



SHAHEED NANDKUMAR PATEL VISHWAVIDYALAYA, RAIGARH (C.G.)

(A State University Established Under Chhattisgarh Vishwavidyalaya Adhiniyam, 1973)

Scheme and Syllabus

Of

Bachelor of Science

Year- First

W.E.F. Session :- 2023-24

Syllabus Approved by the Central Board of Studies

Central Board of Studies Foundation Course Paper-II English Language for Under Graduate Students

Programme Outcomes for English Language B.A/B.Sc/B.Com I, II, III

The programme enables a student to get acquainted

- With the rich cultural heritage and develops patriotic feelings through the works of Indian authors & poets.
- To get exposure of the usage of grammar according to contemporary times.
- To have an exposure about the literary genre with the help of the authors & poets across the globe.
- To develop an appreciation for English Language & Communication Skills.

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(Dr. Sushama Mishra)

Learning Outcomes (English Language) B.A/B.Sc/B.Com - I, II, III

The learning outcomes are as follows:

1. To strengthen the linguistic skills -Listening, Speaking, Reading and Writing.
2. To refine the way of thinking and speaking which would lead them to have mighty ideas in day to day life.
3. To improve students speaking ability in English both in terms of fluency and comprehensibility.
4. To enhance practical use of English in day-to-day life.
5. To enrich the vocabulary of the students.

Sushama
12.6.2023
(Dr. Sushama Mishra)

Dr. Sushama
2/6/23
(Sushama)

**Programme Specific Outcomes FC_ Paper-II
(English Language) B.A/B.Sc/B.Com - I, II,III**

The Programme Specific outcomes are as follows:

1. To develop abilities of the students as a critical reader and writer.
2. To develop the ability of public interaction and speaking.
3. To develop self awareness about English language.
4. To develop critical thinking .

To give a practice in writing, drafting of English assignments.

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(Dr. Sushama Mishra)

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BA/B.Sc./B.Com/B.Sc. Home.Sc. (Part-I)
Foundation Course Paper-II English Language

Max. Marks:75
 Total credits: 05

Qualifying Marks:26

Paper-II	Mark's	Period's	Credit
Unit-I Flamingo : A Textbook for college students Publication : Macmillan Publishers	3x5=15	18	01
Unit -II <ul style="list-style-type: none"> • Writing Skill • Describing a place or a person. • Writing a Biographical Sketch • Narrating an event or experience 	1x10=10	18	01
Unit -III Reading Comprehension <ul style="list-style-type: none"> • (a) Unseen Passage (Normal) • (b) Vocabulary (Text-based) 	1x5=05 1x10=10	18	01
Unit -III Reading Comprehension (a) Unseen Passage (Normal) (b) Vocabulary (Text-based)	1x5=5 1x5=5	09	0.5
Unit-V Grammar <ul style="list-style-type: none"> • Articles • Gerunds /Participles • Subject Verb Agreement • Use of Conjunctions • Tenses • Relatives • Possessives & self forms • Grammatical items given in Textbook 'Flaminso' 	1x25=25	27	1.5
Total	75	90	05
Recommended Books- 1. Essential English Grammar, 2nd Edition by Raymond Murphy, Cambridge Publication 2. English Grammar in use 5th edition by Raymond Murphy, Cambridge Publication. 3. Advanced English Grammar by Martine Hewings Cambridge University Press.			

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 (Dr. Sushama Mishra)

Dr. Sushama
 2/6/23
 (P. Choudhary)

बी.ए./ बी.एस-सी./ बी.कॉम./ बी.एच.एस.सी. भाग -एक

(आधार पाठ्यक्रम)

प्रथम प्रश्नपत्र

हिंदी भाषा

कोड....

पूर्णांक 75

क्रेडिट 05

पाठ्यक्रमका उद्देश्य:-

- 1.हिंदी भाषाके प्रयोजनात्मक स्वरूप का सामान्य ज्ञान प्रदान करना।
- 2.कंप्यूटर में हिंदी भाषा के प्रयोग की आवश्यकता के अनुरूप कंप्यूटर की कार्य प्रणाली की आरंभिक जानकारी से अवगत होने के लिए प्रेरित करना।
- 3.हिंदी व्याकरण की बुनियादी ज्ञान संप्रेषण कौशल तथा भाषायी दक्षता से अवगत कराना।
- 4.साहित्य और समाज को समझने की दिशा में रुझान उत्पन्न करना।

पाठ्य विषय:-

इकाई 1. (क) पल्लवन, पत्राचार, अनुवाद (ख) एक टोकरी भर मिट्टी : माधवराव सप्रे बड़े भाई साहब : प्रेमचंद	अंक 15 18 कालखंड
इकाई 2. (क) संक्षेपण, हिंदी में संक्षिप्तिकरण, हिंदी-अपठित गद्यांश, पारिभाषिक शब्दावली, हिंदी में पदनाम, मुहावरे एवंलोकोक्तियाँ (ख) जागो फिर एक बार: सूर्यकांत त्रिपाठी 'निराला' जन्मदिन ('मिट्टी से कहूँगाधन्यवाद' संग्रह से):एकांत श्रीवास्तव	अंक 15 18 कालखंड
इकाई 3. (क) शब्द-शुद्धि, वाक्य-शुद्धि, शब्द-ज्ञान- पर्यायवाची शब्द, विलोम शब्द, अनेकार्थी-शब्द, समश्रुत शब्द, अनेक शब्दों के लिए एक शब्द (ख) भोलाराम का जीव : हरिशंकर परसाई जीप पर सवार इल्लियां: शरद जोशी	अंक 15 18 कालखंड
इकाई 4.(क) मानक भाषा का अर्थ, मानक हिंदी भाषाका अर्थ, स्वरूप,	अंक 15

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विशेषताएँ, मानक, उपमानक, अमानक-भाषा (ख)शिकागो से स्वामी विवेकानंद का पत्र सत्य और अहिंसा : महात्मा गांधी	18 कालखंड
इकाई 5. (क) देवनागरी लिपि- नामकरण, स्वरूप, विशेषताएँ, कंप्यूटर का सामान्य परिचय, कंप्यूटर में हिंदी का अनुप्रयोग। (ख)कछुआ-धरम : चन्द्रधर शर्मा 'गुलेरी' छत्तीसगढ़ का वैभव: हीरालाल शुक्ल	अंक 15 18 कालखंड

मूल्यांकन योजना:-

प्रत्येक इकाई से एक-एक प्रश्न पूछे जाएंगे। एक प्रश्न के 15 अंक होंगे। प्रत्येक प्रश्न में आंतरिक विकल्प होगा। प्रत्येक प्रश्न के दो भाग 'क' और 'ख' होंगे एवं अंक क्रमशः 08 एवं 07 होंगे। प्रश्नपत्र का पूर्णांक 75 निर्धारित है।

प्रश्नपत्रके पूर्णांकका दस प्रतिशत अंक आंतरिक मूल्यांकनके लिए निर्धारित है।

पाठ्यक्रम अधिगम परिणाम:-

इस पाठ्यक्रम को पूर्ण करने के पश्चात विद्यार्थी:-

1. हिंदी प्रयोजनात्मक तथा कार्यशील भाषा के प्रति सजग होंगे।
2. भाषा संबंधी संभावित अशुद्धियों एवं उनके परिष्कारसे परिचित होंगे तथा मानक भाषा का व्यवहार करने में सक्षम होंगे।
3. विद्यार्थियों के शब्द भंडार में वृद्धि होगी।
4. हिंदी साहित्य के पठन-पाठन के प्रति रुचि जागृत होगी एवं सामाजिक महत्व के विविध आयामों को समझने की दृष्टि विकसित होगी।

पाठ्यक्रम निर्माण का औचित्य:-

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Scheme of B.Sc. Botany

Year	Course Code	Subject Name	Theory/ Practical	Total Credit	Total Marks	
					Max	Min
First year	BOT-1T	Microbial Diversity and Plant Pathology	Theory	4	50	17
	BOT--2T	Archegoniateae and Plant Architecture	Theory	4	50	17
	BOT--1P	LAB 1 : Microbial Techniques and Archegoniate identification	Practical	2	50	17

Note: There shall be four extra credits in each year for internship/apprenticeship. The certificate of extra credits for this would be provided by the concern university and it is not mandatory.

