

BACHELOR OF SCIENCE (HONOURS)

Duration: 36 Months (3 Years) Eligibility: 12th Pass from Science with Minimum 60%

COURSE STRUCTURE OF BOTANY (HONOURS) 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													
3HBHL101H	Ability Enhancement	हिन्दी भाषा और संरचना	50	25	08	10	04	15	06	2	-	-	2
3CBCA201H	Ability Enhancement	Basic Information Computer Technology - I	25	13	04	05	02	07	03	1	-	-	1
3SBBO103H	Core Course - 1	Diversity of microbes and cryptogams	100	50	17	20	08	30	12	4	-	-	4
3SBBO106H	Core Course- 2	Anatomy of Angiosperms	100	50	17	20	08	30	12	4	-	-	4
	Generic Elective -1	(Select From Below Given Specialized Subject)*	100	50	17	20	08	30	12	4	-	-	4
Practical Group				Term End Practical Exam		Lab Performance		Sessional					
3SBBO103H	Practical	Diversity of microbes and cryptogams	50	25	08	25	08	-	-	-	-	2	2
3SBBO106H	Practical	Anatomy of Angiosperms	50	25	08	25	08	-	-	-	-	2	2
	Practical	(Select From Below Given Specialized Subject)*	50	25	08	25	08	-	-	-	-	2	2
3CBCA201H	Practical	Basic Information Computer Technology - I	25	10	04	15	06	-	-	-	-	1	1
Grand Total			550							15	-	07	22

Minimum Passing Marks are equivalent to Grade C

Major- Term End Theory Exam

Minor- Pre University Test

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

L- Lectures T- Tutorials P- Practical

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

Generic Elective- 1		
Specialisation	Course Code	Subject

Zoology	3SBZO105H	Invertebrates & Cell Biology
Chemistry	3SBCH104H	Chemistry - I

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COURSE STRUCTURE OF BOTANY (HONOURS) 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													
3HBEL201H	Ability Enhancement	English Language and Indian Culture	50	25	08	10	04	15	06	2	-	-	2
3MBFE101H	Ability Enhancement	Fundamental of Entrepreneurship	50	25	08	10	04	15	06	2	-	-	2
3SBBO203H	Core Course-3	Cell biology and genetics	100	50	17	20	08	30	12	4	-	-	4
3SBBO206H	Core Course-4	Economic botany	100	50	17	20	08	30	12	4	-	-	4
	Generic Elective -2	(Select From Below Given Specialized Subject)*	100	50	17	20	08	30	12	4	-	-	4
Practical Group				Term End Practical Exam		Lab Performance		Sessional					
3SBBO203H	Practical	Cell biology and genetics	50	25	08	25	08	-	-	-	-	2	2
3SBBO206H	Practical	Economic botany	50	25	08	25	08	-	-	-	-	2	2
	Practical	(Select From Below Given Specialized Subject)*	50	25	08	25	08	-	-	-	-	2	2
Skill Courses								Sessional					
	Skill Enhancement	Skill Enhancement Elective Course-I	50	-	-	-	-	50	20	1	-	1	2
Grand Total			600							17	-	07	24

Minimum Passing Marks are equivalent to Grade C

L- Lectures T- Tutorials P- Practical

Major- Term End Theory / Practical Exam

Minor- Pre University Test

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

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

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

Generic Elective- 2		
Specialisation	Course Code	Subject
Zoology	3SBZO205H	Vertebrates & developmental biology
Chemistry	3SBCH204H	Chemistry - II

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COURSE STRUCTURE OF BOTANY (HONOURS) SEMESTER III rd

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													
3HBHL302H	Ability Enhancement	हिन्दी भाषा सवेधना एवं संचार साधन	50	25	08	10	04	15	06	2	-	-	2
3CBCA502H	Ability Enhancement	Basic Information Computer Technology - II	25	13	04	05	02	07	03	1	-	-	1
3SBBO303H	Core Course-5	Bio-Diversity and systematic of seed plants	100	50	17	20	08	30	12	4	-	-	4
3SBBO306H	Core Course-6	Molecular biology	100	50	17	20	08	30	12	4	-	-	4
	Generic Elective -3	(Select From Below Given Specialized Subject)*	100	50	17	20	08	30	12	4	-	-	4
Practical Group				Term End Practical Exam		Lab Performance		Sessional					
3SBBO303H	Practical	Bio-Diversity and systematic of seed plants	50	25	08	25	08	-	-	-	-	2	2
3SBBO306H	Practical	Molecular biology	50	25	08	25	08	-	-	-	-	2	2
	Practical	(Select From Below Given Specialized Subject)*	50	25	08	25	08	-	-	-	-	2	2
3CBCA502H	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	-	08	24

Minimum Passing Marks are equivalent to Grade C

Major- Term End Theory / Practical Exam

Minor- Pre University Test

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

L- Lectures T- Tutorials P- Practical

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

Generic Elective- 3*		
Specialisation	Course Code	Subject
Zoology	3SBZO305H	Genetics
Chemistry	3SBCH304H	Chemistry -III

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COURSE STRUCTURE OF BOTANY (HONOURS) 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													
3HBEL402H	Ability Enhancement	English language and scientific temper	50	25	08	10	04	15	06	2	-	-	2
3HBHP401H	Ability Enhancement	Human Values & Ethics	50	25	08	10	04	15	06	2	-	-	2
3SBBO403H	Core Course - 7	Structure developments & reproduction in flowering plant	100	50	17	20	08	30	12	4	-	-	4
3SBBO406H	Core Course- 8	Plant metabolism	100	50	17	20	08	30	12	4	-	-	4
	Generic Elective -4	(Select From Below Given Specialized Subject)*	100	50	17	20	08	30	12	4	-	-	4
Practical Group				Term End Practical Exam		Lab Performance		Sessional					
3SBBO403H	Practical	Structure developments & reproduction in flowering plant	50	25	08	25	08	-	-	-	-	2	2
3SBBO406H	Practical	Plant metabolism	50	25	08	25	08	-	-	-	-	2	2
	Practical	(Select From Below Given Specialized Subject)*	50	25	08	25	08	-	-	-	-	2	2
Grand Total			550							16	-	06	22

Minimum Passing Marks are equivalent to Grade C

L- Lectures T- Tutorials P- Practical

Major- Term End Theory Exam

Minor- Pre University Test

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

Generic Elective- 4*		
Specialisation	Course Code	Subject
Zoology	3SBZO405H	Animal Physiology
Chemistry	3SBCH404H	Chemistry -IV

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)

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COURSE STRUCTURE OF BOTANY (HONOURS) 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													
3SBBO501H	Core Course - 9	Plant physiology and biochemistry	50	25	08	10	04	15	06	2	-	-	2
3SBBO502H	Core Course -10	Plant Pathology	50	25	08	10	04	15	06	2	-	-	2
3SBBO503H	Core Course -11	Plant Resource Utilization And Conservation	100	50	17	20	08	30	12	4	-	-	4
3SBBO504H	Discipline Specific Elective-1(Group A)	Plant structure and Development	100	50	17	20	08	30	12	4	-	-	4
3SBBO505H	Discipline Specific Elective-2(Group A)	Biology and diversity of Gymnosperms	100	50	17	20	08	30	12	4	-	-	4
Practical Group				Term End Practical Exam		Lab Performance		Sessional					
3SBBO501H	Practical	Plant physiology and biochemistry	50	25	08	25	08	-	-	-	-	2	2
3SBBO502H	Practical	Plant Pathology	50	25	08	25	08	-	-	-	-	2	2
3SBBO503H	Practical	Plant Resource Utilization And Conservation	50	25	08	25	08	-	-	-	-	2	2
3SBBO504H	Practical	Plant structure and Development	50	25	08	25	25	-	-	-	-	2	2
3SBBO505H	Practical	Biology and diversity of Gymnosperms	50	25	08	25	25	-	-	-	-	2	2
Grand Total			650							16	-	10	26

Minimum Passing Marks are equivalent to Grade C

L- Lectures T- Tutorials P- Practical

Major- Term End Theory Exam

Minor- Pre University Test

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

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

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COURSE STRUCTURE OF BOTANY (HONOURS) SEMESTER VIth													
Course Details				External Assessment		Internal Assessment				Credit Distribution			Allotted Credits
Course Code	Course Type	Course Title	Total Marks	Major		Minor		Sessional ***		L	T	P	Subject wise Distribution
				Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks				
Theory Group													
3SBBO601H	Core Course - 12	Plant ecology, biodiversity and phytogeography	50	25	08	10	04	15	06	2	-	-	2
3SBBO602H	Core Course -13	ETHNOBOTANY	50	25	08	10	04	15	06	2	-	-	2
3SBBO603H	Core Course -14	Plant Systematics	100	50	17	20	08	30	12	4	-	-	4
3SBBO604H	Discipline Specific Elective-3(Group B)	Plants & Society	100	50	17	20	08	30	12	4	-	-	4
3SBBO605H	Discipline Specific Elective-4(Group B)	Plant cell ,Tissue and Organ Culture	100	50	17	20	08	30	12	4	-	-	4
Practical Group				Term End Practical Exam		Lab Performance		Sessional					
3SBBO501	Project/Dessertation	Project&Viva Voice	100	50	17	-	-	50	20	-	-	4	4
Grand Total			500										20

Minimum Passing Marks are equivalent to Grade C

L- Lectures T- Tutorials P- Practical

Major- Term End Theory Exam

Minor- Pre University Test

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

Compulsory Project/Dessertation with choice if any Disciplinary specific elective,Compulsory one paper presentation certificate in related discipline

हिन्दी भाषा और संरचना

पाठ्यक्रम के उद्देश्य:

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

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इकाई-1

भारत वंदना) काव्य(जाग तुझको दूर जाना स्वतंत्रता पुकारती) काव्य(हम अनिकेतन) काव्य(भाषा की महत्ता और उसके विविध रूप भाषा-कौशल

सूर्यकांत त्रिपाठी निराला
सुश्री महादेवी वर्मा
जयशंकर प्रसाद
बालकृष्ण शर्मा नवीन

इकाई-2

करुणा) निबंध (समन्वय की प्रक्रिया) निबंध(बिच्छी बुआ) कहानी(अनुवाद हिन्दी की शब्द-संपदा परिभाषिक शब्दावली

आचार्य रामचन्द्र शुक्ल
रामधारी सिंह 'दिनकर'
डॉ. लक्ष्मण विष्ट 'बटरोही'
परिभाषा प्रकार, महत्व, विशेषताएं

