING PLANT)

Subject Code: 3SBB0403

Theory Max. Marks: 50

Theory Min. Marks: 17

COURSE OBJECTIVE:

- The anatomy of a flower
- The life cycle of flowering seed plants
- The anatomy of a seed
- The role of pollination and seed dispersal in the angiosperm life cycle
- Identify the characteristics of flowering plants
- Describe the structure of a flower and the difference between perfect and imperfect flowers
- Summarize the life cycle of a flowering plant, identifying the sporophyte, the gametophytes, and when mitosis/meiosis/fertilization occur
- Diagram the process of double fertilization
- Explain the importance of pollen and the different types of pollination seen in this group
- Describe the role of the seed, its relationship to fruit, the different types of seeds, and seed dispersal mechanisms

Unit	Course Content	Methodology Adopted
Unit – I	The Root system: Root apical meristems, Differentiation of primary and secondary tissues and their roles, Anatomy of Monocot and Dicot roots, Morphological modification of root for storage, respiration, reproduction and interaction with microbes.	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	The Shoot system: Shoot apical meristem and histological organization, Anatomy of primary stem in Monocotyledons and Dicotyledons, Secondary growth in stem and root – Vascular cambium and its functions, Characteristics of growth rings, Sapwood and Heart wood, Secondary Phloem, Cork Cambium and Periderm.	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
Unit – III	The Leaf system: Origin, Development, Diversity in size, shape and arrangement, Internal structure of Dicot and Monocot leaf in relation to photosynthesis and water loss, Adaptations to water stress, senescence and abscission.	ICT based class room teaching, Case Analysis, Group Presentation
Unit – IV	The Flower system: Concept of flower as a modified shoot, Structure of Anther, Microsporogenesis and Male Gametophyte, Structure of Pistil, Ovules, Megasporogenesis and Development of Female Gametophyte (Embryo Sac) and its types, Pollination –Mechanism and Agencies of Pollination, Pollen Pistil interactions and Self incompatibility.	ICT based class room teaching, Case Analysis, Individual Presentation
Unit – V	Double Fertilization, Development and types of Endosperm and its morphological nature, Development of Embryo in Monocots and Dicots, Fruit development and maturation. Seed structure and dispersal, Vegetative Propagation.	ICT based class room teaching, Case Analysis, Group Presentation

COURSE OUTCOMES**1. Sexual Reproduction in Flowering Plants**

1. Recognize that flowering plants exhibit an alternation of generations even though they produce two types of spores and two types of gametophytes.
2. Identify the reproductive parts of a flower and describe the function of each part.
3. Diagram and describe the development of male and female gametophytes and the development of the sporophyte of flowering plants.

2. Growth and Development

1. Recognize the developmental steps of a eudicot embryo and compare the function of its cotyledons to that of a cotyledon in monocots.
2. Identify different types of fruits.
3. Label seed structure and describe germination and dispersal.

3. Asexual Reproduction and Genetic Engineering in Plants

1. Recognize how asexual reproduction in plants differs from sexual reproduction.
2. Describe how plants are propagated in tissue culture.
3. Explain how genetic engineering can be used to alter plant traits.

4. Control of Growth and Responses

1. Explain the importance of plant hormones.
2. Identify the various types of plant hormones and their function.
3. Recognize how plants respond to stimuli.

PRACTICALS

- Study of anatomy of t.s. of dicot root *Helianthus annuus*. Study of anatomy of t.s. of dicot root *Cicer* and *Ranunculus*.
- Study of anatomy of t.s. of monocot roots *Asparagus*. Study of anatomy of t.s. of monocot roots *Zeamays* and *Orchid*.
- Study of anatomy of t.s. of dicot stem *Cucurbita* and *Xanthium*.
- Study of anatomy of t.s. of monocot stem *Triticum aestivum* and *Asparagus*.
- Study of v.s. of isobilateral monocot leaf *Zeamays* and *Bambusa*.
- Study of prepared slide of l.s. of shoot apex.
- Study of prepared slide of l.s. of root apex.
- Study of different types of ovules.
- Study of pneumatophore or respiratory root.

Job opportunity	Employability skill	Local/National/UNDP Goal Achieved	Enterprenurship Opportunity
Horticulturist, Taxonomist	Plant identification, Plant anatomy	Goal 04(quality Education) Goal 14(Life below water) Goal 15(Life on Land) Goal 03(Good health &well being)	Academician, Horticulture



DR. C.V.RAMAN UNIVERSITY
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	<p>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, CO₂ and S system. Phase equilibria of two component system: solid liquid equilibria, simple eutectic: Bi-Cd, Pb-Ag system, desilverisation of lead.</p> <p>Solid solutions: compound formation with congruent melting point (Mg-Zn) and incongruent melting point, (NaCl-H₂O) (FeCl₃-H₂O) and (CuSO₄-H₂O) system. Freezing mixtures, acetone-dry ice.</p> <p>Liquid-liquid mixtures: Ideal liquid mixtures, Raoult's and Henry's law. Non-ideal system azeotropes: HCl-H₂O and ethanol water systems.</p>	ICT based class-room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	<p>Electrochemistry Electrical transport- conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of specific conductance and equivalent conductance with dilution. Migration of ions and Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald's dilution law, its uses and limitations. Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only). Transport number: Application of conductivity measurements: determination of degree of dissociation, determination of K_a 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.</p>	ICT based class room teaching, Case Analysis, Individual Presentation, Use of chemical modeling.
Unit – III	<p>(a) Chemistry of Lanthanides Elements: electronic structure, oxidation states, ionic radii and lanthanide contraction, complex formation, occurrence and isolation of lanthanide compounds.</p> <p>(b) Chemistry of Actinides: General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from U, Similarities between the later actinides and later lanthanides.</p> <p>(c) Acids and Bases: Arrhenius, Brønsted-Lowry, Lux-Flood, Solvent system and Lewis concepts of acids and bases.</p> <p>(d) Non-aqueous Solvents: Types of solvents and their general characteristics, reaction in non-aqueous solvents with reference to liquid NH₃ and liquid SO₂</p>	ICT based class room teaching, Case Analysis, Group Presentation
Unit – IV	<p>(a) Aldehydes and ketones: Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes and ketones. Physical properties. Mechanism of nucleophilic additions to carbonyl group aldol perkin and knovenagel condensations. Condensation with</p>	ICT based class room teaching, Case Analysis, Individual Presentation

	<p>ammonia and its derivatives. Wittig reaction, Mannich reaction. Oxidation of aldehydes, Baeyer-Villiger oxidation of ketones, Cannizzaro reaction. Clemmensen, Wolf-Kishner, LiAlH_4 and NaBH_4 reductions.</p> <p>(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.</p>	
Unit – V	<p>Organic Compounds of Nitrogen Preparation of nitroalkanes and nitroarenes. Chemical reaction of nitroalkanes. Mechanism of nucleophilic substitution in nitroarenes and their reductions in acidic, neutral and alkaline media, Picric acid.</p> <p>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.</p>	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, ShivalAgrawal & 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
KARGI ROAD, KOTA, BILASPUR (C.G.)