Part A: Introduction			
Program: Certificate course in Microbial Techniques and Archaeogoniate identification		Class: B.Sc.I Year	Year: 2022 Session: 2022-2023
1.	Course Code	BOT-1T	
2.	Course Title	Microbial Diversity and Plant Pathology	
3.	Course Type	Theory	
4.	Pre-requisite (if any)	NO	
5.	Course Learning Outcomes (CLO)	<p>At the end of this course, the students will be able to</p> <ul style="list-style-type: none"> • Understand the Viruses, Bacteria, Phycology, Mycology and Plant pathology • Learn microbial techniques which will be beneficial for agriculture and industry. • Learn life cycles of selected genera of different groups • Understand etiology of plant diseases • Apply their knowledge in the crop fields to eradicate or avoid the diseases • Apply different biofertilizers to enhance productivity 	
6.	Credit Value	Theory: 4	
7.	Total Marks	Max. Marks: 50	Min Passing Marks: 17

Part B: Content of the Course		
Total Periods: 60		
Unit	Topics	No. of Period
I	Microbial Techniques & instrumentation: Microscopy – Light, phase contrast, scanning and transmission electron microscopy, staining techniques for light microscopy. Common equipment of microbiology lab and principle of their working – autoclave, oven, laminar air flow, centrifuge, colorimetry, spectrophotometry, electrophoresis, immobilization methods, fermentation and fermenters.	12
II	Microbial world: Cell structure of Eukaryotic and prokaryotic cells, Gram positive and Gram-negative bacteria, Structure of bacteria; Bacterial Growth curve, factors affecting growth of microbes; Sporulation, reproduction, recombination in bacteria. Viruses, general characteristics, Structure of viruses, Bacteriophages and TMV; Lytic and Lysogenic cycles, viroid, Prions & mycoplasma, phytoplasma, actinomycetes and their economic uses. Applied Microbiology: Food fermentations and food produced by microbes, Production of antibiotics, enzymes, alcoholic beverages, Lactic acid and Acetic acid production. Antigen, antibody and production of monoclonal antibodies (Hybridoma techniques).	12
III	Phycology: General characteristic features, classification and range of thallus organization. Classification and life cycle of – <i>Volvox</i> , <i>Oedogonium</i> , <i>Chara</i> , <i>Vaucheria</i> , <i>Ectocarpus</i> and <i>Polysiphonia</i> . Economic importance of algae - Role of algae in soil fertility, algae as biofertilizer, blue green algae and nitrogen economy of soil; algae as biofuel	12

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IV	<p>Mycology , Mushroom Cultivation, Lichenology & Mycorrhiza: General characteristic features, Economic importance and Classification of Fungi. Distinguishing characters of Myxomycota: General characters of Mastigomycota: <i>Phytophthora</i> and <i>Albugo</i>, Zygomycota: <i>Rhizopus</i> and <i>Mucor</i>, Ascomycota: <i>Saccharomyces</i>, <i>Penicillium</i>, <i>Peziza</i>. Basidiomycota: <i>Ustilago</i>, <i>Puccinia</i>, <i>Agaricus</i>; Deuteromycota: <i>Colletotrichum</i>, <i>Fusarium</i>, <i>Alternaria</i>. Heterothallism, Physiological specialization, Heterokaryosis & Parasexuality, Mushroom cultivation- Button and Oyster mushroom General account of lichens, reproduction and significance; Mycorrhiza: ectomycorrhiza and endomycorrhiza and their significance.</p>	12
V	<p>Plant Pathology: Disease concept, Symptoms, Etiology, Primary and secondary inoculum, pathogenesis, Koch's Postulates. Mechanism of infection and predisposing factors. Disease reoccurrence, Defence mechanism : physical and biochemical, Disease Resistance, Systemic fungicides, Organomercurials and sulphur containing fungicides</p> <p>Diseases and Control: Symptoms, Causal organism, Disease cycle and Control measures of – Early & Late Blight of Potato, Damping of seedlings, False Smut of Rice/ Brown spot of rice, Black Stem Rust of Wheat, <i>Alternaria</i> spot and White rust of Crucifers, Red Rot of Sugarcane, Wilting of Arhar, Mosaic diseases on tobacco and cucumber, yellow vein mosaic of bhindi; Citrus Canker, Little leaf of brinjal; Disease management: Quarantine organization and Integrated plant disease management, Biological control</p>	12
<p>Keywords: Microbial techniques, Mushroom cultivation, Mycology, Lichenology & Mycorrhiza, Plant diseases</p>		

Part C - Learning Resources

Suggested Readings:

1. Microbiology Fundamental and Applications (hindi) (pb) 9. ISBN: 9788188826230 Edition: 03 Year : 2016 Author : Dr. Purohit SS , Dr. Deo Publisher : Student Edition Language : Hindi
2. Modern Microbiology (hindi) (hb) ISBN: 9788177543599 Edition : 1 Year : 2018 Author : Dr. Purohit SS , Dr. Singh T Publisher : Agrobios (India)
3. Plant pathology by R.S. Mehrotra, Tata McGraw-Hill Publication

Text Books:

1. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2nd edition.
2. Tortora, G.J., Funke, B.R., Case, C.L. (2010). Microbiology: An Introduction, Pearson Benjamin Cummings, U.S.A. 10th edition.
3. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi & Their Allies, MacMillan Publishers Pvt. Ltd., Delhi.
4. Aggarwal, S. K. 2009. Foundation Course in Biology, A one books Pvt. Ltd., New Delhi.
5. Aneja, K. R. 1993. Experiments in Microbiology, Pathology and Tissue Culture, Vishwa Prakashan, New Delhi.
6. Annie Ragland, 2012. Algae and Bryophytes, Saras Publication, Kanyakumari, India.
7. Basu, A. N. 1993. Essentials of Plant Viruses, Vectors and Plant diseases, New Age International, New Delhi.
8. Chopra. G. L. 1984. A text book of Algae, Rastogi publications, Meerut, India.
9. Dubey, R. C. and Maheshwari. D.K. 2012. Practical Microbiology, S. Chand & Company, Pvt. Ltd., New Delhi.
10. Fritsch, R. E. 1977. Structure and Reproduction of Algae, Cambridge University Press, London.
11. Sharma, P.D. (2011). Plant Pathology. Meerut, U.P.: Rastogi Publication.
12. Webster, J., Weber, R. (2007). Introduction to Fungi, 3rd edition. Cambridge, U.K.: Cambridge University Press.
13. Pandey B.P. 2001. College Botany Volume 1, S Chand & Company Pvt.Ltd, New Delhi.
14. Pandey. B.P. 2014 Modern Practical Botany, (Vol-I) S. Chand and Company Pvt. Ltd., New Delhi.
15. Pelzar, 1963. Microbiology, Tata Mc Graw Hill, New Delhi
5. Rangaswamy, G. 2009, Disease of Crop Plants in India, Prientice Hall of India, New Delhi.

Online Resources

1. <https://indianculture.gov.in/rarebooks/economic-botany-india>

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- ii. https://www.infinityfoundation.com/mandala/t_es/t_es_tiwar_botany_frameset.htm
- iii. https://www.researchgate.net/publication/335715457_Ancient_Indian_rishi's_Sages_knowledge_of_botany_and_medicinal_plants_since_Vedic_period_was_much_older_than_the_period_of_Theophrastus_A_c
ase_study_who_was_the_actual_father_of_botany
- iv. <https://www.scribd.com/presentation/81269920/Botany-of-Ancient-India>
- v. https://insa.nic.in/writereaddata/UpLoadedFiles/IJHS/Vol17_2_17_PKBhattacharyya.pdf

Suggested equivalent online courses:

1. <https://indianculture.gov.in/rarebooks/economic-botany-india>
2. <https://community.plantae.org/tags/mooc> futurelearn.com/courses/teaching-biology-inspiring-students-with-plants-in-science
3. <https://www.coursera.org/courses?query=plants>
4. <http://egyankosh.ac.in/handle/123456789/53530>
5. <https://www.classcentral.com/tag/microbiology>
6. <https://www.edx.org/learn/microbiology>
7. <https://www.mooc-list.com/tags/microbiology>
8. <https://www.udemy.com/topic/microbiology/> <https://ucmp.berkeley.edu/bacteria/bacteria.html>
9. <https://www.livescience.com/53272-what-is-a-virus.html>
10. <https://gclambathach.in/lms/Economic%20importance%20of%20Algae.pdf>
11. <https://www.slideshare.net/sardar1109/algae-notes-1>
12. <https://www.onlinebiologynotes.com/algae-general-characteristics-classification/>
13. <https://www.sciencedirect.com/topics/immunology-and-microbiology/fungus>
14. <https://ucmp.berkeley.edu/fungi/fungi.html>
15. <https://agrimoon.com/wp-content/uploads/Mashroom-culture.pdf>
16. <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=11293>
17. <http://www.hillagric.ac.in/edu/coa/pplath/lect/plpath111/Lect.%201%20%20Introduction-P1%20Path%20111.pdf>
18. http://www.jnkvv.org/PDF/11042020102651plant_pathology.pdf
19. <https://www.apsnet.org/edcenter/disimpactmngmnt/topc/EpidemiologyTemporal/Pages/ManagementStrategies.aspx>
20. <https://learn.saylor.org/course/view.php?id=23§ionid=6821>
21. <https://www.sciencedirect.com/topics/earth-and-planetary-sciences/microscopy>
22. http://physics.fe.uni-lj.si/students/predavanja/Microscopy_Kulkarni.pdf
23. <https://lipidnanostructuresgroup.weebly.com/>
24. <https://zoology4civilservices.wordpress.com/2016/06/18/65/>
25. <https://microbenotes.com/laminar-flow-hood>

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50

Continuous Comprehensive Evaluation (CCE): As per rule

University Exam(UE): 50Marks

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Declaration

This is to certify that the syllabus is framed by the Central Board of Studies (Botany) as per the guidelines (TOR) of the Department of Higher Education, Raipur Chhattisgarh.