इकाई-3

विलायत पहुंच ही गया) आत्मकथांश (अफसर (व्यंग्य) तीर्थयात्रा) कहानी(मकड़ी का जाला) व्यंग्य(वाक्य- lajpuk :तत्सम, तद्भव देशज विदेशी

महात्मा गांधी
शरद tks'kh
डॉ. मिथिलेश कुमार मिश्र
डॉ. रामप्रकाश सक्सेना

इकाई-4

अप्प दीपो भव) oDr`Ro कला(भारत का सामाजिक व्यक्तित्व) प्रस्तावना (पत्र मैसूर के महाराजा को) पत्र-लेखन (बनी रहेंगी किताबें) आलेख(पत्र-लेखन:महत्व और उसके विविध रूप सड़क पर दौड़ते ईहा मृग) निबंध

स्वामी श्रद्धानंद
जवाहरलाल नेहरू
स्वामी विवेकानंद
डॉ. सुनीता रानी घोष
(डॉ. श्यामसुन्दर दुबे

इकाई-5

योग की शक्ति) डायरी (डॉ .हरि'k राय बच्चन
कोश के अखाड़े में कोई पहलवान नहीं उतरता)साक्षात्कार (& भाषाविद् MkW- gfjnso
ckgjh ls izks- f=HkqouukFk 'kqDy
नीग्रो सैनिक से भेंट) यात्रा-संस्मरण(डॉ .देवेन्द्र सत्यार्थी
यदि बा न होती तो शायद गांधी को यह ऊँचाई न मिलती) साक्षात्कार (कथाकार-
गिरिराज किशोर से सत्येन्द्र शर्मा
lkj- लेखन, भाव-पल्लवन साक्षात्कार और कौशल

अपेक्षित परिणाम:

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

BASIC COMPUTER & INFORMATION TECHNOLOGY-I

COURSE OBJECTIVE:-

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

Syllabus:

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

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

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

इकाई – 2 कम्प्यूटर 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।

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

इकाई – 3 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, टच स्क्रीन।
इनपुट डिवाइस: मॉनीटर की विशेषताएं एवं मॉनीटर के प्रकार, वीडियो स्टैंडर्ड टॉल एटल ए गल ए स्ब स्क्रीन आदि, प्रिंटर, डेजी व्हील, डॉट मैट्रिक्स, इंकजेट, लेजर, लाइन प्रिंटर, प्लॉटर, साउंड कार्ड्स एवं स्पीकर्स।

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

इकाई – 4 स्टोरेज डिवाइसेस स्टोरेज फंडामेंटल्स प्रथमरी विरुद्ध भिन्न स्टोरेज डिवाइसेस मैग्नेटिक टेप, कार्ट्रिज 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।

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

PRACTICALS:-

DOS:

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

Windows 98:

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

MS Word:

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

COURSE OUTCOME:-

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

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DIVERSITY OF MICROBES AND CRYPTOGRAMS

COURSE OBJECTIVES:-

- 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

Syllabus:

- 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.
- 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.
- 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.
- UNIT- IV** Bryophyta : classification, study of morphology, anatomy, reproduction of Hepaticopsida Riccia, Marchantia, Anthocerotopsida Anthoceros, Bryopsida- Polytrichum
- UNIT- V** Pteridophyta: Important characters and classification. Stellar organization. Morphology and anatomy of Rhynia. Structure, anatomy and reproduction in Lycopodium, Selaginella, Equisetum and Marsilea.

COURSE OUTCOME:-

- 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

References Books:

- Singh Panday jain.
- Smith g,M cryptogamic Botany Vol-1 Tata Mc Graw Hill publishing co.Ltd Bombay,New delhi.
- Parihar, N.S.1996 Biology and morphology of pteridophytes,. Central book depot Allahabad.
- Bhatenager, S.P. and Moitra, A.1996; Gymnosperm. New age International,Pvt.Ltd New Delhi
- Singh,H.1978 Embryology of Gymnosperms,Gebruder Bortager,Berlin
- Mehrotra,R.S. and Aneja,R.S.1998;An introduction to mycology. New age Intermediate Press

- Unified practical botany Dr.S.B Agarwal & Dr.Esha Agarwal
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COURSE CODE: 3SBBO106H

Anatomy of Angiosperms

Course Objective:

1. Understand external and internal structure of plants.
2. Aware various plant families and its economic importance
3. Get knowledge on structure and development plant embryo.
4. Acquire knowledge on the physiological functions of plant.

UNIT- I Introduction and scope of Plant Anatomy: Applications in systematics, forensics and pharmacognosy.

UNIT- II Structure and Development of Plant Body: Internal organization of plant body: The three tissue systems, types of cells and tissues. Development of plant body: Polarity, Cytodifferentiation and organogenesis during embryogenic development.

Tissues : Classification of tissues; Simple and complex tissues (no phylogeny); cytodifferentiation of tracheary elements and sieve elements; Pits and plasmodesmata; Wall ingrowths and transfer cells, adcrustation and incrustation, Ergastic substances. Hydathodes, cavities, lithocysts and laticifers.

UNIT- III Apical meristems: Evolution of concept of organization of shoot apex (Apical cell theory, Histogen theory, Tunica Corpus theory, continuing meristematic residue, cytohistological zonation); Types of vascular bundles; Structure of dicot and monocot stem. Origin, development, arrangement and diversity in size and shape of leaves; Structure of dicot and monocot leaf, Kranz anatomy. Organization of root apex (Apical cell theory, Histogen theory, Korper-Kappe theory); Quiescent centre; Root cap; Structure of dicot and monocot root; Endodermis, exodermis and origin of lateral root.

UNIT- IV Vascular Cambium and Wood: Structure, function and seasonal activity of cambium; Secondary growth in root and stem. Axially and radially oriented elements; Types of rays and axial parenchyma; Cyclic aspects and reaction wood; Sapwood and heartwood; Ring and diffuse porous wood; Early and late wood, tyloses; Dendrochronology. Development and composition of periderm, rhytidome and lenticels.

UNIT- V Adaptive and Protective Systems: Epidermal tissue system, cuticle, epicuticular waxes, trichomes(uni-and multicellular, glandular and nonglandular, two examples of each), stomata (classification); Adcrustation and incrustation; Anatomical adaptations of xerophytes and hydrophytes.

COURSE OUTCOME:-

1. Know the scope and importance of the discipline.
2. Understand plant communities and ecological adaptations in plants.
3. Know the concept of methodology in taxonomy.
4. Learn about conservation of biodiversity, Non-conventional Energy and Pollution.
5. Discover botanical regions of India and vegetation types of Maharashtra.
6. Understand Bioremediation, Global warming and climate change.

Practical

1. Study of anatomical details through permanent slides/temporary stain mounts/ macerations/ museum specimens with the help of suitable examples.
2. Apical meristem of root, shoot and vascular cambium.
3. Distribution and types of parenchyma, collenchyma and sclerenchyma.
4. Xylem: Tracheary elements-tracheids, vessel elements; thickenings; perforation plates; xylem fibres.
5. Wood: ring porous; diffuse porous; tyloses; heart- and sapwood.
6. Phloem: Sieve tubes-sieve plates; companion cells; phloem fibres.
7. Epidermal system: cell types, stomata types; trichomes: non-glandular and glandular.
8. Root: monocot, dicot, secondary growth.
9. Stem: monocot, dicot - primary and secondary growth; periderm; lenticels.
10. Leaf: isobilateral, dorsiventral, C4 leaves (Kranz anatomy).
11. Adaptive Anatomy: xerophytes, hydrophytes.
12. Secretory tissues: cavities, lithocysts and laticifers.

References Books:

- Singh & Jain- Taxonomy of Angiosperms, Rastogi Publications.
- Bhojwani, S.S. & Bhatnagar, S.P. (2000) : The Embryology of Angiosperms (4th Edition) Vikas Publishing House(P)Ltd., UBS Publisher's Distributors, New Delhi.
- Singh Pandey Jain Botany book.
- Dr. Niranjanshrotriya and Dr. Archanashrotriya Botany Book (RP Unified) Ram Prasad & Sons BalVihar, Hamidia Road, Bhopal.
- Dr. S.B. Agrawal & Dr. Amit Agrawal Diversity of microbes and cryptogams.

- Verma B.K. (2011) Introduction to Taxonomy of Angiosperms.
- Rende AB (1997) The classification of flowering plants, vol. I & II
- Sivaranjan V.V. (1991) Introduction to the Principal of Plants Taxonomy Oxford & IBH Pub. Co. Pvt Ltd. New Delhi.
- Bhojwani S.S. Embryology of Angiosperms Vikas Publication House
- Bhatnagar S.P.(1974) Angiosperms. Pvt. Ltd. New Delhi. 9. Dwivedi J.N. (2000) Embryology of Angiosperms
- Naik, V.N. Taxonomy of Angiosperms (1988)
- Dickison, W.C. (2000). Integrative Plant Anatomy. Harcourt Academic Press, USA.
- Fahn, A. (1974). Plant Anatomy. Pergmon Press, USA.
- Mauseth, J.D. (1988). Plant Anatomy. The Benjammin/Cummings Publisher, USA.
- Evert, R.F. (2006) Esau's Plant Anatomy: Meristems, Cells, and Tissues of the Plant Body: Their Structure, Function and Development. John Wiley and Sons, Inc.
- Singh, Pandey & Jain-A text book of botany Angiosperms, Rastogi publication.
- M.S.Tayal- Plant anatomy, Rastogi Publication.

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INVERTEBRATES & CELL BIOLOGY

COURSE OBJECTIVE:-

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

Syllabus:

- UNIT- I** Classification of Non Chordates upto classes according to Parker sand 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.
- UNIT- II**
1. Coelenterata – Type study of Obelia.
 2. Helminthes – Type study of Liver Fluke.
 3. Annelida – Type study of Earthworm, Metamerism, Trochophore Larva.
- UNIT- III**
1. Arthropoda – Type study of Prawn.
 - 2 Mollusca – Type study of Pila.
 - 3.Echinodermata – External Features of Star Fish and Echinoderm Larvae.
- UNIT- IV**
1. The cell – History of Cell Biology, Cell theory, Prokaryotic and Eukaryotic cell.
 2. Microscopy : Compound and Electron Microscopy.
- UNIT – V**
1. Nuclear Organization of cell.
 2. Extra nuclear organization of cell.
 3. Cell reproduction – Amitosis, mitosis, meiosis.