SEMESTER- 4th
Course: B. Sc. Maths/Bio/micro/biotech
SUBJECT: CHEMISTRY-III
(INORGANIC & ORGANIC CHEMISTRY) PRACTICAL

Subject Code: 3SBCH104
Theory Max. Marks: 25
Theory Min. Marks : 08

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 by thermometric, dilatometric 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



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

SEMESTER- 4th

Course: B. Sc. Biology

SUBJECT: ZOOLOGY-IV (ANIMAL PHYSIOLOGY)

Subject Code: 3SBZ0405

Theory Max. Marks:50

Theory Min. Marks:17

COURSE OBJECTIVE:

This paper is aimed to introducing the students for animal physiology viz digestion ,respiration ,excretion, nervous and endocrine function

Unit	Course Content	Methodology Adopted
Unit – I	Nutrition, Metabolism 1. Physiology of digestion in mammals 2. Protein Metabolism-Deamination, decarboxylation. Transamination of amino acids, and Ornithine cycle. 3. Carbohydrate metabolism- Glycogenesis, Glycogenolysis, glycolysis, The Citric acid cycle, Gluconeogenesis. 4. Lipid Metabolism-Beta oxidation of fatty acids.	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	Respiration 1. Organs of respiration in mammals 2. Mechanism of respiration in mammals. 3. Physiology of respiration (transport of gases, chloride shift). 4. Properties and function of respiratory pigments.	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
Unit – III	Regulatory Mechanisms and Enzymes 1. Osmoregulation. 2. Physiology of Excretion- urea and urine formation in mammals. 3. Thermoregulation. 4. Definition and nomenclature of enzymes, classification of enzymes. 5. Mechanism of enzyme action.	ICT based class room teaching, Case Analysis, Group Presentation
Unit – IV	Neuromuscular Co- ordination 1. Structure and properties of nervous tissue. 2. Physiology of nerve impulse conduction. 3. Types of muscles and their properties. 4. Theory of muscle contraction and its biochemistry	ICT based class room teaching, Case Analysis, Individual Presentation
Unit – V	Endocrine system 1. Structure and functions of Pituitary Gland. 2. Structure and functions of Thyroid Gland. 3. Structure and functions of Adrenal Gland. 4. Structure and functions of Parathyroid, Thymus and Islets of langerhan's.	ICT based class room teaching, Case Analysis, Group Presentation

PRACTICAL

- Detection of protein, carbohydrate and lipid.
- Study of Human salivary enzyme activity in relation to pH.
- Detection of nitrogenous waste products – Ammonia & Urea
- Use of Kymograph
- Exercise on Haematology – Counting of RBC /WBC and Blood grouping in blood samples.

- Estimation of Haemoglobin in blood samples.
- Histological study of various endocrine glands –T. S. of Thyroid, T. S. of Pituitary gland , T. S. of Adrenal gland , T. S. of Testis, T. S. of Ovary.
- Histological study of Alimentary canal & various digestive organs – T.S of Stomach , T.S of Intestine , T.S of Pancreas, and T. S. of liver.
- Histological study of Visceral organs - T.S of Lungs, L.S. of Kidney
- Histological study of Muscles – Striated, Unstriated& Cardiac muscle.

COURSE OUTCOMES

The student have a knowledge of physiological diseases and treatment

Job opportunity	Employability skill	Local/National/UNDP Goal Achieved	Enterprenurship Opportunity
Scientist, Academician,	Physiologist,Endocrinolgist	Goal 04(quality Education) Goal 15(Life on Land) Goal 03(Good health &well being)	Academician, Scientist.Endocrinologist



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

SEMESTER- 5th

Course: B.Sc. Biology

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 Good communication, Importance of right Pronunciation	Usage of ICT like PPT, Video Lectures, Black board.
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	<ul style="list-style-type: none"> • 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



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

SEMESTER- 5th
Course: B. Sc. Biology
SUBJECT: ENVIRONMENTAL STUDIES

Subject Code: 3SBES501
Theory Max. Marks: 25
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 non-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



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

SEMESTER- 5th

Course: B. Sc. Biology

SUBJECT: DISCIPLINE SPECIFIC ELECTIVE-I

BOTANY-V (PLANT PHYSIOLOGY AND BIOCHEMISTRY)

Subject Code: 3SBB0503

Theory Max. Marks: 50

Theory Min. Marks: 17

COURSE OBJECTIVE:

- Understand the basic principles related to various physiological functions in plant life.
- Familiarize with the basic skills and techniques related to plant physiology.
- Understand the role, structure and importance of the bio molecules associated with plant life.
- Familiarize with the recent trends in the field of plant physiology.
- Familiarize with applied aspects of plant physiology in other fields like agriculture.
- To get an idea of environmental issues and its conservation
- To have an understanding of Environmental legislation and laws

Unit	Course Content	Methodology Adopted
Unit – I	Plant Water Relations: Properties of water, Importance of water in plant life, Diffusion, Osmosis & Osmotic relation to plant cell, Water Absorption, Ascent of Sap, Essential macro & micronutrients and their role. Transpiration: Structure & Physiology of Stomata, Mechanism of Transpiration, Factors affecting the rate of transpiration.	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	Photosynthesis: Chloroplast, Photosynthetic pigments, Red drop, Emerson's effect, Concept of two Photosystems, Light reaction, Dark reaction - Calvin cycle, Hatch-Slack cycle, CAM cycle, Factors affecting rate of photosynthesis & Photorespiration.	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
Unit – III	Respiration: Mitochondria, aerobic and anaerobic respiration, Respiratory coefficient, mechanism of respiration - Glycolysis, Kreb's cycle, Pentose phosphate pathway, Electron transport system, Factors affecting rate of respiration, Redox potential and theories of ATP synthesis.	ICT based class room teaching, Case Analysis, Group Presentation
Unit – IV	Definition, classification and chemical structure: monosaccharide, disaccharide, oligosaccharide and polysaccharides; Amino acids, essential and non essential amino acids; Lipids, saturated and non saturated fatty acids. Classification, nomenclature and characteristics of Enzymes, Concept of holoenzyme, apoenzyme, co-enzyme and co-factors, mode & mechanism of enzyme action, Factors affecting enzyme activity. Plant Harmones, mode of action of Auxins, Gibberellins, Cytokinin and Abscissic acid.	ICT based class room teaching, Case Analysis, Individual Presentation
Unit – V	Genetic Engineering: Tools and techniques of recombinant DNA technology; cloning vectors; genomic and cDNA library; transposable elements; gene mapping and chromosome walking. Biotechnology: Functional definition; basic aspects of plant tissue culture; cellular totipotency, differentiation and morphogenesis biology of Agrobacterium; vectors for gene delivery and marker genes; salient achievements in crop biotechnology.	ICT based class room teaching, Case Analysis, Group Presentation

COURSE OUTCOMES

- The study of functions of plant cell incorporates knowledge at molecular level.