1. Shri Prabhat Pandey
Asst. Prof.
Gramya Bharti Vidyapith, Hardibazar - Chairman *Prabhat*
2. Dr. A.N. Bahadur
Professor - Member *A.N. Bahadur*
Govt. E.R.R. P.G. Science College, Bilaspur
3. Dr. Prashant Kumar Singh
Asst. Prof. - Member *Prashant*
Govt. V.B. Singh Dev Girls College, Jashpur
4. Dr. Awadhesh Kumar Shrivastava
Asst. Prof. - Member *Awadhesh*
Govt. D.T. P.G. College, Utai, Durg
5. Dr. Ashok Kumar Bharti
Asst. Prof. - Member *Ashok*
Kirodimal Govt. Arts & Science College, Raigarh
6. Dr. Smriti Chakravarty
Professor - Member *Smriti*
Govt. J.Y. Chhattisgarh College, Raipur
13/06/2022
7. Dr. Rupinder Diwan
Professor - Member *R Diwan*
Govt. Nagarjun P.G. College of Science, Raipur
13/6/22
8. Dr. Usha Chandel
Asst. Prof. - Member *Usha*
Govt. Dr. W.W. Patankar Girls P.G. College, Durg
13/6/22
9. Mr. Kaushal Kishor
Asst. Prof. - Member *Kaushal*
Govt. Pt. Shyamacharan Shukla College, Dharsiwa,
Raipur
10. *Manisha* Gupta - Member Member

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Part A: Introduction			
Program: Certificate course in Microbial techniques and Archegoniate identification		Class: B.Sc. I Year	Year: 2022 Session: 2022-2023
1.	Course Code	BOT-2T	
2.	Course Title	Archegoniateae and Plant Architecture	
3.	Course Type	Theory	
4.	Pre-requisite (if any)	NO	
5.	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to <ul style="list-style-type: none"> • Understand the General characteristics and affinities of Bryophytes, Pteridophytes and Gymnosperms • Phylogenetic relationships with the help of Palaeobotanical studies • Learn morphology, and- flower architecture of angiosperms 	
6.	Credit Value	Theory: 4	
7.	Total Marks	Max. Marks: 50	Min Passing Marks: 17

Part B: Content of the Course		
Total Periods: 60		
Unit	Topics	No. of Period
I	Introduction to Archegoniateae & Bryophytes: Unique features of archegoniateae, Bryophytes: General characteristic features and Affinities, adaptations to land habit, Range of thallus organization. Classification (up to family), morphology, anatomy and reproduction of <i>Riccia</i> , <i>Marchantia</i> , <i>Anthoceros</i> and <i>Sphagnum</i> . (Developmental details not to be included). Economic importance of bryophytes.	12
II	Pteridophytes: General characteristic features and affinities, Classification (up to family) with examples, Heterospory and seed habit, stelar evolution, economic importance of Pteridophytes, Morphology, anatomy and life cycle of <i>Psilotum</i> , <i>Lycopodium</i> , <i>Selaginella</i> , <i>Equisetum</i> , <i>Pteris</i> and <i>Marselia</i> .	12
III	Gymnosperms: Classification and distribution of gymnosperms; Salient features of Cycadales, Ginkgoales, Coniferales and Gnetales, their examples, structure and reproduction; economic importance, Morphology, anatomy and life cycle of <i>Cycas</i> , <i>Pinus</i> and <i>Ephedra</i> .	12
IV	Palaeobotany: General account, Geological time scale; Brief account of process of fossilization & types of fossils and their study techniques; Fossil plants: <i>Rhynia</i> , <i>Williamsonia</i> , <i>Cycadeoidea</i> . Contribution of Prof. Birbal Sahni	12
V	Angiosperm Morphology (Stem, Roots, Leaves, Flowers and Inflorescence: Morphology and modifications of root; Stem, leaf and bud. Types of inflorescences; flowers, flower parts, fruits and types of placentation; Definition	12

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and types of seeds.

Keywords: Archaeogoniatae, Bryophyta, *Rhynia*, Heterospory, Angiosperms, Fossil

Part C -Learning Resources

1. Gangulee H. S. and K. Kar 1992. College Botany Vol. I and II. (New Central Book Agency)
2. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
3. Pandey S.K. (2012). Quick Concept of Botany. Publisher LAP LAMBERT Academic Publishing GmbH & Co. KG, Germany (ISBN: 978-3-8484-3104-5).
4. Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad.
5. Rashid A (1999) An Introduction to Pteridophyta, Vikas Publishing House Pvt. Ltd. New Delhi.
6. Sharma OP (1990) Textbook of Pteridophyta. MacMillan India Ltd. Delhi.
7. Vashishtha BR, Sinha AK and Kumar A (2010) Botany for Degree Students – Pteridophyta, S. Chand and Company,
8. Vashishtha BR, Sinha AK and Kumar A (2010) Botany for Degree Students – Gymnosperms, S. Chand and
9. Parihar NS (1976) Biology and Morphology of Pteridophytes. Central Book Depot.
10. Bhatnagar SP (1996) Gymnosperms, New Age International Publisher.
11. Pandey BP (2010) College Botany Vol II S. Chand and Company, New Delhi .

Online Resources

1. <https://www.anbg.gov.au/bryophyte/what-is-bryophyte>.
2. <https://pteridoportal.org/portal/index.php>
3. <https://www.conifers.org/zz/gymnosperms.php>
4. <http://www.mobot.org/MOBOT/research/APweb/>
5. <https://milneorchid.weebly.com/plant-id-for-beginners>
6. <http://webapp1.dlib.indiana.edu/inauthors/view?docId=VAC0868&doc.view=print>
7. <https://palynology.org/>
8. <http://www2.estrellamountain.edu/faculty/farabee/biobk/Biobookflowers.html>
9. <https://www.sciencelearn.org.nz/resources/100-plant-reproduction>
10. <https://palaeobotany.org>

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50

Continuous Comprehensive Evaluation (CCE):As per rule

University Exam(UE): 50Marks

For Review
13.6.22

Declaration

This is to certify that the syllabus is framed by the Central Board of Studies (Botany) as per the guidelines (TOR) of the Department of Higher Education, Raipur Chhattisgarh.

1. Shri Prabhat Pandey
Asst. Prof.
Gramya Bharti Vidyapith, Hardibazar - Chairman *Prabhat*
2. Dr. A.N. Bahadur
Professor - Member *A.N. Bahadur*
Govt. E.R.R. P.G. Science College, Bilaspur
3. Dr. Prashant Kumar Singh
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4. Dr. Awadhesh Kumar Shrivastava
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5. Dr. Ashok Kumar Bharti
Asst. Prof. - Member *Ashok*
Kirodimal Govt. Arts & Science College, Raigarh
6. Dr. Smriti Chakravarty
Professor - Member *Smriti*
Govt. J.Y. Chhattisgarh College, Raipur
13/06/2022
7. Dr. Rupinder Diwan
Professor - Member *R. Diwan*
Govt. Nagarjun P.G. College of Science, Raipur
13/6/22
8. Dr. Usha Chandel
Asst. Prof. - Member *Usha*
Govt. Dr. W.W. Patankar Girls P.G. College, Durg
13/6/22
9. Mr. Kaushal Kishor
Asst. Prof. - Member *Kaushal*
Govt. Pt. Shyamacharan Shukla College, Dharsiwa,
Raipur
10. ~~Manisha Gupta~~ - Member

for Prabhat
13.6.22

Part A : Introduction			
Programme: Certificate		Class B.Sc.-I	Year: 2022
		Session: 2022-23	
1.	Course Code	BOT-1P	
2.	Course Title	Microbial Techniques and Archegoniate identification	
3.	Course Type	Practical	
4.	Pre-requisite (if any)	No	
5.	Course outcomes:	<p>After the completion of the course the students will be able to:</p> <ul style="list-style-type: none"> • Understand the instruments, techniques and good lab practices for working in a microbiology laboratory. • Develop skills for identifying microbes and using them for Industrial, Agriculture and Environment purposes. • Practical skills in the field and laboratory experiments in Microbiology & Pathology. • learn to identify Algae, Lichens and plant pathogens along with their Symbiotic and Parasitic associations. • Can initiate his own Plant & Seed Diagnostic Clinic • Can start own enterprise on microbial products 	
6.	Credit Value	2	
7.	Total Marks	Max. Marks: 50	Min. Passing Marks:17
Part B : Content of the Course			
Total No. of Periods – 30			
Tentative Practical List	Topic * (Minimum Any three from each unit depending on facilities and syllabus. 20% for spotting, 10% each for viva and sessional and rest 60 % marks equally in each unit.)		
	INSTRUMENTS & TECHNIQUES: 1. Laboratory safety and good laboratory practices. 2. Principles and application of Laboratory instruments-microscope, incubator, autoclave, centrifuge, Laminar air flow, filtration unit, shaker, pH meter. 3. Buffer preparation & titration 4. Cleaning and Sterilization of glassware 5. Preparation of media- PDA and NAM 6. Inoculation and culturing of Fungi and bacteria BACTERIAL IDENTIFICATION: 1. Isolation of bacteria. 2. Staining techniques: Gram's, staining		
	MYCOLOGY: 1. Study/ Slide preparation and . Staining of fungi. <i>Rhizopus, Saccharomyces, Penicillium, Peziza, Ustilago, Puccinia; Fusarium, Alternaria. Agaricus:</i>		