COURSE OUTCOME:-

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,Nervous systm,.
 - 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

Reference Books : -(All latest editions)

- Jordan, E.I., and Verma, P.S. : Invertebrate Zoology, S. Chand & Co. Ltd., Ram Nagar, New Delhi.
- Parker and Haswell : Text Book of Zoology, Vol.1, (Invertebrata), A.Z.T.B.S. Publishers and Distributors, New Delhi-110051.
- Kotpal, Agarwal&Khetrapal : Modern text book of Zoology :Invertebrate, Rastogi Publications.
- Nigam, H.C. : Biology of Non-Chordates, ShobamLalNagin Chand& Co.
- . Rastogi, V.B. : Invertebrate Zoology, KedarnathRamnath.

CHEMISTRY –I

Syllabus:

- UNIT - I** 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. B. Gaseous States : Deviation from ideal behaviour, van der Waals equation of state. Critical phenomenon : PV isotherms of ideal gases, continuity of states, the isotherms of van der Waals equations, relationship between critical constants and van der Waals constants, the law of corresponding states, reduced equation of states. C. Molecular Velocities : Root mean square, average and most probable velocities. Qualitative discussion of the Maxwell's distribution of molecular velocities, collision numbers, mean free path and collision diameter. Liquefaction of gases (based on Joule-Thomson effect).
- UNIT - II** A. Liquid State : Intermolecular forces, structure of liquids (a qualitative description) Liquid crystals: Difference between liquid crystal, solid and liquid. Classification, structure of nematic and cholestric phases. Thermography and seven segment cell. B. Colloidal State : Definition of colloids, classification of colloids. Solids in liquids (sols): properties- kinetic, optical and electrical; stability of colloids, protective action, Hardy-Schulze law, gold number. Liquids in liquids (emulsions) : types of emulsions, preparation. Emulsifier. Liquids in solids (gels): classification, preparation and properties, inhibition, general applications of colloids. C. 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).
- UNIT - III** Chemical Kinetics : Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction concentration, temperature, pressure, solvent, light and catalyst. Concentration dependence of rates, mathematical characteristics of simple chemical reactions- zero order, first order, second order, pseudo order, half life and mean life. Determination of the order of reaction - differential method, method of integration, method of half life period and isolation method. Experimental methods of chemical kinetics - conductometric, potentiometric, optical methods- polarimetry and spectrophotometry. Theories of chemical kinetics: effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy. Simple collision theory based on hard sphere model, transition state theory (equilibrium hypothesis) Expression for the rate constant based on equilibrium constant and thermodynamic aspects.
- UNIT - IV** A. Structure and Bonding : Hybridizations, Bond lengths and bond angles, bond energy : Localized and delocalized chemical bond, van-der Waals interactions,

inclusion compounds, clathrates, charge transfer complexes, resonance, hyperconjugation, aromaticity, inductive and field effects, hydrogen bonding.

B. Mechanism of Organic reactions : Curved arrow notations, drawing electron movements with arrows, half-headed and double headed arrows, homolytic and heterolytic bond breaking.

C. Types of Reagents : Electrophiles and nucleophiles. Types of organic reactions.

Energy consideration. Reactive intermediates- carbocations, carbanions, free radicals and carbenes. Methods of determination of reaction mechanism.

UNIT - V 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. B. Alkanes and Cycloalkanes : IUPAC nomenclature, classification, isomerism in alkanes, sources and methods of preparation (with special reference to Wurtz, Kolbe, Corey-House reactions and decarboxylation of carboxylic acids). Physical properties and chemical reactions of alkanes. Mechanism of free radical halogenation of alkanes Cycloalkanes : nomenclature, methods of preparations, chemical reactions. Baeyer's strain theory and its limitations. ring strain in cyclopropane and cyclobutanes. Theory of strainless rings.

PRACTICAL:-

Physical Chemistry

A. (Any one experiment will be asked in examination form the following carrying 12 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.

B. (Any one experiment will be asked in examination form the following carrying 12 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

(Any one experiment will be asked in examination form the following carrying 12 Marks)

1. Distillation
2. Crystallization
3. Decolourisation and crystallization using charcoal
4. Sublimation

Viva: 6 marks

Records: 8 marks

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ENGLISH LANGUAGE AND INDIAN CULTURE

COURSE OBJECTIVES:-

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

Syllabus:

UNIT – I

Amalkanti: Nirendranath Chakrabarti

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

UNIT – II

Comprehension

UNIT – III

Composition and Paragraph Writing (Based on expansion of an idea).

UNIT – IV

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

UNIT – V

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

COURSE OUTCOMES:-

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

FUNDAMENTALS OF ENTREPRENEURSHIP

COURSE OBJECTIVE:-

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

Syllabus:

- UNIT – I** Entrepreneurship-Definition, Characteristics and importance, Types and functions of an entrepreneur, merits of a good entrepreneur motivational factors of entrepreneurship.
- UNIT – II** Motivation to achieve targets and establishment of ideas. Setting targets and facing challenges. Resolving problems and creativity. Sequenced planning and guiding capacity, Development of self confidence. Communication skills, Capacity to influence, leadership.
- UNIT – III** Project Report- Evaluation of selected process. Detailed project report - Preparation of main part of project report pointing out necessary and viability.
Selecting the form of Organization: Meaning and characteristics of sole Proprietorship, Partnership and cooperative committees, elements affecting selection of a form of an organization.
Economic management -Role of banks and financial institutions banking, financial plans, working capital-evaluation and management, Cost and Price determination, Calculation of Profits, keeping of accounts.
- UNIT – IV** Production management - Methods of purchase. Management of movable assets/goods. Quality management. Employee management. Packing.
Marketing management Sales and the art of selling. Understanding the market and market policy. Consumer management. Time management.
- UNIT - V** Role of regulatory institutions - district industry centre, pollution control board, food and drug administration, special study of electricity development and municipal corporation.
Role of development organizations, khadi & village Commission/ Board, State Finance Corporation, scheduled banks, MP Women's Economics Development Corporation.
Self-employment-oriented schemes, Prime Minister's Employment schemes, Golden Jubilee Urban environment scheme, Rani Durgavati Self-Employment scheme, Pt. Deendayal Self- employment scheme.
Various grant schemes - Cost-of-Capital grant, interest grant, exemption from entry tax, project report, reimbursement grant, etc.
Special incentives for women entrepreneurs, prospects & possibilities.
Schemes of Tribal Finance Development Corporation, schemes of Antyavasai

Corporation, schemes of Backward Class and Minorities Finance Development Corporation.

COURSE OUTCOME:-

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

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CELL BIOLOGY AND GENETICS

COURSE OBJECTIVES:-

- 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

Syllabus:

UNIT – I The cell envelope; plasma membrane, bilayer lipid structure, function of the cell wall. Structure and function of cell organelles: Golgi bodies, ER, Peroxisome, Vacuole, Chloroplast and Mitochondrion.

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

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.

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.

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.

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 plant cell.
- To study the cell structure of onion hydrilla and spirogyra.
- To study the cyclosis in tradescantia stamial cell.
- To study the plastid distribution in plants.
- To examine the electron micrograph of an eukaryotic cell.
- To examine the electron micrograph of an chloroplast.
- To examine the electron micrograph of an endoplasmic reticulum.
- To examine the electron micrograph of an Golgibody.
- To examine the electron micrograph of an Ribosome.
- To examine the electron micrograph of an Nucleus.
- To make a temporary acetocarmine stained slides of root tip of onion and to study various stages of mitosis.
- To make a temporary acetocarmine stained slides of Floral bud of onion and to study various stages of meiosis.
- Cytological examination of lampbrushchromosome.
- Cytological examinationofPolytene chromosome.
- Cytological examination of barr body.
- To demonstrate the phenomenon of segregation by yellow and green colour pea seeds.
To demonstrate the independent assortment by various type of pea seeds.

Reference Books:

- Cell biology and genetics p.k.gupta.
- Beerbala Rastogi cell biology book.
- Rastug S.C. 1992 cell biology.
- S.P. Singh & B.S. Tomar cell biology
- R.P. meyyar 2000 Genetics
- Dr.S.B.Agarwal&Dr.Amit Agarwal

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ECONOMIC BOTANY

COURSE OBJECTIVES:-

- Investigate utilization of crop plants.
- Study of origin, distribution, botanical description, brief idea of cultivation and economic uses of cereals, pulses, beverages, natural fibers and medicinal plants
- Gain knowledge about the taxonomic diversity of important families of useful plants
- Is able to map and recognize geographical, historical and cultural contributions of economically important plants
- Understanding of the roles of potentially important plant and plant products to the development of human culture

THEORY

UNIT- I Origin of Cultivated Plants: Origin of Cultivated Plants Concept of Centres of Origin, their importance with reference to Vavilov's work. Examples of major plant introductions; Crop domestication and loss of genetic diversity; evolution of new crops/varieties, importance of germplasm diversity.

UNIT- II Cereals: Cereals Wheat and Rice (origin, morphology, processing & uses); Brief account of millets. Legumes Origin, morphology and uses of Chick pea, Pigeon pea and fodder legumes. Importance to man and ecosystem. Spices Listing of important spices, their family and part used. Economic importance with special reference to fennel, saffron, clove and black pepper. Spices Listing of important spices, their family and part used. Economic importance with special reference to fennel, saffron, clove and black pepper. Beverages Tea, Coffee (morphology, processing & uses).

UNIT- III Legumes : Sources of sugars and starches Morphology and processing of sugarcane, products and by-products of sugarcane industry. Potato – morphology, propagation & uses.

UNIT- IV Sources of oils and fats General description, classification, extraction, their uses and health implications groundnut, coconut, linseed, soybean, mustard and coconut (Botanical name, family & uses). Essential Oils: General account, extraction methods, comparison with fatty oils & their uses.

UNIT- V Natural Rubber Para-rubber: tapping, processing and uses. Drug-yielding plants Therapeutic and habit-forming drugs with special reference to Cinchona, Digitalis, Papaver and Cannabis; Tobacco (Morphology, processing, uses and health hazards). Timber plants General account with special reference to teak and pine. Fibers

Classification based on the origin of fibers; Cotton, Coir and Jute (morphology, extraction and uses).