- This gives an idea of the cell functions and by alteration of the functioning of enzymes and biomolecules,
- The student can find out more ideas of improving productivity.
- The physiological knowledge help to develop newer ideas in developing newer techniques in agriculture.
- Environmental awareness makes the students respect mother earth by protecting and conserving the plants and animals and keep up the balance on the earth.

PRACTICALS

- Study of instruments.
- Experiment to demonstrate transpiration in plants by bell jar method.
- To demonstrate that there is loss in weight of plant due to transpiration. Demonstrate that oxygen (O₂) gas is released during photosynthesis.
- Experiment to show that carbon dioxide (CO₂) is necessary for photosynthesis.
- General test for carbohydrates in plant tissue.
- To test the presence of monosaccharide in plant tissue.
- To perform starch test in leaves. To test the presence of lipids in plant tissues Demonstration of micro propagation (seed culture, stem culture).
- Demonstration of micro propagation (seed culture, stem culture).
- Perform starch test in leaves.
- Demonstration of micro propagation.

Job opportunity	Employability skill	Local/National/UNDP Goal Achieved	Enterprenurship Opportunity
Plant physiologist, Biochemist	Plant physiology, Biochemistry	Goal 04(quality Education) Goal 14(Life below water) Goal 15(Life on Land) Goal 03(Good health &well being)	Academician, genetic engineer



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SEMESTER- 5th

Course: B. Sc. Biology

**SUBJECT: DISCIPLINE SPECIFIC ELECTIVE-II
BOTANY-V (PLANT PATHOLOGY)**

Subject Code: 3SBBO504

Theory Max. Marks: 50

Theory Min. Marks: 17

COURSE OBJECTIVE:

To introduce concepts and principles of plant pathology. Study of interaction between plant and pathogen in relation to the overall environment and mechanism of disease development by pathogens.

Unit	Course Content	Methodology Adopted
Unit – I	Plant Diseases Definition of plant disease, Nature and Concept of diseases in plant, importance of plant diseases and their effect on human affairs, classification of plant diseases, definition and terms in plant pathology history and development of plant pathology, methods of studying plant diseases (Air born, soil born and Water born diseases), Koch's Postulates.	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	Plant Disease Epidemiology Detail study of symptoms, Fungi, etiology, epidemiology and control of fungal disease of plants: Late blight of potato, Damping off vegetables, Taphrina leaf spot of turmeric, Black rust of wheat, Red rot of sugarcane, Tikka disease of groundnut, Powdery mildew of apple, Rust of linseed, Rust of coffee, Smut disease of grasses.	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
Unit – III	Seed Pathology Principles of plant disease control, plant quarantine, seed treatment, methods of studying seed born disease, collection, preservation, isolation of pathogens and biological control of plant diseases.	ICT based class room teaching, Case Analysis, Group Presentation
Unit – IV	Host – Pathogen Interaction Distribution on plant pathogens, mode of infection, entry of pathogen in to host, roles of enzymes, toxins, phytoalexins in plant pathogenesis, physiological changes in diseased plants.	ICT based class room teaching, Case Analysis, Individual Presentation
Unit – V	Plants Bacteriology And Virology Nomenclature and Classification of plant viruses, detail study of symptoms, symptoms caused by plant pathogenic bacteria and viruses, control of bacterial and viral disease : Bacterial leaf blight of rice, Citrus canker, Little leaf of brinjal, Tobacco mosaic disease, Potato scab, Crown gall of apple and grapes, Leaf curl of papaya, Bud blight disease.	ICT based class room teaching, Case Analysis, Group Presentation

COURSE OUTCOMES

Students will know about concept of diseases, knowledge and awareness of diseases, causal agents of plant diseases, identification methods and management of crop diseases.

PRACTICALS

1. To study different sterilization technique.
2. To study preparations of culture media.(MS)
3. To study sterilization of seeds.
4. Enplant preparations.
5. Study of different techniques in plant hybridization.
6. Preparation of synthetic seeds.

Job opportunity	Employability skill	Local/National/UNDP Goal Achieved	Enterprenurship Opportunity
Plant Pathologist, Microbiologist	Plant pathology, Mycologist	Goal 04(quality Education) Goal 14(Life below water) Goal 15(Life on Land) Goal 03(Good health &well being)	Academician, Horticulture



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SEMESTER- 5th

Course: B. Sc. Biology

**SUBJECT: DISCIPLINE SPECIFIC ELECTIVE-III
BOTANY-V (PLANT REPRODUCTION)**

Subject Code: 3SBBO505

Theory Max. Marks: 50

Theory Min. Marks: 17

COURSE OBJECTIVE:

To enable the students:

- To understand the various aspects of plant floral parts, development and reproduction
- To understand the various aspects of embryology and apomixes

Unit	Course Content	Methodology Adopted
Unit – I	Flower Calyx, corolla, Androecium, Gynoecium; Microsporangium: Anther Wall, Endothecium Middle layers, Tapetum, Nuclear behaviour in tapetal cells, Sporogenoustissue; Male Gametophyte: Formation of vegetative and generative cells, Formation of Sperms, Pollen wall, Abnormal features. Megasporangium: Types of ovule, Integuments, Nucellus, Megasporogenesis, Special features. Female Gametophyte: Types of female gametophytes, Mature Embryo sac, Haustorialbehaviour of embryo sac, Nutrition of Embryo sac.	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	Pollination Anther dehiscence, pollen transfer, self pollination, cross pollination, artificial pollination, pollen storage; Fertilization: Pollen germination and pollen tube growth. Path of pollentube, pollentube discharge, Double fertilization, Syngamy. Endosperm: Types of endosperm, ruminant endosperm, cytology of endosperm, functions of endosperm.	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
Unit – III	Embryo Zygote, proembryo, Embryogeny in dicotyledons, Embryogeny in monocotyledons, suspensor, under developed and reduced embryos, Nutrition of embryo. Polyembryony: Causes of polyembryony, experimental induction of polyembryony, classification of polyembryony practical value of polyembryony.	ICT based class room teaching, Case Analysis, Group Presentation
Unit – IV	Embryology in relation to Taxonomy Importance of Embryological characters in taxonomic considerations, families with special embryological features, examples of the value of embryology in taxonomy,	ICT based class room teaching, Case Analysis, Individual Presentation
Unit – V	Apomixis Vegetative reproduction, apospory, causes of apomixis, significance of apomixis.: Experimental Embryology: Palynology in relation to Taxonomy. Effects of young seeds on fruit growth, Parthenocarpy, parasexual hybridization.	ICT based class room teaching, Case Analysis, Group Presentation

Outcome

On completion of this course, the students will be able to:

- Discuss the structural elements of plants floral parts and reproduction.
- Discuss the Pollination, embryology and apomixes.