For Records
13.6.22

2. Lichens: crustose, foliose and fruticose specimens.

PHYCOLOGY:

1. Study / Slide preparation and Staining of algae –

Volvox, Oedogonium and *Chara; Vaucheria; Ectocarpus Polysiphonia*

EXPERIMENTAL PLANT PATHOLOGY

Isolation of pathogen from diseased leaf.

Identification: Pathological specimens of Brown spot of rice, Bacterial blight of rice, Loose smut of wheat, red rot of sugar cane, Tikka disease of ground nut, Slides of uredial, telial, pycnial & aecial stages of *Puccinia*, Few viral and bacterial plant diseases. like- Leaf curl of Papaya, Citrus canker

PRACTICALS IN APPLIED MICROBIOLOGY

1. Isolation of rhizosphere to non rhizosphere population of bacteria.
2. Isolation of phyllosphere microflora.
3. Alcohol production from grapes in anaerobic condition
4. Isolation of lactic acid bacteria from curd.
5. Enzyme production and assay – catalase, protease and amylase.

Bryophyta:

Study of morphology and anatomy of :

1. *Riccia*
2. *Marchantia*
3. *Anthoceros*
4. *Sphagnum*

Pteridophyta:

Study of morphology and anatomy of :

1. *Lycopodium*
2. *Selaginella*
3. *Equisetum*
4. *Pteris*
5. *Marselia*

Gymnosperm:

Study of morphology and anatomy of :

1. *Cycas*
2. *Pinus*
3. *Ephedra*

Part C - Learning Resource

Text Books, Reference Books, Other Resources

Suggested Readings:

1. Practical Botany (Part I) ISBN #:81-301-0008-8 Sunil D Purohit, Gotam K Kukda & Anamika Singhvi Edition:2013 Apex Publishing House Durga Nursery Road, Udaipur, Rajasthan (bilingual).
2. Pandey S.K. (2012). Quick Concept of Botany. Publisher LAP LAMBERT Academic Publishing GmbH & Co. KG, Germany (ISBN: 978-3-8484-3104-5).
3. Dubey, R. C. and Maheshwari. D.K. 2012. Practical Microbiology, S. Chand & Company, Pvt. Ltd., New Delhi.
4. Pandey. B.P. 2014 Modern Practical Botany, (Vol-I) S. Chand and Company Pvt. Ltd., New Delhi.

Sanjiv Kumar
13.6.22

E-learning Resources:

5. <https://community.plantae.org/tags/mooc>
6. futurelearn.com/courses/teaching-biology-inspiring-students-with-plants-in-science
7. <https://microbiologysociety.org/publication/education-outreach-resources/basic-practical-microbiology-a-manual.html>
8. <https://microbiologyonline.org/file/7926d7789d8a2f7b2075109f68c3175e.pdf>
9. <http://allaboutalgae.com/benefits/>
10. <https://repository.cimmyt.org/xmlui/bitstream/handle/10883/3219/64331.pdf>
11. <https://www.mooc-list.com/tags/microbiology>
12. <http://www.agrifs.ir/sites/default/files/A%20text%20book%20of%20practical%20botany%201%20%7BAshok%20Bendre%7D%20%5B8%20%5D%20%281984%29.pdf>
13. <https://www.coursera.org/courses?query=plants>
14. <http://egyankosh.ac.in/handle/123456789/53530>
15. <https://www.classcentral.com/tag/microbiology>
16. <https://www.edx.org/learn/microbiology>
17. <https://www.mooc-list.com/tags/microbiology>
18. <https://www.mooc-list.com/tags/microbiology>
19. <https://www.udemy.com/topic/microbiology/>

Part D – Assessment and Evaluation**Suggested Continuous Evaluation Methods:**

Maximum Marks: 50

Continuous Comprehensive Evaluation (CCE): Not Applicable

University Exam(UE): 50 Marks

Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	As per rules
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For Records
13.6.22

Declaration

This is to certify that the syllabus is framed by the Central Board of Studies (Botany) as per the guidelines (TOR) of the Department of Higher Education, Raipur Chhattisgarh.

- | | | | |
|--|---|----------|----------------------------------|
| 1. Shri Prabhat Pandey
Asst. Prof.
Gramya Bharti Vidyapith, Hardibazar | - | Chairman | <i>[Signature]</i> |
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Govt. V.B. Singh Dev Girls College, Jashpur | - | Member | <i>[Signature]</i> |
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Kirodimal Govt. Arts & Science College, Raigarh | - | Member | <i>[Signature]</i> |
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Govt. J.Y. Chhattisgarh College, Raipur | - | Member | <i>[Signature]</i>
13/06/2022 |
| 7. Dr. Rupinder Diwan
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Govt. Nagarjun P.G. College of Science, Raipur | - | Member | <i>[Signature]</i>
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| 8. Dr. Usha Chandel
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Govt. Dr. W.W. Patankar Girls P.G. College, Durg | - | Member | <i>[Signature]</i>
13/6/22 |
| 9. Mr. Kaushal Kishor
Asst. Prof.
Govt. Pt. Shyamacharan Shukla College, Dharsiwa,
Raipur | - | Member | <i>[Signature]</i> |
| 10. Manisha Gupta | - | Member | |

for [Signature]
13.6.22

Scheme of B. Sc. Chemistry

Year	Course Code	Subject Name	Theory/ Practical	Total Credit	Total Marks	
					Max	Min
First year	CHEM-1T	Inorganic and Physical Chemistry	Theory	4	50	17
	CHEM-2T	Organic and Physical Chemistry	Theory	4	50	17
	CHEM-1P	LAB 1 : General Chemistry-1	Practical	2	50	17

Note: There shall be four extra credits in each year for internship/apprenticeship. The certificate of extra credits for this would be provided by the concern university and it is not mandatory.

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Part A: Introduction			
Program: Certificate Course		Class: B.Sc. I Year	Year: 2022 Session: 2022-23
1.	Course Code	CHEM-1T	
2.	Course Title	Inorganic and Physical Chemistry	
3.	Course Type	Theory	
4.	Pre-requisite (if any)	To Study this course our students must have had the subject chemistry in class +2 or equivalent	
5.	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to learn the following aspects of Chemistry <ul style="list-style-type: none"> • To learn basic concept of atomic structure and the periodic properties of elements • To understand chemical bonding in ionic and covalent compounds • To study group trends for <i>s</i> and <i>p</i>-block elements in the periodic table • learn properties and bonding of compounds of the noble gases • Understand the metallurgical extraction of metals. • Basic concepts of Mathematics and Computer for Chemists. • Basics and mechanism of chemical kinetics and catalysis. 	
6.	Credit Value	Theory: 4	
7.	Total Marks	Max. Marks: 50	Min. Passing Marks: 17

Part B: Content of the Course		
Total No. of Lecturers: 90		
Unit	Topics	No. of Lectures
I	<p>Atomic structure : Bohr's theory and its limitation, General idea of de-Broglie matter-waves, Heisenberg uncertainty principle, Schrödinger wave equation, significance of Ψ and Ψ^2, radial & angular wave functions and probability distribution curves, quantum numbers, Atomicorbital and shapes of <i>s</i>, <i>p</i>, <i>d</i> orbitals, Aufbau and Pauli exclusion principles, Hund's Multiplicity rule, electronic configuration of the elements.</p> <p>Periodic properties: Detailed discussion of the following periodic properties of the elements, with reference to <i>s</i>- and <i>p</i>- block. Trends in periodic table and applications in predicting and explaining the chemical behavior.</p> <p>a. Atomic and ionic radii, b. Ionization enthalpy, c. Electron gain enthalpy, d. Electronegativity, Pauling's, Mulliken's, Allred Rochow's scales. Effective nuclear charge, shielding or screening effect, Slater rules, variation of effective nuclear charge in periodic table.</p>	15
II	<p>Chemical bonding- I: Ionic bond: Ionic Solids - Ionic structures, radius ratio & co-ordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy Born-Haber cycle, Solvation energy and solubility of ionic solids, polarizing power & polarizability of ions, Fajan's rule, Ionic character in covalent compounds: Bond moment and dipole</p>	15