COURSE OUTCOME:-

- On completion of this course, the students will be able to: Understand core concepts of Economic Botany and relate with environment, populations, communities, and ecosystems
- Develop critical understanding on the evolution of concept of origin of crops and evolution of new crops/varieties and importance of germ plasma diversity,
- Develop a basic knowledge of taxonomic diversity and important families of useful plants
- Increase the awareness and appreciation of plants & plant products encountered in everyday life
- Appreciate the diversity of plants

Practical

1. **Cereals:** Wheat (habit sketch, L. S/T.S. grain, starch grains, micro-chemical tests) Rice (habit sketch, study of paddy and grain, starch grains, micro-chemical tests).
2. **Legumes:** Soybean, Groundnut, (habit, fruit, seed structure, micro-chemical tests).
3. **Sources of sugars and starches:** Sugarcane (habit sketch; cane juice- micro-chemical tests), Potato(habit sketch, tuber morphology, T.S. tuber to show localization of starch grains, w.m. starch grains, micro-chemical tests).
4. **Spices:** Black pepper, Fennel and Clove (habit and sections).
5. **Beverages:** Tea (plant specimen, tea leaves), Coffee (plant specimen, beans).
6. **Sources of oils and fats:** Coconut- T.S. nut, Mustard–plant specimen, seeds; tests for fats in crushed seeds.
7. **Essential oil-yielding plants:** Habit sketch of *Rosa*, *Vetiveria*, *Santalum* and *Eucalyptus* (specimens/photographs).
8. **Rubber:** specimen, photograph/model of tapping, samples of rubber products.
9. **Drug-yielding plants:** Specimens of *Digitalis*, *Papaver* and *Cannabis*.
10. **Tobacco:** specimen and products of Tobacco.
11. **Woods:** *Tectona*, *Pinus*: Specimen, Section of young stem.
12. **Fiber-yielding plants:** Cotton (specimen, whole mount of seed to show lint and fuzz; whole mount of fiber and test for cellulose), Jute (specimen, transverse section of stem, test for lignin on transverse section of stem and fiber).

Suggested Readings

- Kochhar, S.L. (2012). Economic Botany in Tropics, MacMillan & Co. New Delhi, India.
- Swaminathan, M.N. & Jain, R.S. Biodiversity: Implications for global security, Macmillan, 1982.
- CSIR 1986. The Useful Plants in India.
- Kothari, 1987. Understanding biodiversity, life sustainability and equity, Orient Longman.
- Sharma, O.P. 1996. Hills Economic Botany.
- Thakur, R.S. et al., Major Medicinal Plants.
- Kocchar, S.L. 1998. Economic Botany of Tropics..
- Richard B. Primack. 1993. Essentials of Conservation Biology.
- Heywood, V.H. & Watson, R.T. 1995. Global Biodiversity Assessment.
- Peter B. Kaufman et al., 1999. Natural Products from Plants.
- Negi, S.S. 1993. Biodiversity and its Conservation in India. M. Sc. Botany

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VERTEBRATES & DEVELOPMENTAL BIOLOGY

COURSE OBJECTIVE:-

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

Syllabus:

- 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.
- UNIT – II**
1. Urochordata – Type study of Herdmania (excluding Development). Cephalochordata – Type study of Amphioxus. Affinities of Amphioxus.
- UNIT – III**
1. Comparison between Petromyzon and Myxine.
 2. Comparative account of limb bones and girdles of vertebrates (Amphibia, Reptiles, Birds and Mammals).
- UNIT – IV**
1. Parthenogenesis.
 2. Gametogenesis.
 3. Fertilization, Patterns of cleavage
- 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

COURSE OUTCOME:-

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

PRACTICALS:-

- 1.The practical work will be based on theory syllabus and the candidates will be required to show knowledge of the following :
- 2 Study of museum specimens and slides relevant to theory paper.
- 3 Osteology
 - a. Girdles and limb bones of : Frog, Varanus, Fowl and Rabbit
- 4 Cell Biology:Study of DNA and RNA Models.
 - a. Preparations of Polytene chromosome in chironomous larva
 - b. Squash preparation of chromosome from Onion root tip.

c. Study of Meiosis in Grasshopper testis.

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

PRACTICAL:-

Major Dissection

Spotting

Embryology

Viva

Practical Record/Collection

Reference Books:

- Introduction to Chordates - Majumuria
- Modern text book of zoology vertebrate- R.L.Kotpal
- R.P.Unified – Zoology Dr. S.N.Saxena
- Unified Zoology – U.K. Tiwari and V.K. Singh
- Unified Practical Zoology – Dr. A.K. Kushrestha
- Laboratory Techniques by Swaroop, Arora&Pathak
- Development Biology – VeerbalaRastogi
- Pranivigyan Books of Hindi Granth Academy
- Fundamentals of Zoology – Ghosh& Manna

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CHEMISTRY –II

Syllabus:

- UNIT - I**
- 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.
- B.** Periodic Properties : Atomic and ionic radii, ionization energy, electron affinity and electronegativity : definition, method of determination, trends in periodic table and applications.
- C.** Chemical Bonding : Covalent bond- valence bond theory and its limitations, directional characteristic of covalent bond. Hybridization and shapes of simple molecules and ions. Valence Shell Electron Pair Repulsion (VSEPR) theory to NH_3 , SF_4 , ClF_3 , ICl_2 - and H_2O .
- UNIT - II**
- A.** Molecular Orbital theory for homonuclear and heteronuclear (CO and NO) diatomic molecules, multicenter bonding in electron deficient molecules, bond strength and the bond energy, % ionic character from dipole moment and electronegativity difference. Weak interactions, hydrogen bonding, van der Waals forces.
- B.** Ionic Solids : Ionic structures, radius ratio effect and coordination number, limitation of radius ratio rule, Lattice defects, semiconductors, lattice energy and Born-Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarizability of ions. Fajan's rule, Metallic bond, free electron, Valence bond and Band theories.
- C.** Noble Gases : Chemical properties of the noble gases, chemistry of xenon, structure and bonding in xenon compounds.
- UNIT - III**
- A.** s-Block Elements : Comparative study, diagonal relationships, salient features of hydrides, solvation and complexation tendencies including their function in biosystems, an introduction to alkyls and aryls.
- B.** p-Block Elements : Comparative study (including diagonal relationship) of groups 13-17 elements, compounds like hydrides, oxides, oxyacids and halides of groups 13-16.
- Hydrides of boron-diborane and higher boranes. Borazine, borohydrides. Fullerenes, carbides, fluorocarbons, silicates (structural principle), tetrasulphur tetranitride, basic properties of halogens, interhalogens.
- UNIT – IV**
- A.** Arenes and Aromaticity : Nomenclature of benzene derivatives. The aryl group, Aromatic nucleus and side chain structure of benzene, molecular formula and Kekule structure. Stability and carbon-carbon bond lengths of benzene, resonance structure. MO picture. Aromaticity the Huckel rule, aromatic ions. Aromatic electrophilic

substitution, general pattern of the mechanism, role of s and p complexes. Mechanism of nitration, halogenation, sulphonation, mercuration and Friedel-Crafts reaction. Energy profile diagrams. Activating and

deactivating substituents. orientation and ortho/para ratio. Side chain reactions of benzene derivatives. Birch reduction. Methods of formation and chemical reactions of alkylbenzenes and biphenyl.

B. Alkenes : Nomenclature of alkenes, methods of formation, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides, regio-selectivity in alcohol dehydration. The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes, mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroboration-oxidation, oxymercuration-reduction, Epoxidation, ozonolysis, hydration, hydroxylation and oxidation with KMnO_4 , polymerization of alkenes, Substitution at the allylic and vinylic positions of alkenes, Industrial applications of ethylene and propene.

UNIT – V

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

B. Alkyl and Aryl Halides : Nomenclature and classes of alkyl halides, methods of formation, chemical reactions; mechanisms of nucleophilic substitution reaction of alkyl halides, $\text{S}_\text{N}2$ and $\text{S}_\text{N}1$ reactions with energy profile diagrams.

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

PRACTICAL:-

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.

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

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इकाई -1

1. भारतीय संस्कृति
2. भारतीय समाज व्यवस्था
3. सभ्यता एव संस्कार
4. वैश्विक चेतना
5. समन्वयीकरण Hkkjrh; ,oa varjkZ"V^ah; lanHkZ esa

इकाई – 2

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

इकाई – 3

1. संचार संसाधन : laidZ के नए क्षितिज
2. समाचार पत्र
3. भारतीय प्रेस परिषद्
4. रेडियो

5. दूरदर्शन

इकाई – 4

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

इकाई – 5

1. कम्प्यूटर
2. नव्यकालीन कला
3. कथा : (कहानी) का अर्थ
4. मातृ भूमिगुप्त मैथिलीशरण : (कविता)
5. साहित्यकार का जीवन - भारती प्रेम .

विद्यार्थी के लिए सुझाव

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

BASIC COMPUTER & INFORMATION TECHNOLOGY-II

Course Objective:

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

Syllabus:

UNIT – I: Word Processing: Word

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

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UNIT – II: Introduction to Excel& Worksheet

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

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UNIT – III: INTRODUCTION TO POWER POINT

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

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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.

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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

COURSE CODE: IBBC602

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

Practicals:

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

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:

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

Course outcome:

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

BIO-DIVERSITY & SYSTEMATIC OF SEED PLANT

COURSE OBJECTIVES:-

- 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.

Syllabus:

- 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.
- UNIT – II** Morphology, Anatomy Reproduction and life cycle of Cycas, Pinus and Ephedra.
- 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.
- UNIT – IV** Diagnostic characteristics and Economic Importance of Families –Ranunculaceae, Brassicaceae, Malvaceae, Rutaceae, Fabaceae, and Apiaceae.
- UNIT – V** Diagnostic characteristics & Economic Importance of Families – Asteraceae, Asclepiadaceae, Solanaceae, Lamiaceae, Euphorbiaceae, Liliaceae and Poaceae.

COURSE OUTCOME:-

- 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

PRACTICAL:-

- 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 annus*) up to family level.

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MOLECULAR BIOLOGY

COURSE OBJECTIVES:-

- Discuss the structure and function of proteins including the roles of individual amino acids in protein folding, charge, acid/base properties, and protein-protein interactions, using hemoglobin as one example.
- Explain the principles of enzyme catalysis and how enzyme activity can be altered by drugs that act as competitive, non-competitive, or irreversible inhibitors.
- Analyze and interpret data and graphs related to protein expression and function, enzyme catalysis, and malfunctions of these processes in disease.
- Discuss chromatin structure and how it can be modified to affect gene expression.
- Explain the mechanisms of DNA replication and repair, RNA synthesis and processing, and protein synthesis.
- Describe how gene expression is regulated at the transcriptional and post-transcriptional level.