PRACTICALS

- To study the parts of flower.
- To cut the T.S. of anther, pollen and ovule.

- To cut the T.S. of Dicot and monocot embryo.
- To study the modes of reproduction in plant.
- To study of endosperm.
- To study of different types of ovule.

Job opportunity	Employability skill	Local/National/UNDP Goal Achieved	Enterprenurship Opportunity
Embryologist, Flowering expert	Pollination, Embryology	Goal 04(quality Education) Goal 14(Life below water) Goal 15(Life on Land) Goal 03(Good health &well being)	Academician, Horticulture



Dr. C.V. RAMAN UNIVERSITY
Kargi Road, Kota, Bilaspur (C.G.)

SEMESTER- 5th

Course: B.Sc. Maths/Bio/micro/biotech

SUBJECT: Chemistry-V (Physical Inorganic & Organic Chemistry)

Subject Code: 3SBCH503

Max. Marks: 50

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	<p>Spectroscopy – I (a) Electromagnetic radiation, regions of the spectrum, basic features of different spectrometers, statement of the Born-Oppenheimer approximation, degrees of freedom.</p> <p>(b) Rotational spectrum of diatomic molecules. Raman spectrum, application of Raman spectrum.</p> <p>Spectroscopy - II</p> <p>(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.</p> <p>(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.</p>	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	<p>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 Ca²⁺. Nitrogen fixation.</p> <p>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</p>	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.
Unit-III	<p><u>Inorganic Chemistry</u></p> <p>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.</p> <p>Gravimetric Analysis Principles of gravimetric estimation, supersaturation, co-precipitation, post-precipitation and Ash treatment with respect to the estimation of Ba, Zn and Cu.</p> <p>Water Analysis Hardness, types of hardness-Temporary, permanent and total hardness, acidity and alkalinity, BOD, COD and DO.</p>	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic.
Unit-IV	<p>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 diastereoisomers. Conversion of glucose into mannose. Formation of glycosides, ethers and esters, determination of ring size of monosaccharide, cyclic</p>	Usage of ICT (Powrpoint, PDF and video lectures) and black board (traditional) as per requirement of the topic. Nptel lecture video E ug Pathshala

	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, ShivilalAgrawal& 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.



Dr. C.V. RAMAN UNIVERSITY
Kargi Road, Kota, Bilaspur (C.G.)

SEMESTER- 5th

Course: B.Sc. Maths/Bio/micro/biotech

SUBJECT: Chemistry-V (Elective –I) Industrial Chemistry

Subject Code: 3SBCH504

Max. Marks: 50

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, plate heat 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. Banchemo, McGraw Hill 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

Course: B.Sc. Maths/Bio/micro/biotech

SUBJECT: Chemistry-V (Elective –I) Green Chemistry

Subject Code: 3SBCH505

Max. Marks: 50

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

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, Shivalal Agrawal & Company.
- Experiment & Calculations in Engineering Chemistry, Dr. S.S. Dara, S.Chand & Com. Ltd.



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

SEMESTER- 5th

Course: B. Sc. Biology

**SUBJECT: DISCIPLINE SPECIFIC ELECTIVE-I
ZOOLOGY –V (APPLIED ZOOLOGY)**

Subject Code: 3SBZO503

Theory Max. Marks: 50

Theory Min. Marks:17

COURSE OBJECTIVE:

This paper is aimed to introducing the students for Aquaculture, Economic Entomology, toxicology and lab techniques.

Unit	Course Content	Methodology Adopted
Unit – I	Aquaculture <ul style="list-style-type: none"> • Definition and scope of aquaculture. • Prawn culture –(Culture of fresh water prawn, Methods of prawn fishing, preservation and processing of prawns) • Pearl culture and Pearl Industry. • By products of fishing industry. • Frog culture, Breeding and selection. 	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	Pisciculture <ul style="list-style-type: none"> • General account of Edible fresh water fishes. • Carp culture: Management of ponds, Preservation and processing of fishes. • Maintenance of Aquarium • Plankton and their role in Fisheries. • Elementary knowledge of polyculture. 	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
Unit – III	Economic Entomology <ul style="list-style-type: none"> • Sericulture: Species of silkworm, life history of Bombyx mori, Sericulture Industry in India. • Apiculture –life cycle and species Methods of bee keeping, Products of bees, enemies of bees. • Lac culture: Lifecycle, Host Plant cultivation. • Common Pest: Stored Grains Sitophilus oryzae and TriboliumCastanaeum, Vegetable pest Piers brassicae and Dacuscucurbitae.. • Biological control of insect pests. 	ICT based class room teaching, Case Analysis, Group Presentation
Unit – IV	Toxicology <ul style="list-style-type: none"> • Toxicology: Basic concepts, • Heavy metal toxicity- Pb, Cd, Hg. • Toxicity testing, LC 50, LD 50, acute and chronic toxicity. • Pesticide and their toxicological effect. • Occupational health hazards and their control 	ICT based class room teaching, Case Analysis, Individual Presentation
Unit – V	Lab Techniques <ul style="list-style-type: none"> • pH- Definition, Study of pH- meter, determination of pH. • Chromatography: Principles & Types of chromatography (Paper Chromatography). • Types of microtome and their uses. • General ideas of some common fixatives, stains and reagents. • Museum keeping, preservation and skeleton preparation, taxidermy(Bird) 	ICT based class room teaching, Case Analysis, Group Presentation

PRACTICAL

1. Study of museum specimen of fresh water edible fishes.
2. Study of pH of Water and soil.
3. Study of Chromatography (Paper Chromatography).
4. Study of working instrument : Microtome.
5. Study of different techniques for Museum Keeping..
6. Maintenance of aquarium.
7. Study of pests-
 - Stored grain pests- Sitophilus Oryzae&Triboliumcastanaeum.
 - Vegetable pests- Pieris brassicae&Dacuscucurbitae
8. Study of Plankton – Euglena, Paramoecium, Cyclops, Mysis, Daphnia

PRACTICAL MARKS DISTRIBUTION

1. Exercise based on pH determination
2. Exercise based on simple chromatography
3. Comments on instruments based on theory paper(any one) Exercise based on museum keeping techniques
4. Spotting
5. Viva
6. Practical record/collection

COURSE OUTCOMES

The student have a knowledge of different culture Skill to develop own Business, lab Techniques and self employment.