AUST

	moment, Percentage ionic character from dipole moment and electronegativity difference, Metallic bond-free electron and band theories.	
III	Chemical bonding-II: Covalent bond: Valence bond theory and its limitations, Concept of hybridization, equivalent and non-equivalent hybrid orbitals. Valence shell electron pair repulsion theory (VSEPR), shapes of the following simple molecules and ions containing lone pairs and bond pairs of electrons: H ₂ O, NH ₃ , PCl ₃ , H ₃ O ⁺ , SF ₄ , ClF ₃ , ICl ₂ ⁻ , XeF ₂ , XeF ₄ , XeF ₆ , XeOF ₂ , XeOF ₄ . Molecular orbital theory. Bond order and bond strength, Molecular orbital diagrams of diatomic and simple heteroatomic molecules N ₂ , O ₂ , F ₂ , CO, NO.	15
IV	Chemistry of s- & p- block elements: General concepts on group relationships and gradation properties, Comparative study, salient features of hydrides, solvation & complexation tendencies, General concepts on group relationships and gradation properties. Halides, hydrides, oxides and oxyacids of Boron, Aluminum, Nitrogen and Phosphorus. Boranes, borazines, fullerenes, graphene and silicates, interhalogens and pseudohalogens. Chemical properties of the noble gases. Metallurgical extraction of Fe, Al and Cu : Principle of extraction of metal, The occurrence, extraction & isolation of Fe, Al, and Cu	15
V	Mathematical concepts for chemist: Basic Mathematical Concepts: Logarithmic relations, curve sketching, linear graphs, Properties of straight line, slope and intercept, Functions, Differentiation of functions, maxima and minima; integrals; ordinary differential equations; vectors and matrices; determinants; Permutation and combination and probability theory, Significant figures and their applications. Computer for chemists: Introduction to computer, introduction to operating systems like DOS, Windows, Linux Use of computer programs: Running up standard programs & packages such as MS –Word, MS- Excel, Power Point. Execution of linear regression x-y plot, use of software for drawing structures and molecular formulae	15
VI	Chemical kinetics : Rate of reaction, Factors influencing rate of reaction, rate law, rate constant, Order and molecularity of reactions, rate determining step, Zero, First and Second order reactions, Rate and Rate Law, methods of determining order of reaction, Chain reactions. Temperature dependence of reaction rate, Arrhenius theory, Physical significance of Activation energy, collision theory, demerits of collision theory, non-mathematical concept of transition state theory. Catalysis: Homogeneous and Heterogeneous Catalysis, types of catalyst, characteristics of catalyst, Enzyme catalyzed reactions, Micellar catalyzed reactions, Industrial applications of catalysis.	15
Keywords: Atomic structure, Periodic properties, ionic bonding, covalent bonding, diagonal relationship, metallurgy, computer, memory, chemical kinetics, catalysis		

Part C : Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings :

1. Lee, J. D. Concise Inorganic Chemistry, Wiley, 5th Edition, 2008.
2. Douglas, B.; McDaniel, D. and Alexander J. Concepts & Models of Inorganic Chemistry, Wiley, 3rd Edition, 2006
3. Atkins, P.W. & Paula, J. Physical Chemistry, 10th Ed., Oxford University Press, 2014.
4. Puri, B. R., Sharma, L. R. and Kalia, K. C., Principles of Inorganic Chemistry, Milestone Publishers/ Vishal Publishing Co.; 33rd Edition 2016
5. Madan, R. D. Modern Inorganic Chemistry, S Chand Publishing, 1987.

Acub

7. Rodger, G.E. Inorganic and Solid State Chemistry, Cengage Learning India Edition, 2002.
8. Pfennig, B. W. Principles of Inorganic Chemistry, Wiley, 2015.
9. Housecroft, C. E. and Sharpe, A. G. Inorganic Chemistry, Pearson, 4th Edition, 2012
10. Rajarammana, V., Computers for beginners, PHI Learning Private Publishers, New Delhi, 2021
11. Tebbutt, P., Basic mathematics for Chemists, IInd Edn. ELBS, 1999
12. Khera, H.C., Gurtu, J.N., Singh, J., Chemistry for B.Sc. Ist Year, Pragati Prakashan
13. Bariyar, A. & Goyal, S., B.Sc. Chemistry Combined (in Hindi), Krishna Educational Publishers Year 2019
14. Puri, B.R., Pathania, M.S., Sharama, L.R., Principles of Physical Chemistry, Vishal Publishing Company 2020
15. Gurtu, J.N., Gurtu, A., Advanced Physical Chemistry, Pragati Prakashan, Meerut, Edition IV, 2017
16. Atkins' Physical Chemistry, 10th Edition, Oxford University Press, 2014
17. Barrow, G.M., Physical Chemistry Tata McGraw-Hill, 2007
18. Ball, D.W., Physical Chemistry, Thomson Press, India, 2007
19. Castellan, G.W., Physical Chemistry, 4th Edition, Narosa, 2004
20. Mortimer, R.G., Physical Chemistry, 3rd Edition, Elsevier, Noida, UP, 2009
21. Levine, I.N., Physical Chemistry, 6th Edition, Tata McGraw-Hill, 2010
22. Metz, C.R., 2000 Solved Problems in Chemistry, Sahaun Series, 2006
23. Engel, T. and Reid, P., Physical Chemistry, 3rd Edition, Prentice Hall, 2012
24. Negi, A.S. & Anand, S.C., A Text Book of Physical Chemistry, 3rd Edition, New Age International Publication
25. Bajpai, D.N., Advanced Physical Chemistry, S. Chand, 2019
26. Bahal & Tuli, Essential of Physical Chemistry, 2020

E- Learning Resources:

1. <http://heecontent.upsdc.gov.in/Home.aspx>
2. <https://nptel.ac.in/courses/104/106/104106096/>
3. <http://heecontent.upsdc.gov.in/Home.aspx>
4. <https://nptel.ac.in/courses/104/106/104106096/>
5. <https://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro1.htm>
6. <https://nptel.ac.in/courses/104/103/104103071/#>

Fundamental Chemistry related topics on SWAYAM platform and E-pathshala

Part D: Assessment and Evaluation

Maximum Marks: 50

DECLARATION

This is to certify that the syllabus is framed by the Central Board of Studies (Chemistry) as per the guidelines (TOR) of the Department of Higher Education, Raipur Chhattisgarh.


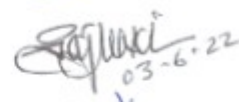


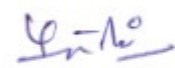
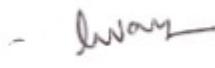


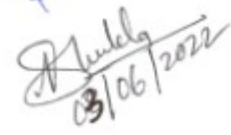
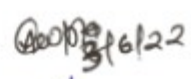

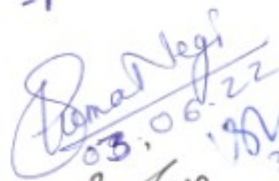
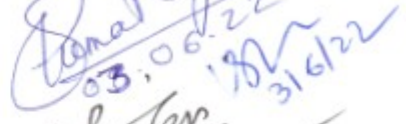
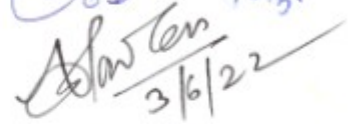