UNIT- I Nucleic acids : DNA as the carrier of genetic information. The Structures of DNA and RNA / Genetic Material DNA Structure:, DNA structure, , Types of DNA, Types of genetic material, denaturation and renaturation, cot curves; Organization of DNA-Prokaryotes, Viruses, Eukaryotes.RNA StructureOrganelle DNA -- mitochondria and chloroplast DNA.The Nucleosome ,Chromatin structure- Euchromatin, Heterochromatin

UNIT- II The replication of DNA , RNA priming; Various models of DNA replication, Enzymes involved in DNA replication Central dogma and genetic code Key experiments establishing-The Central Dogma (Adaptor hypothesis and discovery of mRNA template), Genetic code (deciphering & salient features)

UNIT- III Transcription Transcription in prokaryotes and eukaryotes. Principles of transcriptional regulation; Prokaryotes: Regulation of lactose metabolism and tryptophan synthesis in E.coli. Eukaryotes: transcription factors

UNIT- IV Processing and modification of RNA Split genes-concept of introns and exons, removal of introns, spliceosome machinery, splicing pathways, group I and group II intron splicing, alternative splicing eukaryotic mRNA processing(5' cap, 3' polyA tail); Ribozymes; RNA editing and mRNA transport.

UNIT- V Translation Ribosome structure and assembly, mRNA; Charging of tRNA, aminoacyl tRNA synthetases; Various steps in protein synthesis, proteins involved in initiation,

elongation and termination of polypeptides; Fidelity of translation; Inhibitors of protein synthesis;

COURSE OUTCOME:-

1. The biochemistry and molecular biology major will be able to use instrumentation in the design, execution, and critical interpretation of experiments.
2. The biochemistry and molecular biology major will be able to work responsibly, collaboratively, and ethically on teams in the development of scientific communities.
3. The biochemistry and molecular biology major will understand appropriate concepts, laboratory techniques, and quantitative analyses to solve current day problems in areas such as drug design, medicine, agriculture, biotechnology or other related scientific areas.
4. The biochemistry and molecular biology major will demonstrate proficiency in concepts, manipulations, and calculations in biochemistry and molecular biology.
5. The biochemistry and molecular biology major will be able to interpret primary research articles, identify gaps in current knowledge, and formulate both testable hypotheses and concrete future goals in areas that bridge chemistry and biology and communicate qualitative and quantitative ideas in spoken or written form.

PRACTICAL

1. Preparation of medium and raising E.Coli.
2. Isolation of genomic DNA from E.Coli.
3. DNA isolation .
4. DNA estimation by diphenylamine reagent/UV Spectrophotometry.
5. Study of DNA replication mechanisms through photographs (Rolling circle, Theta replication and semi-discontinuous replication).
6. Study of structures of prokaryotic RNA polymerase and eukaryotic RNA polymerase II through photographs.
7. Photographs establishing nucleic acid as genetic material (Messelson and Stahl's, Avery et al, Griffith's, Hershey & Chase's and Fraenkel & Conrat's experiments)
8. Study of the following through photographs: Assembly of Spliceosome machinery; Splicing mechanism in group I & group II introns; Ribozyme and Alternative splicing.

SUGGESTED READINGS

1. Watson J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M., Losick, R. (2007). Molecular Biology of the Gene, Pearson Benjamin Cummings, CSHL Press, New York, U.S.A. 6th edition.
2. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics. John Wiley and Sons Inc., U.S.A. 5th edition.
3. Klug, W.S., Cummings, M.R., Spencer, C.A. (2009). Concepts of Genetics. Benjamin Cummings. U.S.A. 9th edition.
4. Russell, P. J. (2010). i-Genetics- A Molecular Approach. Benjamin Cummings, U.S.A. 3rd edition.
5. Griffiths, A.J.F., Wessler, S.R., Carroll, S.B., Doebley, J. (2010). Introduction to Genetic Analysis. W. H. Freeman and Co., U.S.A. 10th edition.

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GENETICS

COURSE OBJECTIVE:-

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

Syllabus:

UNIT - I:

Heredity & Variation, Gene and Genetic Material

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 (a) Chemistry of Gene ; 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.

UNIT - II:

Cytoplasmic Inheritance, Gene Expression and Regulation

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

UNIT - III:

Linkage and Chromosomal Aberrations

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.

UNIT - VI:

Mutation and Applied Genetics

1. Types of Mutation.
2. Causes of mutation.
3. Mutagens- classification, Types & effects.
4. Gene therapy.

5. DNA finger printing.

UNIT - V: Human Genetics & Genetic Engineering

1. Human chromosomes, Elementary idea of Human Genome Project
2. Common genetic diseases in man (Autosomal syndromes, sex chromosome syndromes, diseases due to mutation-Sickle cell anaemia, Albinism & Alkaptonuria.
3. Multiple factors and blood groups.
4. Twins- physical traits, mental traits.
5. Techniques used in recombinant DNA technology. Construction of Chimeric DNA, Elementary idea of plasmids & vectors.
6. Gene cloning and Polymerase Chain Reaction (PCR) ,Gel Electrophoresis, Northern & Southern Blotting.

COURSE OUTCOME:-

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

PRACTICAL:-

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

SCHEME OF PRACTICAL EXAMINATION

1. Spotting (5) Spots
2. Squash preparation
3. Study of instruments / techniques related to applied genetics
4. Problems on Genetics
5. Viva-Voce
6. Practical Record and Collection.

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CHEMISTRY –III

Syllabus:

Physical Chemistry

UNIT – I Thermodynamics-1 Definition of thermodynamic terms: System, surrounding, Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process. Concept of heat and work.
First Law of Thermodynamics: Statement, definition of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship. Joule's Law: Joule Thomson coefficient and inversion temperature.
Calculation of w , q , dU and dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process. Thermochemistry: Standard state, standard enthalpy of formation: Hess's Law of heat summation and its application. Heat of reaction at constant pressure and at constant volume. Enthalpy of neutralization. Bond dissociation energy and its calculation from thermochemical data, temperature dependence of enthalpy, Kirchoff's equation.
Second Law of Thermodynamics- Need for the law, different statements of the law, Carnot cycle and its efficiency. Carnot theorem. Thermodynamic scale of temperature.

UNIT – II Thermodynamics-II (a) Concept of entropy: Entropy as a state function, entropy as a function of P&T, entropy change in physical change, Clausius inequality, entropy as criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases. Third Law of Thermodynamics: Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data, Gibbs and Helmholtz functions, Gibbs function (G) and Helmholtz function(A) as a thermodynamic quantities, A and G as a criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of G and A with P, V and T.
(b) Chemical equilibrium Equilibrium constant and free energy. Thermodynamic derivation of law of mass action. Le Chateliers's principle. Reaction isotherm and reaction isochore: Clapeyron equation and Clausius- Clapeyron equation, applications.
(c) Buffers: Mechanism of buffer action, Henderson-Hazel equation, Hydrolysis of salts.
(d) Corrosion: types, theories and methods of combating it.

Inorganic Chemistry

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

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

UNIT – IV (a) Coordination Compounds: Werner's coordination theory and its experimental

verification, EAN Concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, VBT of transition metal complexes.

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

Organic Chemistry

UNIT – V (a) Electromagnetic Spectrum: Absorption Spectra; UV absorption spectroscopy: Absorption laws (Beer-Lambert law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of conjugation.

Concept of chromophore and auxochrome. Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated enes and enones. IR absorption spectroscopy; molecular vibrations, Hook's law, selection rules, intensity and position of IR bands, measurement of IR spectrum, fingerprint region, characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds.

(b) Alcohols: Classification and nomenclature. Monohydric alcohols: nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters. Hydrogen bonding, acidic nature, reactions of alcohols. Dihydric alcohols: nomenclature, methods of formation, chemical reactions of vicinal glycols, oxidative cleavage [Pb(OAc)₄ and HIO₄] and pinacole-pinacolone rearrangement. Trihydric alcohols-nomenclature and methods of formation, chemical reactions of glycerol

(c) Phenols: Nomenclature, structure and bonding. 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, Hauben-Hoesch reaction, Lederer-Manasse reaction and Riemer-Tiemann reaction

(d) Ethers and Epoxides Nomenclature of ethers and methods of their formation, physical properties. Chemical reactions: cleavage and auto oxidation. Ziesel's method. Synthesis of epoxides. Acid and base-catalysed ring opening of epoxides, orientation of epoxide ring opening, reaction of Grignard and organolithium reagents with epoxides.

PRACTICAL:-

Time: 6 hours

Inorganic Chemistry 18 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 18 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 phthalate.

COURSE OUTCOME:-

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

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

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ENGLISH LANGUAGE AND SCIENTIFIC TEMPER

COURSE OBJECTIVES:-

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

Syllabus:

UNIT – I

1. Tina Morris : 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 Morris : A short extract from the Naked Ape
8. A.G. Gardiner : On the rule of the road

UNIT – II Comprehension of an unseen passage.

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

UNIT – IV Report Writing.

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

COURSE OUTCOMES:-

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

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HUMAN VALUES AND ETHICS

COURSE OBJECTIVES:-

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

Syllabus:

UNIT – I: Concept of value and value crisis in contemporary Indian Society.

1. Concept of value
2. Value crisis at- individual level
3. Value crisis at- Cultural level
4. Value crisis at- Societal level
5. The Indian concept of value.
6. Modern Approach to the study of Values.

UNIT – II: Moral and Ethical Human values.

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

UNIT – III: Moral Values in Profession.

1. What is Profession?
2. Professional Ethos
3. Code of Professional Ethics
4. Corporate social Responsibility

UNIT – IV: Gender sensitization.

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

UNIT – V: Co- Curricular Activities and value Education.

1. Games and sports
2. Literary and cultural Activities

3. NSS, NCC activates
4. A New Approach to Human Value Freedom, Creativity Love & Wisdom

COURSE OUTCOMES:-

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

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

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STRUCTURE, DEVELOPMENT & REPRODUCTION IN FLOWERING PLANT

COURSE OBJECTIVES:-

- 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

Syllabus:

- 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.
- 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.
- 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.
- 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.
- 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.

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.

PRACTICAL:-

- 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

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PLANT METABOLISM

COURSE OBJECTIVES:-

- Describe levels of organization and related functions in plants and animals.
- Identify the characteristics and basic needs of living organisms and ecosystems.
- Explain the processes of growth and development in individuals and populations.
- Design and critically assess the scientific investigations they perform.
- Demonstrate critical thinking skills.

UNIT- I **Concept of metabolism** Introduction, anabolic and catabolic pathways, regulation of metabolism, role of regulatory enzymes (allosteric ,covalent modulation and Isozymes).

UNIT- II **Carbon assimilation** Historical background, photosynthetic pigments, role of photosynthetic pigments (chlorophylls and accessory pigments), antenna molecules and reaction centres, photochemical reactions, photosynthetic electron transport, PSI, PSII, Q cycle, CO₂ reduction, photorespiration, C₄pathways; Crassulacean acid metabolism; Factors affecting CO₂ reduction.