Job opportunity	Employability skill	Local/National/UNDP Goal Achieved	Enterprenurship Opportunity
Scientist, Academician, Toxicologist, Fishery	Toxicologist, Pharmaceutical drug testing . Aquaculture	Goal 04(quality Education) Goal14(Life below water) Goal 15(Life on Land) Goal 03(Good health &well being)	Academician, Toxicologist, Scientist, Sericulture



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

SEMESTER- 5th

Course: B. Sc. Biology

**SUBJECT: DISCIPLINE SPECIFIC ELECTIVE-II
ZOOLOGY-V (WILDLIFE CONSERVATION)**

Subject Code: 3SBZO504

Theory Max. Marks: 50

Theory Min. Marks:17

COURSE OBJECTIVE:

This paper is aimed to introduce wildlife conservation ,endangered species ,santuries biosphere reserve Project Tiger and. Gir Lion.

Unit	Course Content	Methodology Adopted
Unit – I	1. Wild Life of India. 2. Types of Wild Life. 3. Value of Wild Life. 4. Positive negative of Wild Life.	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	1. Wild Life protection act. 2. Conservation of wild Life in India. 3. Endangered species in India.	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
Unit – III	1. Wild Life conservation. 2. National park in India. 3. Santuries in C.G & M.P.	ICT based class room teaching, Case Analysis, Group Presentation
Unit – IV	1. Project Tiger. 2. National animal and their conservation. 3. Project Gir Lion.	ICT based class room teaching, Case Analysis, Individual Presentation
Unit – V	1. Wild Life in M.P & C.G with references to mammals. 2. Biosphere reserves. 3. Bird santuries in India.	ICT based class room teaching, Case Analysis, Group Presentation

PRACTICAL

1. Wild life : Endangered and threatened species.
2. National animal and their conservation
3. Achanakmar Project Tiger.
4. Zoo Visit Kannan Pendari
5. Crocodile Project, National park in India.
6. Bird santuries in India.
7. Butterfly identification, Santuries ,Biospher Reserve

Course Outcomes

The student have a knowledge of different biosphere reserve, santuries ,wildlife conservation Skill to develop employment in Zoo.

Job opportunity	Employability skill	Local/National/UNDP Goal Achieved	Enterprenurship Opportunity
Taxonomist,Scientist, Academician,	Zoo Management,Wildlife Expert	Goal 04(quality Education) Goal 14(Life below water) Goal 15(Life on Land) Goal 03(Good health &well being)	Academician, Taxonomist.Wildlife Manager



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

SEMESTER- 5th

Course: B. Sc. Biology

**SUBJECT: DISCIPLINE SPECIFIC ELECTIVE-III
ZOOLOGY-V (INDUSTRIAL BIOLOGY)**

Subject Code: 3SBZO505

Theory Max. Marks: 50

Theory Min. Marks:17

COURSE OBJECTIVE:

This paper is aimed to introduce micro-organism used in Fermentation. Vitamin, Enzyme Antibiotics, Alcohol, dairy products and other pathogenic treatment.

Unit	Course Content	Methodology Adopted
Unit – I	1. Vitamin.- Commercial production of vitamin. 2. Fermentation techniques 3. Microorganism used in alcohol.	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	1. Antibiotics their importance 2. Antibiotics and their Producing companies. 3. Chemical nature of Penicillin.	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
Unit – III	1. Biofertilizers 2. Vermi composting 3. Enzymes and their properties. 4. Industrial uses of enzymes.	ICT based class room teaching, Case Analysis, Group Presentation
Unit – IV	1. Microbiology of domestic water and sewage. 2. Microbiology of milk and milk products. 3. Industrial microbiology.	ICT based class room teaching, Case Analysis, Individual Presentation
Unit – V	1. Brief introduction to pathogenic Nemetodes. 2. Brief account, Life history and Pathogenicity of <i>Entamoeba, Trypanozoma, Giardia</i> . 3. Vector insects	ICT based class room teaching, Case Analysis, Group Presentation

PRACTICAL

1. Study of Micro-organism from soil.
2. Study of Entamoeba, Trypanozoma, Giardia.
3. Study of Microorganism used in alcohol.
4. Study of Microbiology of domestic water and sewage.
5. Study of Biofertilizers, Vermi composting
6. Study of Vector insect

COURSE OUTCOMES

The student have a knowledge of different micro-organism used for drug, alcohol vitamine, antibiotics, enzyme, dairy production Skill to develop own Business, marketing and self employment.

Job opportunity	Employability skill	Local/National/UNDP Goal Achieved	Enterprenurship Opportunity
Scientist, Academician,	Zoo Management, Microbiologist, Enzymologist	Goal 04(quality Education) Goal 15(Life on Land) Goal 03(Good health & well being)	Academician, Scientist.



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

SEMESTER- 6th

Course: B. Sc. Biology

SUBJECT: DISCIPLINE SPECIFIC ELECTIVE-I

BOTANY-VI (PLANT ECOLOGY, BIODIVERSITY AND PHYTOGEOGRAPHY)

Subject Code: 3SBB0603

Theory Max. Marks: 50

Theory Min. Marks: 17

COURSE OBJECTIVE:

- To examine the role that biotic and abiotic factors play in ecological biogeography
- To gain an appreciation of Earth's geological history and understand the role of historical biogeography in interpreting plant distributions
- To investigate the relationship between systematics and biogeography
- To investigate the relationship between systematics and biogeography (phylogeography)
- To review major features of contemporary plant distributions with emphasis on hot-spots, endemics, and islands
- To understand the role that glaciation has played in plant distributions
- To examine pattern and process in bent hic marine algal distributions with a focus on kelp