1. Dr. Alka Shrivastav,
Assistant Professor,
Govt. E.V.P.G. College, Korba

- Chairman

2. Smt. Priyanka Tiwari,
Assistant Professor,
Govt. J.P. Verma P.G. College, Bilaspur (C.G.)

- Member

Alka
3.6.22
Priyanka

- | | | |
|---|----------|---|
| 3. Mr. Vijay Kumar Lahare,
Assistant Professor,
Govt. Lahiri P.G. College Chirimiri(C.G.) | - Member |  |
| 4. Dr. Rajmani Patel,
Assistant Professor,
Hemchand Yadav University, Durg (C.G.) | - Member |  |
| 5. Dr. A.K. Singh,
Professor,
Govt. V.Y.T. P.G. College Durg (C.G.) | - Member |  |
| 6. Dr. P.K. Singh,
Assistant Professor,
Govt. T.C.L. P.G. College Janjgir(C.G.) | - Member |  |
| 7. Dr. P.K. Agnihotri,
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Govt. Yuganandam Chhattisgarh College Raipur(C.G.) | - Member |  |
| 8. Dr. B.D. Diwan,
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Govt. M.M.R. P.G. College Champa(C.G.) | - Member |  |
| 9. Dr. Sandhya Patre,
Assistant Professor,
Sant Shiromani Guru Ravidas Govt. College Sargaon,
Mungeli(C.G.) | - Member |  |
| 10. Mrs. Mousami Lahare,
Assistant Professor,
Govt. G.N.A. P.G. College Bhatapara, (C.G.) | - Member |  |
| 11. Dr. Alka Shukla,
Assistant Professor,
Mohan Lal Jain(Mohan Bhaiya) Govt. College Khursipar,
Bhilai(C.G.) | - Member |  |
| 12. Dr. Arti Gupta,
Professor, Govt. Dr. W.W.P. Girl's P.G. College Durg (C.G.) | - Member |  |
| 13. Dr. Deepti Tikariha,
Assistant Professor, APSGMNS Govt. P.G. College
Kawardha(C.G.) | - Member |  |
| 14. Dr. Seema Negi,
Assistant Professor, Govt. J.M.P. College, Takhatpur (C.G.) | - Member |  |
| 15. Dr. Vikesh Kumar Jha,
Assistant Professor, Govt. R.R.M. P.G. College Surajpur
(C.G.) | - Member |  |
| 16. Dr. Ashish Tiwari,
Assistant Professor,
Dr. Bhimrao Ambedkar Govt. College Pamgarh(C.G.) | - Member |  |
| 17. Mr. Laxmi Chand Manwani,
Assistant Professor,
Government Vivekand PG College Manendragarh(C.G.) | - Member |  |

Part A: Introduction			
Program: Certificate Course		Class: B.Sc. I Year	Year: 2022
		Session: 2022-23	
1.	Course Code	CHEM-2T	
2.	Course Title	Organic and Physical Chemistry	
3.	Course Type	Theory	
4.	Pre-requisite (if any)	To Study this course our students must have had the subject chemistry in class +2 or equivalent	
5.	Course Learning Outcomes (CLO)	<p>At the end of this course, the students will be able to learn the following aspects of Chemistry</p> <ul style="list-style-type: none"> • Understand the fundamentals of physical organic chemistry • Stereochemistry of carbon compounds • Chemistry of Alkenes and Alkynes • Chemistry of Alicyclic and aromatic Hydrocarbons • Understanding kinetic model of gases and its properties, Behavior of real gases, its derivation from ideal behavior, equation of state, isotherms and Law of corresponding states and molecular velocities. • Fundamental concepts of liquid state and colloids & surface chemistry. • Solids, Lattice parameters – its calculation, application of symmetry, solid characteristics of simple salts. 	
6.	Credit Value	Theory: 4	
7.	Total Marks	Max. Marks: 50	Min. Passing Marks: 17

Part B: Content of the Course		
Total No. of Lecturers: 90		
Unit	Topics	No. of Lectures
I	Basics of organic chemistry: Influence of hybridization on bond properties (as applicable to ethane, ethene, and ethyne). Application of inductive effect (a) Basicity of amines (b) Acidity of carboxylic acids (c) Stability of carbocations. Resonance or Mesomeric effect, application to (a) acidity of phenol, and (b) acidity of carboxylic acids. Hyper conjugation and its application to stability of carbocations, Free radicals and alkenes. Reactive intermediates: carbanions, carbenes, Nitrene, Basic concept of S_N1 , S_N2 , $E1$, $E2$, $E1c_b$ reactions and Neighboring group Participation (NGP). Electrophiles and Nucleophiles; Nucleophilicity and basicity.	15
II	Introduction to stereochemistry: Optical Isomerism: Optical Activity, Specific Rotation, Chirality/Asymmetry, Enantiomers, Molecules with two or more chiral-centres, Diastereoisomers, meso compounds, Relative and absolute configuration: Fischer, Newman and Sawhorse Projection formulae and their interconversions; Erythrose and threose, D/L, d/l system of nomenclature, Cahn-Ingold-Prelog system of nomenclature (C.I.P rules),	15

Ans
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	R/S nomenclature. Geometrical isomerism: cis-trans, syn-anti and E/Z notations. Stereospecific and stereoselective synthesis. Asymmetric synthesis.	
III	Acyclic hydrocarbons: Alkenes - Preparation of alkenes. Properties: Addition of hydrogen - heat of hydrogenation and stability of alkenes. Addition of halogen and its mechanism. Addition of HX, Markonikov's rule, addition of H ₂ O, (Oxymercuration-reduction and hydroboration -oxidation), HOX, H ₂ SO ₄ with mechanism and addition of HBr in the presence of peroxide (anti - Markonikov's addition). Dienes - Types of dienes, reactions of conjugated dienes - 1,2 and 1,4 addition of HBr to 1,3 - butadiene and Diel's - Alder reaction. Alkynes: Preparation by dehydrohalogenation of dihalides, dehalogenation of tetrahalides, Properties; Acidity of acetylenic hydrogen (formation of Metal acetylides). Preparation of higher acetylenes, Metal ammonia reductions, Physical properties. Chemical reactivity - electrophilic addition of X ₂ , HX, H ₂ O (Tautomerism), Oxidation with KMnO ₄ , OsO ₄ , reduction and Polymerization, reaction of acetylene.	15
IV	Alicyclic hydrocarbons (cycloalkanes): Nomenclature, Preparation by Freunds method, Wislicenus method. Properties - reactivity of cyclopropane and cyclobutane by comparing with alkanes, Stability of cycloalkanes - Baeyer's strain theory, Sachse and Mohr predictions and Pitzer's strain theory. Conformational structures of cyclobutane, cyclopentane, cyclohexane. Confirmers: in substituted cyclohexane, decalins. Aromatic hydrocarbons: Aromaticity: Hückel's rule, aromatic character of arenes, cyclic carbocations/ carbanions and heterocyclic compounds with suitable examples. Electrophilic aromatic substitution: halogenation, nitration, sulphonation and Friedel-Craft's alkylation/acylation with their mechanism. Directive effects of the groups.	15
V	Gaseous state chemistry: Kinetic molecular model of a gas: postulates and derivation of the kinetic gas equation; collision frequency; collision diameter; mean free path; Maxwell distribution and its use in evaluating molecular velocities (average, root mean square and most probable) and average kinetic energy, law of equipartition of energy, degrees of freedom and molecular basis of heat capacities. Joule Thomson effect, Liquefaction of Gases. Behavior of real gases: Deviations from ideal gas behavior, compressibility factor (Z), and its variation with pressure and temperature for different gases. Causes of deviation from ideal behavior. Vander Waals equation of state, its derivation and application in explaining real gas behavior, calculation of Boyle temperature. Isotherms of real gases and their comparison with Vander Waals isotherms, continuity of states, critical state, relation between critical constants and Vander Waals constants, law of corresponding states.	15
VI	Liquid state chemistry: Intermolecular forces, magnitude of intermolecular force, structure of liquids, Properties of liquids, viscosity and surface tension. Colloids and surface chemistry: Classification, Optical, Kinetic and Electrical Properties of colloids, Coagulation, Hardy Schulze law, flocculation value, Protection, Gold number, Emulsion, micelles and types, Gel, Syneresis and thixotropy, Application of colloids. Physical adsorption, chemisorption, adsorption isotherms (Langmuir and Freundlich). Qualitative	15

Ans
3/6

discussion of BET. Solid state chemistry: Nature of the solid state, law of constancy of interfacial angles, law of rational indices, Miller indices, elementary ideas of symmetry, symmetry elements and symmetry operations, seven crystal systems and fourteen Bravais lattices; X-ray diffraction, Bragg's law, a simple account of rotating crystal method and powder pattern method. Crystal defects.	
Keywords: Electronic effect, Reactive intermediates, Stereochemistry, Alkenes, Alkynes, Cycloalkanes, Aromaticity, Gas, Liquid, Colloidal state and Solid	
Part C: Learning Resource	
Text Books, Reference Books, Other Resources	
Suggested Readings :	
<ol style="list-style-type: none"> 1. Morrison, R. N. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd.(Pearson Education). 2. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education). 3. Finar, I. L. Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Products), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education). 4. Eliel, E. L. & Wilen, S. H. Stereochemistry of Organic Compounds, Wiley: London, 1994. 5. Kalsi, P. S. Stereochemistry Conformation and Mechanism, New Age International, 2005. 6. McMurry, J.E. Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning India Edition, 2013. 7. Bruice, P. Y. Organic Chemistry, 2nd Edition, Prentice-Hall, International Edition (1998). 8. Atkins' Physical Chemistry, 10th Edition, Oxford University Press, 2014 9. Barrow, G.M., Physical Chemistry Tata McGraw-Hill, 2007 10. Ball, D.W., Physical Chemistry, Thomson Press, India, 2007 11. Castellan, G.W., Physical Chemistry, 4th Edition, Narosa, 2004 12. Mortimer, R.G., Physical Chemistry, 3rd Edition, Elsevier, Noida, UP, 2009 13. Levine, I.N., Physical Chemistry, 6th Edition, Tata McGraw-Hill, 2010 14. Metz, C.R., 2000 Solved Problems in Chemistry, Sahaun Series, 2006 15. Negi, A.S. & Anand, S.C., A Text Book of Physical Chemistry, 3rd Edition, New Age International Publication 16. Bajpai, D.N., Advanced Physical Chemistry, S. Chand, 2019 17. Bahal & Tuli, Essential of Physical Chemistry, 2020 	
E- Learning Resources:	
<ol style="list-style-type: none"> 1. http://heecontent.upsdc.gov.in/Home.aspx 2. https://nptel.ac.in/courses/104/106/104106096/ 3. http://heecontent.upsdc.gov.in/Home.aspx 4. https://nptel.ac.in/courses/104/106/104106096/ 5. https://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro1.htm 6. https://nptel.ac.in/courses/104/103/104103071/# 	
Fundamental Chemistry related topics on SWAYAM platform and E-pathshala	
Part D: Assessment and Evaluation	
Maximum Marks: 50	

DECLARATION

This is to certify that the syllabus is framed by the Central Board of Studies (Chemistry) as per the

Arun
3/6

guidelines (TOR) of the Department of Higher Education, Raipur Chhattisgarh.