UNIT- III **Carbohydrate metabolism and Carbon Oxidation** Synthesis and catabolism of sucrose and starch. Glycolysis, fate of pyruvate, regulation of glycolysis, oxidative pentose phosphate pathway, oxidative decarboxylation of pyruvate, regulation of PDH, NADH shuttle; TCA cycle,amphibolic role, anaplerotic reactions, regulation of the cycle, mitochondrial electron transport, oxidative phosphorylation, cyanide-resistant respiration, factors affecting respiration.

UNIT- VI **Lipid metabolism** Synthesis and breakdown of triglycerides, β -oxidation, glyoxylate cycle, gluconeogenesis and its role in mobilisation of lipids during seed germination, α oxidation.

UNIT- V **Nitrogen metabolism and Mechanisms of signal transduction** Nitrate assimilation, biological nitrogen fixation (examples of legumes and non-legumes); Physiology and biochemistry of nitrogen fixation; Ammonia assimilation and transamination. Receptor-ligand interactions; Second messenger concept, Calcium calmodulin, MAP kinase cascade.

COURSE OUTCOMES:-

- be able to describe the roles of carbohydrates and carbohydrate metabolism in plants and yeasts
- be able to describe the role of amino acids in plant and yeast metabolism and explain their importance in the formation of flavour and aroma compounds of economic importance.
- be able to use knowledge of protein structure and function to explain the role of enzymes in plant and yeast metabolism
- be able to describe the roles of different classes of lipids involved in plant and yeast metabolism and explain their role in forming economically important flavour and aroma compounds and their influence on berry properties and yeast fermentation
- be able to describe plant secondary metabolite processes and the unique contribution of these metabolites in grape and wine production.

PRACTICAL

1. Chemical separation of photosynthetic pigments.
2. Experimental demonstration of Hill's reaction.
3. To study the effect of light intensity on the rate of photosynthesis.
4. Effect of carbon dioxide on the rate of photosynthesis.
5. To compare the rate of respiration in different parts of a plant.
6. To demonstrate activity of Nitrate reductase in germinating leaves of different plant sources.
7. To study the activity of lipases in germinating oilseeds and demonstrate mobilization of lipids during germination.
8. Demonstration of fluorescence by isolated chlorophyll pigments.
9. Demonstration of absorption spectrum of photosynthetic pigments.

Suggested readings

1. Hopkins, W.G. and Huner, A. (2008). Introduction to Plant Physiology. John Wiley and Sons. U.S.A. 4th edition.
2. Taiz, L., Zeiger, E., MØller, I.M. and Murphy, A (2015). Plant Physiology and Development. Sinauer Associates Inc. USA. 6th edition.
3. Harborne, J.B. (1973). Phytochemical Methods. John Wiley & Sons. New York

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ANIMAL PHYSIOLOGY

COURSE OBJECTIVE:-

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

Syllabus:

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.

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.

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.

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.

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.

COURSE OUTCOMES:-

The student have a knowledge of physiological diseases and treatment

PRACTICAL:-

1. Detection of protein, carbohydrate and lipid.
2. Study of Human salivary enzyme activity in relation to pH.
3. Detection of nitrogenous waste products – Ammonia & Urea
4. Use of Kymograph
5. Exercise on Haematology – Counting of RBC /WBC and Blood grouping in blood samples.
6. Estimation of Haemoglobin in blood samples.
7. 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.

8. 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.
9. Histological study of Visceral organs - T.S of Lungs, L.S. of Kidney
10. Histological study of Muscles – Striated, Unstriated & Cardiac muscle.

PRACTICAL:-

1. Spotting
2. Biochemical test
3. Physiological experiment
4. Exercise on enzyme activity
5. Viva
6. Practical

record/collection

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CHEMISTRY-IV

Syllabus:

Physical Chemistry

UNIT – I Phase equilibrium Statement and the meaning of the terms: phase component and the degree of freedom, derivation of the Gibbs phase rule. Phase equilibria of one component system: water, CO₂ and S system. Phase equilibria of two component system: solid liquid equilibria, simple eutectic: Bi-Cd, Pb-Ag system, desilverisation of lead.

Solid solutions: compound formation with congruent melting point (Mg-Zn) and incongruent melting point, (NaCl-H₂O) (FeCl₃-H₂O) and (CuSO₄-H₂O) system. Freezing mixtures, acetone-dry ice.

Liquid-liquid mixtures: Ideal liquid mixtures, Raoult's and Henry's law. Non-ideal system azeotropes: HCl-H₂O and ethanol water systems.

Partial miscible liquids: Phenol-water, trimethylamine-water and nicotine-water systems. Lower and upper consolute temperature. Effect of impurity on consolute temperature. Immiscible liquids, steam distillation, Nernst distribution law: thermodynamic derivation, applications.

UNIT – II Electrochemistry Electrical transport- conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of specific conductance and equivalent conductance with dilution.

Migration of ions and Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald's dilution law, its uses and limitations. Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only). Transport number: Definition and determination by Hittorf method and moving boundary method. Application of conductivity measurements: determination of degree of dissociation, determination of K_a of acids, determination of solubility product of sparingly soluble salt, conductometric titrations.

Types of reversible electrodes: gas-metal ion, metal-metal ion, metal- insoluble salt-anion and redox electrodes. Electrode reactions, Nernst equation, derivation of cell E.M.F and single electrode potential, standard hydrogen electrode- reference electrodes- standard electrode potential, sign conventions, electrochemical series and its significance. Electrolytic and Galvanic cells, reversible and irreversible cells. Conventional representation of electrochemical cells.

EMF of a cell and its measurements. Computation of cell EMF. Calculation of thermodynamic quantities of cell reaction (G, H and K), polarization, over potential and hydrogen over voltage.

Concentration cell with and without transport, liquid junction potential, application of concentration cells, valency of ions, solubility product and activity coefficient, potentiometric titration. Definition of pH and pK, determination of pH using hydrogen,

quinhydrone and glass electrodes by potentiometric methods.

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

Organic Chemistry

- UNIT – IV** (a) Aldehydes and ketones: Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes and ketones from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties. Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives. Wittig reaction, Mannich reaction.
- Use of acetals as protecting group. Oxidation of aldehydes, Baeyer-Villiger oxidation of ketones, Cannizzaro reaction. Meerwein-Ponndorf-Verley (MPV), Clemmensen, Wolf-Kishner, LiAlH₄ and NaBH₄ reductions, Halogenation of enolizable ketones. An introduction of alpha, beta unsaturated aldehydes and ketones
- (b) Carboxylic Acids: Nomenclature, structure and bonding, physical properties, acidity of carboxylic acids, effects of substituents on acid strength. Preparation of carboxylic acids, reactions of carboxylic acids. Hell-Volhard-Zelinsky reaction. Synthesis of acid chlorides, esters and amides. Reduction of carboxylic acids. Mechanism of decarboxylation. Methods of formation and chemical reactions of unsaturated monocarboxylic acids. Dicarboxylic acids: Methods of formation and effect of heat and dehydrating agents. Methods of formation and chemical reactions of halo acids, hydroxy acids, malic, tartaric and citric acids.
- Carboxylic acid derivatives Structure and nomenclature of acid chlorides, esters, amides (urea) and acid anhydrides. Relative stability of acyl derivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution. Preparation of carboxylic acid derivatives, chemical reactions. Mechanism of esterification and hydrolysis (acidic and basic).
- UNIT – V** 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.
- Halonitroarenes: reactivity, structure and nomenclature. Structure and nomenclature of amines, physical properties and stereochemistry of amines. Separation of mixture of primary, secondary and tertiary amines. Structural features affecting basicity of

amines. Amine salt as phase transfer catalysts. Preparation of alkyl and aryl amines (reduction of nitro compounds, nitriles), reductive amination of aldehydic and ketonic compounds. Gabriel-Phthalamide reaction, Hoffmann bromamide reaction, Reactions of amines, electrophilic aromatic substitution in aryl amines, reaction of amines with nitrous acid. Synthetic transformation of aryl diazonium salts, azo coupling.

PRACTICAL:-

Time: 6 hour

Organic Chemistry

Qualitative analysis

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

Physical Chemistry

Transition temperature

1. Determination of transition temperature of given substance by thermometric, dilatometric method (e.g.) ($MnCl_2 \times 4H_2O / SrBr_2 \times 2H_2O$). Phase equilibrium.
2. To study the effect of solute (e.g. NaCl, scenic acid) on the critical solution temperature of two partially miscible liquid (e.g., phenol water system) and to determine the concentration of that soluble in phenol water system.
3. To construct the phase diagram of two component (e.g., diphenyl amine benzophenone) by cooling curve method.
4. To determine the enthalpy of neutralization of weak acid/weak base versus strong acid/ strong base and determine the enthalpy of ionization of the weak acid/ base.

Inorganic chemistry-Quantitative Volumetric Analysis:

5. Estimation of ferrous and ferric by dichromate method.
6. Estimation of copper using thiosulphate.

COURSE OUTCOME:

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

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Botany-V Plant physiology and biochemistry

Course Objective:

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

Syllabus:

- 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.
- 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.
- 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.
- 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 Hormones, mode of action of Auxins, Gibberellins, Cytokinin and Abscissic acid.
- 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.

Course Outcome :

- 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.

PRACTICAL:

- Study of instruments.
- Experiment to demonstrate transpiration in plants by belljar 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 test the presence of
- 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.

Suggested readings:

- Campbell, M.K. 1999. Biochemistry. Saunders College Publishing, New York.
- Conn, E.E. and Stumpf P.K. et al., 1999. Biochemistry. John Wiley and Sons. New Delhi.
- David T. Dennis and David H. Trurpin (Eds.) 1993. Plant Physiology. Biochemistry and Molecular Biology. Longmann Scientific and Technical, Singapore.
- Fisher J. et. al., 1999. Instant notes in Chemistry for Biologists. Viva Books Pvt. Ltd. New Delhi.
- Goodwin and mercer 1996. Introduction to plant Biochemistry. CBS Publishers and Distributors, New Delhi.
- Hames, B.D. et al., 1999. Instant notes in Biochemistry. Viva books Pvt. Ltd. New Delhi.
- Harborne, J.B. 1999. Plant Biochemistry. Chapman & Hall, New Delhi.