SYLLABUS

Unit	Course Content	Methodology Adopted
Unit – I	Ecosystems: Structure and types, Biotic and Abiotic components, Trophic levels, Food chains, Food webs, Ecological pyramids, Energy flow; Biogeochemical cycles: Concept, Gaseous and Sedimentary cycles, Carbon, Nitrogen, Phosphorus and Sulfur cycle.	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	Ecological adaptations: Morphological, Anatomical and Physiological responses, Water adaptation (Hydrophytes, Xerophytes and Mesophytes), Temperature adaptation (Thermoperiodism and Vernalization), Light adaptation (Heliophytes and Sciophytes), Plant Succession: Causes, trends and processes, types of succession - Lithosere, Hydrosere and Xerosere.	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
Unit – III	Population Ecology: Distribution patterns, Density, Natality, Mortality, Growth curves, Ecotypes and Ecads; Community Ecology: Characteristics, Classification, Life forms. Biodiversity: Basic concept, definition, Importance, Biodiversity of India, Hotspots, In situ and ex situ conservation, Endangered and threatened species, Red data book.	ICT based class room teaching, Case Analysis, Group Presentation
Unit – IV	Soil: Physico-chemical properties, Soil formation, Development of Soil Profile, Soil classification, Soil composition, Soil factors; Pollution: Definition, Types & Causes; Global Phytogeography: Phytogeographical regions of India, Vegetation types of Madhya warming, Climate change and Ozone holes.	ICT based class room teaching, Case Analysis, Individual Presentation
Unit – V	Pradesh, Biosphere reserves, Sancturies and National parks of Madhya Pradesh, Natural resources – definition and classification of natural resources, Conservation and management of natural resources, Land resources management, Water resources management, Wet land resource management.	ICT based class room teaching, Case Analysis, Group Presentation

OUTCOMES

Students will be able to:

- Distinguish between ecological versus historical biogeography
- Recognize patterns and hypothesize underlying process
- Summarize the five areas that have resulted in a Renaissance in Biogeography
- Describe the 3 major biogeographic patterns and illustrate them with significant plant genera
- Compare long-distance dispersal vs vicariance as mechanisms for disjunct distributions
- Define endemic and illustrate with significant plant genera (from BC and elsewhere)

PRACTICALS

- To determine the minimum size of the quadrat by species area curve. To determine the frequency of various species occurring in a given area.
- Determination of percentage frequency of plant species by quadrat method.
- Determination of density of plant species by quadrat methods.
- Study the soil texture of field soil.
- To study the composition of field soil. To study out the water holding capacity of the soil.
- To find out pH of the soil.
- To test the presence of nitrate in the soil. To study the. Morphological adaptation in hydrophytes.
- To classify hydrophytes, xerophytes plant.
- To study the morphological adaptation in hydrophytes.
- To study the hydrophytic adaptation in the t.s. of hydrilla stems.
- To study the morphological and anatomical adaptation in xerophytes.
- To study the xerophytic adaptation in v.s. of Nerium leaf . To study the mesophytic plant.

Job opportunity	Employability skill	Local/National/UNDP Goal Achieved	Enterprenurship Opportunity
Ecologist, Environmentalist	Pollution Expert Ecology, soil profiling	Goal 04(quality Education) Goal 14(Life below water) Goal 15(Life on Land) Goal 03(Good health &well being)	Academician, Environmentalist



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SEMESTER- 6th

Course: B. Sc. Biology

**SUBJECT: DISCIPLINE SPECIFIC ELECTIVE-II
BOTANY-VI (ETHNO BOTANY)**

Subject Code: 3SBB0604

Theory Max. Marks: 50

Theory Min. Marks: 17

COURSE OBJECTIVE:

To enable the students:

- To proper documentation and presentation of traditional knowledge about plants.
- To use important plants by the tribal communities for various purposes.
- Conservation natural growing plants and socioeconomic impacts.
- Ethnobotany solve human problem of nutrition health care and life support system.

Unit	Course Content	Methodology Adopted
Unit – I	Ethno-Medicine Introduction, concept, scope and objective; Aboriginal uses and management of ethno-botanical species in India. Carefully analyzed, verified and proper preparation of medicines by local healers. Exploration of some ethno-medicinal plants used by tribals. Medico-Ethno-botanical sources in India. Ailments for cure diseases.	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	Ethno-botany (concept and studies) Introduction, definition, Classification, method of study ethno-botany, phytosociological studies, Significance and ethno-botanical practices, role of ethnic groups, Traditional systems of medicine, Conservation and protection of ethno-biodiversity, ethno- botany as tool to protract ethnic groups. Role of ethno-botany in modern, high tech science.	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
Unit – III	Ethno-botany and Legal aspect Ethnobotany as an interdisciplinary science. Paleo-ethnobotany. Aims and object of legal aspect. Biopiracy, Intellectual property rights, endangered species Vulnerable and extinct ethno-species . Application of natural habitat and propagation of ethno-botanical species. Propagation through cutting, layering, grafting, and budding. Enforcement of existing Acts. Policy framework.	ICT based class room teaching, Case Analysis, Group Presentation
Unit – IV	Herbal Medicines and Folk medicines History ,Scope, Definition, Aims and Objects about folk and herbal medicines. Selection of herbal planting material for Cultivation, Harvesting, Storage and Marketing of herbal medicines. Systematic position of herbal medicinal plants. Nursery, Forming, use of green houses for nursery. Development of agro- technology and promotion of rural bio-technology.	ICT based class room teaching, Case Analysis, Individual Presentation
Unit – V	Pharmacognosy and Economic ethno-botany Active principals and method of screening, testing of secondary metabolites-Alkaloids, Flavonoids, Steroids, Tannins, Terpenoids, Phenolic compounds. Anti-microbial, Anti-oxidant, Anti-inflammatory, Drug adulteration- types, methods of drug evaluation. Biological testing of herbal medicines. Future aspect of pharmacognosy. Tribal economic realization through different sources for their livelihood. Ethnic policy for commercialization.	ICT based class room teaching, Case Analysis, Group Presentation

COURSE OUTCOMES

On completion of this course, the students will be able to:

1. To express the historical development of ethnobotany. Recognize and identify important plant species.
2. Explain ethnobotanically uses of plants. Detail their native habitats and cultivated lands.

PRACTICALS

- Study of Ethnomedicinal plant.
- Study of archaeoethnobotany
- Study of Plants used in various systems of medicines.
- Study of plant used in Ayurvedic, Unani and Homoeopathic system .
- Study of plant in Allopathic systems.
- Plants used by villagers and tribal people.