1. Dr. Alka Shrivastav,
Assistant Professor,
Govt. E.V.P.G. College, Korba - Chairman *AmS*
3/6/22
2. Smt. Priyanka Tiwari,
Assistant Professor,
Govt. J.P. Verma P.G. College, Bilaspur - Member *Diver*
3/6/22
3. Mr. Vijay Kumar Lahare,
Assistant Professor,
Govt. Lahiri P.G. College Chirimiri(C.G.) - Member *Vijay*
4. Dr. Rajmani Patel,
Assistant Professor,
Hemchand Yadav University, Durg - Member *Rajmani*
03-6-22
5. Dr. A.K. Singh,
Professor,
Govt. V.Y.T. P.G. College Durg - Member *A.K.S.*
6. Dr. P.K. Singh,
Assistant Professor,
Govt. T.C.L. P.G. College Janjgir(C.G.) - Member *P.K.S.*
7. DR. P.K. Agnihotri,
Professor,
Govt. Yuganandam Chhattisgarh College Raipur(C.G.) - Member *P.K.A.*
8. Dr. B.D. Diwan,
Professor,
Govt. M.M.R. P.G. College Champa(C.G.) - Member *B.D.*
3/6/22
9. Dr. Sandhya Patre,
Assistant Professor,
Sant Shiromani Guru Ravidas Govt. College Sargaon,
Mungeli(C.G.) - Member *Sandhya*
03/06/2022
10. Mrs. Mousami Lahare,
Assistant Professor,
Govt. G.N.A. P.G. College - Member *Mousami*
03.06.2022
11. Dr. Alka Shukla,
Assistant Professor,
Mohan Lal Jain(Mohan Bhaiya) Govt. College Khursipar,
Bhilai(C.G.) - Member *Alka*
03/06/2022
12. Dr. Arti Gupta,
Professor, Govt. Dr. W.W.P. Girls P.G. College Durg (C.G.) - Member *Arti*
3/6/22
13. Dr. Deepti Tikariha,
Assistant Professor, APSGMNS Govt. P.G. College
Kawardha(C.G.) - Member *Deepti*
3/6/22
14. Dr. Seema Negi,
Assistant Professor, Govt. J.M.P. College, Takhatpur (C.G.) - Member *Seema Negi*
3/6/22
15. Dr. Vikesh Kumar Jha,
Assistant Professor, Govt. R.R.M. P.G. College Surajpur
(C.G.) - Member *V.K.J.*
16. Dr. Ashish Tiwari,
Assistant Professor,
Dr. Bhimrao Ambedkar Govt. College Pamgarh(C.G.) - Member *Ashish*
3/6/22
17. Mr. Laxmi Chand Manwani,
Assistant Professor,
Government Vivekand PG College Manedragarh(C.G.) - Member *Laxmi*

Part A: Introduction			
Program: Certificate Course		Class: B.Sc. I Year	Year: 2022
		Session: 2022-23	
1.	Course Code	CHEM-1P	
2.	Course Title	Lab. 1	
3.	Course Type	Practical	
4.	Pre-requisite (if any)	To Study this course our students must have had the subject chemistry in class +2 or equivalent	
5.	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to learn the following aspects of Chemistry <ul style="list-style-type: none"> • To analyse the given mixture for anions (acid radicals) and cations (basic radicals). • Titrations • Qualitative Analysis • Surface tension measurements. • Viscosity measurement • Chemical Kinetics 	
6.	Credit Value	Practical: 2	
7.	Total Marks	Max. Marks: 50	Min Passing Marks: 17

Part B: Content of the Course		
Total No. of Lecturers: 30		
LABATORY COURSE		No. of Lectures
Tentative list of Practical	A. Inorganic chemistry Semi-micro qualitative analysis (using H ₂ S or other methods) of mixtures - not more than four ionic species (two anions and two cations, excluding interfering, insoluble salts) out of the following: Cations : NH ₄ ⁺ , Pb ²⁺ , Bi ³⁺ , Cu ²⁺ , Cd ²⁺ , Fe ³⁺ , Al ³⁺ , Co ²⁺ , Ni ²⁺ , Mn ²⁺ , Zn ²⁺ , Ba ²⁺ , Sr ²⁺ , Ca ²⁺ , Na ⁺ Anions : CO ₃ ²⁻ , S ²⁻ , SO ₃ ²⁻ , NO ₂ ⁻ , CH ₃ COO ⁻ , Cl ⁻ , Br ⁻ , I ⁻ , NO ₃ ⁻ , SO ₄ ²⁻ (Spot tests may be carried out wherever feasible)	10
	B. Acid-Base Titrations <ul style="list-style-type: none"> • Standardization of sodium hydroxide by oxalic acid solution. • Determination of strength of HCl solution using sodium hydroxide as intermediate. • Estimation of carbonate and hydroxide present together in mixture. • Estimation of carbonate and bicarbonate present together in a mixture. • Estimation of free alkali present in different soaps/detergents 	

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3/6

	<p>C. Redox Titrations</p> <ul style="list-style-type: none"> • Standardization of KMnO_4 by oxalic acid solution. • Estimation of Fe(II) using standardized KMnO_4 solution. • Estimation of oxalic acid and sodium oxalate in a given mixture. • Estimation of Fe(II) with $\text{K}_2\text{Cr}_2\text{O}_7$ using internal (diphenylamine, anthranilic acid) and external indicator. 	
	<p>Organic chemistry</p> <ol style="list-style-type: none"> 1. Demonstration of laboratory Glassware's and Equipments. 2. Calibration of the thermometer. $80^\circ - 82^\circ$ (Naphthalene), $113.5^\circ - 114^\circ$ (Acetanilide), $132.5^\circ - 133^\circ$ (Urea), 100° (Distilled Water.) 3. Purification of organic compounds by crystallization using different solvents. Phthalic acid from hot water (using fluted filter paper and stemless funnel). Acetanilide from boiling water. Naphthalene from ethanol. Benzoic acid from water. 4. Determination of the melting points of organic compounds. Naphthalene $80^\circ - 82^\circ$, Benzoic acid $121.5^\circ - 122^\circ$, Urea $132.5^\circ - 133^\circ$ Succinic acid $184.5^\circ - 185^\circ$, Cinnamic acid $132.5^\circ - 133^\circ$, Salicylic acid $157.5^\circ - 158^\circ$, Acetanilide $113.5^\circ - 114^\circ$, m-Dinitrobenzene 90°, p-Dichlorobenzene 52°, Aspirin 135°. 5. Effect of impurities on the melting point – mixed melting point of two unknown organic compounds. Urea–Cinnamic acid mixture of various compositions (1:4, 1:1, 4:1). 6. Determination of boiling point of liquid compounds. (boiling point lower than and more than 100°C by distillation and capillary method). Ethanol 78°, Cyclohexane 81.4°, Toluene 110.6°, Benzene 80°. i. Distillation (Demonstration) Simple distillation of ethanol-water mixture using water condenser. Distillation of nitrobenzene and aniline using air condenser. ii. Sublimation Camphor, Naphthalene, Phthalic acid and Succinic acid. iii. Decolorisation and crystallization using charcoal. Decolorisation of brown sugar with animal charcoal using gravity filtrations crystallization and decolorisation of impure naphthalene (100 g of naphthalene mixed with 0.3 g of Congo red using 1 g of decolorizing carbon) from ethanol. 7. Qualitative Analysis Detection of elements (N, S and halogens) and functional groups (Phenolic, Carboxylic, Carbonyl, Esters, Carbohydrates, Amines, Amides, Nitro and Anilide) in simple organic compounds. 8. Preparation and characterization of biodiesel from vegetable oil. 9. Preparation of soap. 	10
	<p>Physical chemistry</p> <ol style="list-style-type: none"> 1. Surface tension measurements. Determine the surface tension by (i) drop number (ii) drop weight method. • Surface tension composition curve for a binary liquid mixture. 2. Viscosity measurement using Ostwald's viscometer. Determination of viscosity of aqueous solutions of (i) sugar (ii) ethanol at room temperature. Study of the variation of viscosity of sucrose solution with the concentration of solute. Viscosity Composition curve for a binary liquid mixture. 	10