- Jain, J.L. 2000. Fundamentals of Biochemistry. S. Chand & Co. New Delhi.
- Plummer, D.T. 1996. An Introduction to practical Biochemistry. McGraw Hill
- Satyanarayana, U. 1999. Biochemistry. Books and Allied (P) Ltd. Calcutta.
- Wilson and Goulding. 1992. Biologists Guide to Principles and Techniques of Practical
- Hopkins, W.G.1995. Introduction toPlantPhysiology.John Wiley & Sons, Inc, New York. USA.
- Lodish, H. Berk, A. Zipursky, S.L. Matsudaira, P. Baltimore, D. & Darnell, J. 2000Molecular Cell Biology, W.H. Freeman and company, New York. USA.
- Moor,T.C.1989 Biochemistry And Physiology of Plant Hormones Springer- Verlag,New York, USA.
- Nobel, P.S. 1999 Physiochemical and Environmental Plant physiology Academic Press, San Diego, USA.
- Sallisbury F.B. and Ross, C.W. 1991 and 2012, Plant Physiology Widsworth, Publishing Co. California. USA.
- Unified Botany Book
- R.P. Singh Plant Physiology
- Pandey Biochemistry and physiology
- Rastogi Biochemistry m c graw hill pub

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Botany-V Plant Pathology

Course Code: 3SBBO502H

Course Objectives:

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.

Syllabus:

- 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.
- 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.
- 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.
- 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.
- 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.

Course Outcomes:

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

PRACTICAL:

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.

Suggested readings:

- Plant pathology by R S Mehrotra, Ashok Aggarwal
- Plant pathology by P.D. Sharma
- Plant pathology by G.S. Agrious

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Botany-V Plant Resource Utilization And Conservation

Course Objective:

To enable the students:

- To understand the threats of air, soil and water pollution
- To understand the economic importance of different plants
- To understand the various threats of biodiversity and the strategies for conservation

Unit I: Air pollution: Classification and properties of air pollutants and their effects on plants; Ozone layer and Ozone hole; climate change. Water pollution: Domestic and industrial water pollution; oil pollution; Soil pollution; acidification, agrochemical pollution; contamination by metalliferous wastes.

Unit II: Botany, cultivation and uses of: 1) Food crops: Rice, Wheat and Sorghum. 2) Vegetable crops: Potato, tomato and chillies Distribution, description and uses of: 3) Timber yielding plants: *Tectona*, *Dalbergia* and *Rosewood*. 4) Medicinal plants: *Rawolfia*, *Withania*, *Embllica*, *Andrographis*, *Aloe* and *Neem*. 5) Production and applications of biofuels – Biogas, hydrogen and methane.

Unit III: Phytogeography – Hotspots of India and world. General account on activities of DBT, Botanical Survey of India and NBPGR.

Unit IV :Biodiversity – Current concept and status in India. Conservation of Biology. Current practice in conservation in India and abroad. Organisations involved in resource conservation IUCN, WWF, UNEP, UNESCO.

Unit V: Strategies for *in situ* conservation – Protected areas, Wildlife sanctuaries, National parks, Biosphere reserves, mangroves. Strategies for *ex situ* conservation – Botanical Gardens, Seed banks, Field gene banks, *in vitro* conservation

Course Outcomes:

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

- Understand the various uses of plants; biodiversity status, loss and management strategies.
- Describe economically important plants with binomial names, family and uses
- Analyse the biogeography, status and loss of biodiversity, initiatives for biodiversity conservation

PRACTICAL:

1. To study the medicinal plants and its taxonomic description.
2. To study the food crops plants and its taxonomic description.
3. To study the timber yielding plants and its taxonomic description.
4. Production and applications of biofuels
5. To Study of national park and Botanical garden.

Suggested readings:

- Singh, Pandey, Jain – Economic botany, Rastogi Publication.
- P.D.Sharma, Ecology and Environment, Rastogi Publication.

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Course Code: 3SBBO504H

Botany-V Plant structure and Development

Course objectives:

To enable the students:

- To understand the development of SAM and RAM
- To understand the Mechanism of Seed Germination and growth
- To understand the principles of microscopy

Unit I-Introduction: Unique features of plant development; differences between animal and plant development. Shoot development; Organization of the shoot, apical meristem (SAM); cytological and molecular analysis of SAM; control of cell division and cell to cell communication; secretory ducts and laticifers. Structure, differentiation and phylogenetic specializations of xylem and phloem.

Unit II- Dormant and active vascular cambium and its abnormal activity, Wood development in relation to environmental factors. Leaf growth and differentiation; determination phyllotaxy, control of leaf form; differentiation of epidermis (with special reference to stomata and trichomes) and

mesophyll.

Unit III-Root development: Organization of root apical meristem (RAM); cell fates and lineages; vascular tissue differentiation; lateral roots; root hairs; root microbe interaction.

Unit IV-Seed germination and seedling growth: Metabolism of nucleic acids, Proteins and mobilization of food reserves; tropisms; hormonal control of seedling growth; gene expression; use of mutants in understanding seedling development.

Unit V-Latent life dormancy: Importance and types of dormancy, seed dormancy, overcoming seed dormancy, bud dormancy; Senescence and programmed cell death (PCD); Basic concepts; types of cell death, PCD in the life cycle of plants, metabolic changes associated with senescence and its regulation, influence of hormones and environmental factors on senescence; Principles of microscopy (Light and electron microscopy).

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

- Understand the various developments of SAM and RAM
- Describe the mechanism of seed germination and seed growth
- Understand the process of microscopy

PRACTICAL:

- Examination of shoot apices in a monocotyledon in both T.S. and L.S. to show the origin and arrangement of leaf primordia.
- Study of alternate and distichous; alternate and superposed; opposite and superposed; opposite and decussate leaf arrangement. Examination of rosette plants (Launaea, Mullugo, Raphanus, Hyoscyamus, etc.) and induction of bolting under natural conditions as well as by GA treatment.
- Microscopic examination of vertical sections of leaves such as Cannabis, Nicotiana, Nerium, Zea mays and Triticum to understand the internal structure of leaf tissues and trichomes, glands, etc. Also study the C₃ and C₄ leaf anatomy of plants.
- Study of epidermal peels of leaves such as Coccinia, Gaillardia, Tradescantia, Notonea, etc. To study the development and final structure of stomata and prepare stomatal index. Demonstration of the effect of ABA on stomatal closure.
- Study of whole roots in monocots and dicots. Examination of L.S. of root from a permanent preparation to understand the organization of root apical meristem and its derivatives (use maize, aerial roots of banyan, Pistia, Jussiaea, etc.). Origin of lateral roots. Study of leguminous roots with different types of nodules.
- Study of permanent tissues.

Suggested readings

- Singh, Pandey and Jain, Text book of botany structure development and reproduction in Angiosperms. (Rastogi Publication).
- Unified botany for degree students S.B. Agrawal Shival Agrawal and Company.
- Dr. S.B. Agrawal and Dr. Amit Agrawal. Diversity of microbes and cyptogams.
- Fahn, A. Plant Anatomy (4th Ed.), 1990.
- Easu, K. Anatomy of Seed Plants.

- Easu, K. Plant Anatomy, 2nd Ed. Wiley N.Y. 1965.
- Fahh, A. 1982. Plant Anatomy (3 rd Ed.), Pergamon Press, Oxford.

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Course Code: 3SBBO505H

Botany-V Biology and diversity of Gymnosperms

Course objectives:

1. Be able to compare and contrast the characteristics of seed, nonseed, and nonvascular plants.
2. Be able to list the uses of some common gymnosperm plants, such as pines and ginkgoes.
3. Be able to list some of the uses of flowering plants.
4. It has been stated that the ancestor of flowering plants most likely was a gnetalean plant (or at least a plant closely related to them). What evidence supports this?
5. How might the fact that a species is monoecious or dioecious affect your decision to use it as a crop plant? As a landscape plant?

6. Discuss the type of seeds produced by gymnosperms, as well as other characteristics of gymnosperms

7. State which period saw the first appearance of gymnosperms and explain when they were the dominant plant life

8. List the four groups of modern-day gymnosperms and provide examples of each

UNIT-I

- General Characteristics,
- Classification,
- Distribution of Gymnosperms in India,,
- Economic Importance,
- Evolutionary Tendencies in Gymnosperms Indian Contribution to Gymnosperms.

UNIT-II

- General Characteristics of fossil Gymnosperms,
- (Pteridospermales): Lygenopteris, Medullosa,
- Glossopteris, Caytonia, Pentoxylon,

UNIT-III

- General characteristics of (Cycadeoidales&Cycadales):
- Bennettitales,
- Williamsonia,
- Cycadeoidea,
- Cycas,
- Zamia Nilssonia.

UNIT-IV

- General Characteristics of Ginkgoales,
- Corditales and Coniferales: Ginkgo,
- Cordites,
- Cedrus,
- Pinus,
- Araucaria,
- Cryptomeria,
- Thuza,
- Cupressus,
- Podocarpus,
- Taxux.

UNIT-V

- General Characteristics of Ephedrales,
- Welwitschiales And Gnetales :
- Ephedra,
- Welwitschia,
- Gnetum.

Course Outcomes:

- List the feature of an organism that is needed to qualify it as a plant.
- List examples of plants.
- Define the term *alternation of generations*.
- Diagram the life cycle of a moss and compare it to the life cycle of a fern.
- Know the differences among the plant groups.
- Describe the evolutionary relationships among plants.
- Explain how plants adapted to terrestrial habitats.
- Describe the advantage of vascular tissue to plants.
- Differentiate among roots, stems, and leaves.
- Distinguish between vascular and nonvascular tissue.
- Compare gymnosperms and angiosperms.
- Define and contrast homosporous and heterosporous
- discuss the evolutionary advantage of heterosporous over homosporous
- identify the parts of a seed and discuss why reproducing by seeds is an advantage compared to reproducing by spores
- discuss the life cycle of a pine

PRACTICAL:

- Study of Gymnosperms -morphological, anatomical and preparing slide.
- Study of Cycas cone and preparing slide
- Study of Thuza(young,old stem) and preparing a temporary slide.
- Study of Pinus, morphological, anatomical and preparing slide.
- Study of Thuza(young,old root) and preparing a temporary slide.
- Study of various meristems and plant tissues by permanent and temporary slides.
- Identification of plant organs on the basis of anatomy
- Study of anatomy of root, stem and leaves by double staining method
- Comparative study of anatomy of vegetative and reproductive parts of To study permanent slide of various Gymnosperms

Suggested readings

- Biswas, C. and Johri, B.M. 1999. The Gymnosperms. Narosa Publishing House, New Delhi.
- Chamberlain, C.J. 1955. Gymnosperms. Structure and Evolution.
- Chamberlain, C.J. 2000. Gymnosperms. C B S Publishers and Distributors, New Delhi.
- Sporne, K.R. 1986. Morphology of Gymnosperms. Hutchinson University Press.