Job opportunity	Employability skill	Local/National/UNDP Goal Achieved	Enterprenurship Opportunity
Medicinal plant expert, Environmentalist	Ethnomedicine, herbal medicine	Goal 04(quality Education) Goal 14(Life below water) Goal 15(Life on Land) Goal 03(Good health &well being)	Medicinal plant cultivation



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

SEMESTER- 6th
3SBB0605

Course: B. Sc. Biology

SUBJECT: DISCIPLINE SPECIFIC ELECTIVE-III
BOTANY-VI (EVOLUTIONARY AND ECONOMIC BOTANY)

Subject Code:

Theory Max. Marks: 50

Theory Min. Marks: 17

COURSE OBJECTIVE:

- Describe the theory of natural selection.
- Explain how new species arise.
- Construct a phylogenetic tree.
- Explain the mechanisms which underlie evolution at the molecular level.
- To identify the following crops: Sorghum, Maize, Rice, and Wheat
- To know the origin, distribution, spread and taxonomy of the above listed crops
- To be able to describe morphological feature
- To know the economic importance of the listed crops.

SYLLABUS

Unit	Course Content	Methodology Adopted
Unit – I	Evolutionary Biology: Origin of life (including aspects of prebiotic environment and molecular evolution); Concept of evolution; Theories of organic evolution; Mechanisms of speciation. Hardy-Weinberg genetic equilibrium, genetic polymorphism and selection; origin and evolution of economically important microbes and plants.	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	Origin of agriculture: World centers of primary diversity of domesticated plants; Plant introduction; Secondary centers of origin. Plant as a source of renewable energy; Innovations for meeting world food demands.	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
Unit – III	Botany, cultivation and uses of – a. Food, forage and fodder crops (cereals, pulses, vegetables and fruits) b. Fiber yielding plants c. Botany, cultivation and uses of Medicinal plants d. Aromatic plants e. Oil yielding plants	ICT based class room teaching, Case Analysis, Group Presentation
Unit – IV	Important fire-wood, timber-yielding plants and Non-wood forest products (NWFPs) such as- Bamboos, rattans, raw materials for paper-making, gums, tannins, dyes and resins. Plants used as avenue trees for shade, pollution control and aesthetics.	ICT based class room teaching, Case Analysis, Individual Presentation
Unit – V	Farming of medicinal plant, cryopreservation, seed bank, methods of crop rotation.	ICT based class room teaching, Case Analysis, Group Presentation

COURSE OUTCOMES

- Acknowledge the economic uses of plants in modern society.
- Acquire an increased awareness and appreciation of plants & plant products encountered in everyday life.

- Develop scientific insights into the development of many plant products that have shaped our society.
- Appreciate the diversity of plants and the plant products in human use;
- Understand the biological reasons why certain plant resources are important;
- Explain the geographical, historical, and cultural contributions of economically important plants on the development of human culture.
- Understand the conditions & consequences of natural selection; & describe different modes of speciation
- Search the library for literature review; & choosing a valuable research topic.

PRACTICAL:-

- Study of timber –Yielding plants
- Study of aromatic plant
- Study of cultivation and uses of medicinal plants
- Study of oil yielding plants
- Study of fiber yielding plants
- Study of Food, forage and fodder crops (cereals, pulses vegetables and fruits)

PRACTICAL –IV

- Study of timber –Yielding plants
- Study of aromatic plant
- Study of cultivation and uses of medicinal plants
- Study of oil yielding plants
- Study of fiber yielding plants
- Study of Food, forage and fodder crops (cereals, pulses vegetables and fruits)

Job opportunity	Employability skill	Local/National/UNDP Goal Achieved	Enterprenurship Opportunity
Economic botany expert, Environmentalist	Food and fiber yielding plant, Agriculture	Goal 04(quality Education) Goal 14(Life below water) Goal 15(Life on Land) Goal 03(Good health &well being)	Fiber, food and timber plant cultivator



Dr. C.V. RAMAN UNIVERSITY
Kargi Road, Kota, Bilaspur (C.G.)

SEMESTER- 6th
Course: B.Sc. Maths/Bio/micro/biotech
SUBJECT: Chemistry-VI
(Physical Inorganic & Organic Chemistry)

Subject Code: 3SBCH 603
Max. Marks: 50
Min. Marks-17

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-Grothaus-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-	(a) Organometallic compounds: Organomagnesium compounds, The Grignard reagents-formation, structure and synthetic applications,	Usage of ICT (Powrpoint, PDF and video lectures) and black

V	<p>organozinc compounds, formation and chemical reactions, Organolithium compounds-formation and chemical reactions.</p> <p>(b) Organic synthesis via enolates Organic synthesis via enolates, acidity of α-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.</p> <p>(c) Organosulphur compounds Nomenclature, structural features.</p> <p>(d) Amino acids Classification, structure, stereochemistry of amino acids, acid base behaviour, isoelectric point, general methods of preparation and properties of α-amino acids</p>	<p>board (traditional) as per requirement of the topic, NPTEL video lectures, Use of chemical models with structural elucidation, Google Classroom, other digital tools along with Chem-draw Softwares.</p>
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Course Outcomes – After completion of the course student will be 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, ShivalAgrawal & 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. RAMANA UNIVERSITY
Kargi Road, Kota, Bilaspur (C.G.)

SEMESTER- 6th

Course: B.Sc. Biology/Maths/Microbio/Biotech

SUBJECT: Discipline Specific Elective-II (Bio-Chemistry)

Subject Code: 3SBCH 604

Theory Max. Marks: 50

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

SEMESTER- 6th

Course: B.Sc. Biology/Maths/Microbio/Biotech

SUBJECT: Discipline Specific Elective-II (NanoChemistry)

Subject Code: 3SBCH 605

Theory Max. Marks: 50

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.



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SEMESTER- 6th

Course: B.Sc. Biology/Maths/Microbio/Biotech

SUBJECT: Chemistry Practical - VI

Subject Code: 3SBCH 603

Practical Max. Marks: 25

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

Books:

- Experiments & Calculations in engineering chemistry, Dr. S.S. Dara, S.Chand & Company Ltd.
- Practical Chemistry, Dr. M.M.N.Tandon, Shivrul Agrawal & Company



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

SEMESTER- 6th
Course: B. Sc. Biology

Subject Code: 3SBZO603
Theory Max. Marks: 50

SUBJECT: DISCIPLINE SPECIFIC ELECTIVE-I
ZOOLOGY – VI (ENVIRONMENTAL BIOLOGY & EVOLUTION)

Theory Min. Marks:17

COURSE OBJECTIVE:

This paper is aimed to introduce Ecology ,Origin of life and evolution, Palaeontology and distribution

Unit	Course Content	Methodology Adopted
Unit – I	Concept of Ecology <ul style="list-style-type: none"> • Abiotic and Biotic Factors • Energy flow in ecosystem • Food chain and Food web • Biogeochemical cycle: CO₂, N and P • Population Concept- Characteristics of population. Factors affecting population growth. • Community Concept-Succession, Periodicity ,Indicators 	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	Habitat Ecology <ul style="list-style-type: none"> • Fresh water habitat – Factors and classification. • Marine habitat- Factors and classification • Terrestrial habitat – Factors and classification. • Ecological divisions of India. • Natural resources and their Conservation with special reference to forests 	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
Unit – III	Man and Environment <ul style="list-style-type: none"> • Wild life conservation (Laws, National Parks and Sanctuaries of MP) • Environmental degradation and pollution. • Thermal and Noise pollution • Radiation Ecology ,Global Warming and Green House Effect • Urbanisation and effect of human population on environment. 	ICT based class room teaching, Case Analysis, Group Presentation
Unit – IV	Origin of life and evolution <ul style="list-style-type: none"> • Origin of life- modern concept only • Lamarckism, Darwinism. • Modern Synthetic theory :Variations Mutations, Isolation & Speciation • Adaptations and Mimicry • Micro, macro Evolution and Mega evolution. 	ICT based class room teaching, Case Analysis, Individual Presentation
Unit – V	Palaeontology and distribution <ul style="list-style-type: none"> • Fossils, Methods of fossilisation, Determination of age of Fossils. • Study of Extinct forms: Dinosaurs and Archaeopteryx • Zoogeographical distribution of animals • Evolution of man. 	ICT based class room teaching, Case Analysis, Group Presentation

PRACTICAL

1. Study of Fresh water, Marine and Terrestrial Fauna .
2. Water analysis – Oxygen, Chloride.
3. Pond ecosystem.
4. Wild life : Endangered and threatened species.
5. Study of specimen related with Micro , Mega evolution ,Commensalisms

Symbiosis , Mimicry , Parasitism and colouration .

Study of various fossils: Living fossil, Limulus, Latimera, dinosaurs, Archaeopteryx,.

Job opportunity	Employability skill	Local/National/UNDP Goal Achieved	Enterprenurship Opportunity
Scientist, Academician, Evolution Biologist	Population Scientist Wildlife Managment	Goal 04 (Quality Education) Goal14(Lifebelow Water) Goal 15(Life on Land) Goal 03(Good health &well being)	Academician, Scientist Wildlife Managment



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SEMESTER- 6th
Course: B. Sc. Biology

SUBJECT: DISCIPLINE SPECIFIC ELECTIVE-II
ZOOLOGY – VI (AQUACULTURE)

Subject Code: 3SBZO604
Theory Max. Marks:50
Theory Min. Marks:17

COURSE OBJECTIVE:

This paper is aimed to introduce fresh water Prawn, Fish and Pearl Culture.

Unit	Course Content	Methodology Adopted
Unit – I	Aquaculture: history, definition, scope & importance. Abiotic & biotic factors of water necessary for fish life. Ecological characteristics of pond.	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	Fish culture :- Mono, Poly, Fish culture. Fresh water prawn culture, pearl culture. Sewage fed fish culture.	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
Unit – III	Fish breeding in natural conditions. Transport of live fish & seed. Different types of crafts & gears used for fish catching, induced breeding.	ICT based class room teaching, Case Analysis, Group Presentation
Unit – IV	Fresh water fish farm: different types of fish ponds, preservation and processing byproducts of fish Industry & their utility.	ICT based class room teaching, Case Analysis, Individual Presentation
Unit – V	Water pollution and its effects on fisheries and their control. Common fish diseases & their control. Biochemical composition and nutritional value of fish. cultivable species of fishes in india.	ICT based class room teaching, Case Analysis, Group Presentation

COURSE OUTCOME:-

The student have a knowledge of different culture Skill to develop own Business, marketing and self employment.

PRACTICAL:-

1. Study of Fresh water, Marine and Terrestrial Fauna.
2. Water analysis – Oxygen, Chloride.
3. Pond ecosystem.
4. Study of specimen of fresh water fishes.
5. Study of slide preparation from fish scale.

Job opportunity	Employability skill	Local/National/UNDP Goal Achieved	Enterprenurship Opportunity
Scientist, Academician, Fishery Industry	Fisheries Management	Goal 04 (Quality Education) Goal 14 (Life below Water) Goal 15 (Life on Land) Goal 03 (Good health & well being)	Academician, Fish Industry, Scientist



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SEMESTER- 6th

Course: B. Sc. Biology

**SUBJECT: DISCIPLINE SPECIFIC ELECTIVE-III
ZOOLOGY-VI (ECONOMIC ZOOLOGY)**

Subject Code: 3SBZO605

Theory Max. Marks:50

Theory Min. Marks:17

COURSE OBJECTIVE:

This paper is aimed to introduce Pearl Culture, Lac –Culture , Sericulture and Poultry keeping. Protozoa, rats, mites, insect diseases and control.

Unit	Course Content	Methodology Adopted
Unit – I	1. Protozoa and human diseases 2. House hold insect. 3. Mites and their control.	ICT based class room teaching, Group Discussion, Case Analysis, Individual Presentations
Unit – II	1. Toxicology: Basic concepts, 2. Heavy metal toxicity- Pb, Cd, Hg. 3. Toxicity testing, LC 50, LD 50, acute and chronic toxicity. 4. Pesticide and their toxicological effect. 5. Pest of Pulse crops, Vegetables and Paddy	ICT based class room teaching, Case Analysis, Individual Presentation, Visit to Venture Capitalists
Unit – III	1. Chemical control of pest. 2. Natural control of pest. 3. Physical control of pest. 4. Biological control of insect pests.	ICT based class room teaching, Case Analysis, Group Presentation
Unit – IV	1. Economic importance of mammals. 2. Poultry keeping. 3. Rats and their control.	ICT based class room teaching, Case Analysis, Individual Presentation
Unit – V	1. Pearl culture: 2. Sericulture 3. Lac culture. 4. Apiculture 5. Snake venom.	ICT based class room teaching, Case Analysis, Group Presentation

COURSE OUTCOME:-

The student have a knowledge of different culture Skill and diseases and their control to develop own Business, marketing and self employment.

PRACTICAL:-

- Study of Life cycle of Silk worm
- Study of Bee culture
- 3.Study of pests-Stored grain pests- Sitophilus Oryzae&Triboliumcastanaeum.
- 4.Study of Vegetable pests- Pierisbrassicae&Dacuscucurbitae
- Study of Plankton – Euglena, Paramoecium, Cyclops, Mysis, Daphnia
- Study of Protozoa and diseases

Job opportunity	Employability skill	Local/National/UNDP Goal Achieved	Enterprenurship Opportunity
Scientist, Academician, Toxicologist	Toxicologist, Pharmaceutical drug testing .	Goal 04(quality Education) Goal 15(Life on Land) Goal 03(Good health &well being)	Academician, Toxicologist,Scientist