- Vashishta, P.C. 1999. Gymnosperms, S. Chand & Company Ltd. New Delhi.
- David F. Cutler et. al. 2007. Plant Anatomy: An Applied Approach, Wiley-Blackwell.
- William C. Dickison 2000. Integrative Plant Anatomy, Academic P
- Bhatnager, S.P. and Moitra, A. 1996; Gymnosperm. New Age International, Pvt. Ltd New Delhi.
- Chamberlin, Gymnosperms- Structure & Evolution ; CBS Publisher & Distributors Delhi.
- Singh, H. 1978 Embryology of Gymnosperms, GebruderBortrager, Berlin
- Shukla A.C. & Mishra S.P. Essentials of Paleobotany; Vikash Publishing House Pvt. Ltd. Delhi, Bombay.
- Singh Pandey Jain Botany book.

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CourseCode:3SBBO601H

Botany-VI Plant ecology, biodiversity and phytogeography

Course Objectives:

- 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 benthic marine algal distributions with a

Syllabus:

- 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.
- 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.
- 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.

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 Pradesh, Climate change and Ozone holes.

UNIT – V Pradesh, Biosphere reserves, Sanctuaries 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.

Course 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)

Course Code: 3SBBO601

PRACTICAL:

- 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.

Suggested readings:

1. Odum, E.P. (2005). Fundamentals of ecology. Cengage Learning India Pvt. Ltd., New Delhi. 5th edition.
2. Singh, J.S., Singh, S.P., Gupta, S. (2006). Ecology Environment and Resource Conservation. Anamaya Publications, New Delhi, India.
3. Sharma, P.D. (2010). Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition.
4. Wilkinson, D.M. (2007). Fundamental Processes in Ecology: An Earth Systems Approach. Oxford University Press. U.S.A.
5. Kormondy, E.J. (1996). Concepts of ecology. PHI Learning Pvt. Ltd., Delhi, India. 4th edition.

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Botany-VI ETHNOBOTANY

Course Code: 3SBBO602H

Course Objectives:

To enable the students:

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

Syllabus:

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.

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.

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.

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.

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.

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.

Course Code: 3SBBO602H

PRACTICAL:

- 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.

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Course Code: 3SBBO603H

Botany-VI Plant Systematics

Course Objectives:

- The course will give students an introduction to diversity in vascular plants with emphasis on systematics and evolution.
- Revision of evolutionary kinship and morphological characteristics of the most important vascular plant groups including cultivated crops. There will be special emphasis on crops.
- Students will gain practical experience in basic molecular and phylogenetic methods.

Unit 1: Identification Field inventory; Functions of Herbarium; Important herbaria and botanical gardens of the world and India; Virtual herbarium; E-flora; Documentation: Flora, Monographs, Journals; Keys: Single access and Multi-access

Unit 2: Taxonomic hierarchy, Concept of taxa (family, genus, species); Categories and taxonomic hierarchy; Species concept (taxonomic, biological, evolutionary).

Unit 3: Botanical nomenclature, Principles and rules (ICN); Ranks and names; Typification, author

citation, valid publication, rejection of names, principle of priority and its limitations; Names of hybrids

Unit 4: Systems of classification , Major contributions of Theophrastus, Bauhin, Tournefort, Linnaeus, Adanson, de Candolle, Bessey, Hutchinson, Takhtajan and Cronquist; Classification systems of Bentham and Hooker (upto series) and Engler and Prantl (upto series); Brief reference of Angiosperm Phylogeny Group (APG III) classification.

Unit 5: Phylogeny of Angiosperms, Terms and concepts (primitive and advanced, homology and analogy, parallelism and convergence, monophyly, Paraphyly, polyphyly and clades).origin& evolution of angiosperms; co-evolution of angiosperms and animals; methods of illustrating evolutionary relationship (phylogenetic tree, cladogram)

Course Outcomes:

- Understand and describe plant diversity, evolution, classification and distribution.
- Understand and describe plant morphology from an evolutionary and systematic perspective.
- Recognize and name a selection of families and important plant groups.
- Perform molecular systematic work and easier phylogenetic analysis
- *Perform botanical fieldwork and collection of material.

PRACTICAL:

1. Study of vegetative and floral characters of the following families (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification):

Ranunculaceae - Ranunculus, Delphinium

Brassicaceae - Brassica, Alyssum / Iberis

Myrtaceae - Eucalyptus, Callistemon

Umbelliferae - Coriandrum /Anethum / Foeniculum

Asteraceae - Sonchus/Launaea, Vernonia/Ageratum, Eclipta/Tridax

Solanaceae - Solanum nigrum/Withania

Lamiaceae - Salvia/Ocimum

Euphorbiaceae - Euphorbia hirta/E.milii, Jatropha

Liliaceae - Asphodelus/Lilium/Allium

Poaceae - Triticum/Hordeum/Avena

2. Field visit (local) – Subject to grant of funds from the university.
3. Mounting of a properly dried and pressed specimen of any wild plant with herbarium label (to be submitted in the record book).

Suggested Readings :

1. Singh, G. (2012). Plant Systematics: Theory and Practice. Oxford & IBH Pvt. Ltd., New Delhi. 413rd edition.
2. Jeffrey, C. (1982). An Introduction to Plant Taxonomy. Cambridge University Press, Cambridge.
3. Judd, W.S., Campbell, C.S., Kellogg, E.A., Stevens, P.F. (2002). Plant Systematics-A Phylogenetic Approach. Sinauer Associates Inc., U.S.A. 2nd edition.
4. Maheshwari, J.K. (1963). Flora of Delhi. CSIR, New Delhi. 5. Radford, A.E. (1986). Fundamentals of Plant Systematics. Harper and Row, New York.

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Botany-VI Plants & Society Course Code: 3SBBO604H

Course objectives:

1. Students will gain an appreciation for the plants in their world.

2. Students will develop an understanding of how plants grow.
3. Students will gain an understanding of how plants are used by people.
4. Students will be able to identify and label the basic parts of a plant, including: root, stem, leaves, flower, and petals, by creating their own flower and explaining it to the teacher or their classmates.
4. Introduce children to the concept that plants have various parts.
5. Help students to understand the basic functions of each of these structures.
6. Children will learn about plants and the elements (food, water, and sun) necessary for plant growth.

Unit.1 History of plants and development of society, Role of plants in tracing human history, green revolution:- benefits and adverse consequences. Innovations for meeting world food demands. Early domestication centers of major cultivated plants, Plants in Mythology, folklores Role of Ethnobotany in relation to development of society.

Unit.2 Plants & Human Health, Usage of plants in different systems of medicine allopathic, Homeopathic Aurvedic, Herbal Medicine, and concept of Herbal Cosmetic. Plants as health hazards. Food spoilage. Viral, Bacterial and fungal diseases of human beings.

Unit.3 Plants in Enterprenural Areas-A: Techniques of cultivation and marketing of few Chlorophytum, Guggul, Commiphera wightii, Rauwolfia serpentina. Plants and other uses : Agriculture & Horticulture.

Unit.4 Plants in Enterprenural Areas - B: Use of plants in earning livelihood - Such as Bamboos, Rattans, Raw Materials of papermakings, Gums tannins, dyes, resins and fruits. Techniques of cultivation and marketing of - Aromatic Plants - Lemon grass, plasma Rosa, Floriculture - rose and gladioli.

Unit.5 Plants in Enterprenural Areas - C: Techniques of cultivation and marketing of - Mushroom Cultivation, Nursery management, Vermiculture & Vermicompost. Mass cultivation of few plants using tissue culture techniques. Bonsii Techniques.

Course Outcomes:

- a. Plants are *like* other organisms in regard to: basic metabolism, sexual reproduction, clonal reproduction, hormonally regulated development, ability to respond to the environment, diversity and evolution.
- b. Plants are *unique* organisms in: their varied life histories - especially a sporic one with alternation of generations; their role as primary producers in food webs, serving as the interface organisms between the organic and inorganic worlds *via* mineral assimilation and photosynthesis; and the oxygenation of the atmosphere.
- c. Plants serve as an important source of products: food, fiber, flavorings, feed, fuel, pharmaceuticals, etc

PRACTICAL:

1. Identification of economically important plant products- their binomials, families and morphology of the parts used.
2. Submission of digital photographs with description of 5 wild medicinal plants and 5 wild edible plants.
3. Usage of plants in different systems of medicine
allopathic, Homeopathic, Ayurvedic, Herbal Medicine
4. Techniques of cultivation and marketing of - Mushroom Cultivation.
5. Techniques of cultivation and marketing of - Aromatic Plants

Suggested Readings:

1. Jain, S.K. (1989). Method and Approach in Ethnobotany. Society of Ethnobotany, Lucknow.
2. Pal, D.C. and Jain, S.K. (1998). Tribal Medicine, NayaPrakash Publishers, Kolkata.
3. Pandey, B.P. (1992). Economic Botany. (S. Chand and Sons Co., New Delhi).
4. Verma, (1998). Text book of Economic Botany, Embay Publishers, New Delhi.

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Botany-VI Plant cell ,Tissue and Organ Culture

Course Code: 3SBBO605H

Course objectives: To enable the students:

- To understand the basic principles and methodologies of plant tissue culture
- To learn various methods of Tissue Culture and secondary metabolites production.

Unit I: General introduction, history scope, concept of cellular differentiation and totipotency;Tissue culture media; preparation and sterilization procedures; Anther culture and production of androgenic haploids, bulbosum method.

Unit II: Meristem culture and production of disease free plants; Cell culture and production of secondary metabolites / natural products; Embryo culture.

Unit III: Callus culture, somatic embryogenesis and production of synthetic seeds; Endosperm

culture.

Unit IV: Somaclonal and gametoclonal variation; Clonal propagation; Cryopreservation, germplasm storage, and gene banks.

Unit V: Somatic hybridization: Protoplast isolation, fusion and culture, hybrid selection and regeneration possibilities.

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

- Understand various media, sterilization, organogenesis
- Able to apply the techniques to develop a standard protocol for Plant Tissue Culture

PRACTICAL:

- To study different sterilization technique.
- To study preparations of culture media.(MS)
- To study sterilization of seeds.
- Enplant preparations.
- Study of different techniques in plant hybridization.
- Study organ culture, shoot tip, nodal segment.
- Preparation of synthetic seeds.

Suggested Readings:

- Bhojwani, Razdan – Plant tissue culture, Elsevier India,
- U.Satyanarayan – Biochemistry, books and allied (P) Ltd.
- H.S.Chawla – Introduction to biotechnology Rastogi Publication.

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