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3/6

	<p>3. Chemical Kinetics To determine the specific rate of hydrolysis of methyl/ethyl acetate catalysed by hydrogen ions at room temperature. To study the effect of acid strength on the hydrolysis of an ester. To compare the strengths of HCl & H₂SO₄ by studying the kinetics of hydrolysis of ethyl acetate.</p> <p>4. Colloids To prepare colloidal solution of silver nanoparticles (reduction method) and other metal nanoparticles using capping agents.</p>	
<p>Keywords: Semi-micro qualitative analysis, Qualitative analysis, Titrations, Chemical Kinetics, Colloids, Viscosity, Surface tension, Decolorization and crystallization, Distillation, Sublimation, Soap, biodiesel.</p>		

Part C: Learning Resource

Text Books, Reference Books, Other Resources

Suggested Readings :

1. Mendham, J., A. I. Vogel's Quantitative Chemical Analysis 6th Ed., Pearson, 2009.
 2. Ahluwalia, V. K., Dhingra, S. and Gulati, A. College practical Chemistry, University Press.
 3. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education (2009).
 4. Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. Practical Organic Chemistry, 5th Ed., Pearson (2012)
 5. Khosla, B. D.; Garg, V. C. & Gulati, A. Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi (2011).
 6. Garland, C. W.; Nibler, J. W. & Shoemaker, D. P. Experiments in Physical Chemistry 8th Ed.; McGraw-Hill: New York (2003).
 7. Halpern, A. M. & McBane, G. C. Experimental Physical Chemistry 3rd Ed.; W.H. Freeman & Co.: New York (2003).
- Sidhwani, I.T., Saini, G., Chowdhury, S., Garg, D., Malovika, Garg, N. Wealth from waste: 8.A green method to produce biodiesel from waste cooking oil and generation of useful products from waste further generated "A Social Awareness Project", Delhi University Journal of Undergraduate Research and Innovation.
9. Carpenter, William Lant; Leask, Henry (1895). A treatise on the manufacture of soap and candles, lubricants and glycerin. Free ebook at Google Books.

E- Learning Resources:

1. <http://heecontent.upsdc.gov.in/Home.aspx>
2. <https://nptel.ac.in/courses/104/106/104106096/>
3. <http://heecontent.upsdc.gov.in/Home.aspx>
4. <https://nptel.ac.in/courses/104/106/104106096/>
5. <https://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro1.htm>
6. <https://nptel.ac.in/courses/104/103/104103071/#>

Fundamental Chemistry related topics on SWAYAM platform and E-pathshala

Part D: Assessment and Evaluation

Maximum Marks: 50

Ans
2/6

**Scheme of B.Sc.
Zoology**

Year	Course Code	Subject Name	Theory/ Practical	Total Credit	Total Marks	
					Max	Min
First year	ZOOL-1T	Animal Diversity:Non-Chordata and Chordata , Comparative Anatomy and Physiology of Non-chordates	Theory	4	50	17
	ZOOL-2T	Cell Biology , Histology and Comparative Anatomy & Physiology Of Chordates	Theory	4	50	17
	ZOOL-1P	Practical	Practical	2	50	17

Note: There shall be four extra credits in all the years of under graduation for internship/apprenticeship. The certificate of extra credits would be provided by the university concern.



Part A: Introduction			
Program: Certificate Course		Class: B.Sc. I st Year	Year: 2022 Session: 2022-2023
1	Course Code	ZOOL-1T	
2	Course Title	Animal Diversity: Non-Chordata and Chordata, Comparative Anatomy and Physiology of Non-chordates	
3	Course Type	Theory	
4	Pre-requisite (if any)	No	
5	Course Learning Outcomes (CLO)	Upon completion of the course students should be able to : <ul style="list-style-type: none"> • Learn about the importance of systemic, taxonomy and phylogeny to get a concrete idea of evolution of non-chordate phyla. • Understand the various morphological, anatomical structures and functions of animals of different phyla. • Get the knowledge about economic, ecological and medical significance of various animals in human welfare. • Understand the important parasites and their control measures. • Comparison of the anatomy and physiology of the different taxa of non-chordates. 	
6	Credit Value	4	
7	Total Marks	Max. Marks: 50	Min Passing Marks : 17

Part B: Content of the Course		
Total Lectures: 60		
Unit	Topics	No. of Lectures
I	Taxonomy, Protozoa, Porifera Taxonomy- Elementary knowledge of Zoological Nomenclature and International Code. Classification of Animal Kingdom upto Phylum of acoelomate and coelomate non-chordates according to Parker and Haswell 7 th edition. Protozoa- Phylum Protozoa: General characters of the phylum and classification up to order with characters and suitable examples. Structure, life history and pathogenicity of malaria parasite (<i>Plasmodium vivax</i>). Protozoa and disease. Porifera- Phylum Porifera: General characters of the phylum and classification up to order with characters and suitable examples. Type study of Sycon.	12
II	Coelenterata, Platyhelminthes, Nematelminthes : Coelenterata- Phylum Coelenterata: General characters of the phylum and classification up to order with characters and suitable examples. Type Study of Obelia. Platyhelminthes - Phylum Platyhelminthes: General characters of the phylum and classification up to order with characters and suitable examples. Type Study of Liverfluke. Nematelminthes- Phylum Nematelminthes: General characters of the phylum and classification up to order with characters and suitable examples. Pathogenic nematodes and diseases.	12
III	Annelida, Arthropoda, Mollusca : Annelida- Phylum Annelida: General Characters of the phylum and classification up to order with characters and suitable examples. Types study of Earthworm (<i>Pheretima</i>). Arthropoda - Phylum Arthropoda: General Characters of the phylum and classification up to order with characters and suitable examples. Type study of Prawn. Insects as a vector of human disease. Mollusca - Phylum Mollusca: General characters of the phylum and classification up to order with characters and suitable examples. Type study of <i>Pila</i> .	12


 A.K.R. Jahn
 31.5.2022

IV	<p>Echinodermata, Hemichordata, Classification of Chordata :</p> <p>Echinodermata - Phylum Echinodermata: General characters of the phylum and classification up to order with characters and suitable examples. Type study of Starfish (<i>Asterias</i>).</p> <p>Hemichordata - Phylum Hemichordata: General characters of the phylum hemichordate and relationship with non-chordates and chordates. Type study of <i>Balanoglossus</i></p> <p>Classification of Chordata - Classification of Chordata up to order with characters and suitable examples. Brief account of Urochordata, Cephalochordata and Vertebrata.</p>	11
V	<p>Comparative Anatomy and Physiology of Non-chordates: Coelom and coelomducts in Non-chordate. Locomotory organs and locomotion in Non-chordate. Pattern of feeding and digestion in lower Metazoans. Comparative anatomy and physiology of respiration and excretion in Non-chordate. Primitive, diffused and advance nervous system in Non-chordate. Reproduction in Non-chordates.</p>	13
<p>Keywords : Locomotory organ, feeding and digestion, respiration, International Commission on Zoological Nomenclature (ICZN), Classification, Protozoa, Classification, Liver Fluke, Trochophore, Arthropoda, Crustacea larva, Echinodermata larva</p>		

Part C - Learning Resource	
<p>1. Text Books, Reference Books, Other Resources –</p> <ol style="list-style-type: none"> Parker, J, Haswell, WA, "A Text Book of Zoology", VII edition, Vol. I & II, Low Price Publications, Delhi, 1990. Barnes, RD, "Invertebrate Zoology", VII Edition, Cengage Learning, India, 2006. Pechenik, JA, "Biology of the Invertebrates" McGraw-Hill Educations, VII Edition, 2015. Sedgwick, A, "A Students Text Book of Zoology", Vol. I, II & Vol. III., Low Price Publications, Delhi, 1990. Dhami and Dhami, "Invertebrate Zoology" R., Chand & Co., India, 2009. Jordan and Verma, "Invertebrate Zoology," S. Chand & Company, New Delhi, 2013. Agarwal, VK, "Zoology for Degree Students: Non-Chordata", S Chand & Company, 2017. Kotpal, R, "Modern Text Book of Invertebrates", Rastogi Publications, Meerut, 2017. Kotpal, R, "Protozoa to Echinodermata (Phylum Series)", Rastogi Publications, Meerut, 2017. Kardong, K.V. (2006) Vertebrates: Comparative Anatomy, Function, Evolution (4th edition), McGraw-Hill Jordan, E. L. and Verma, P. S. (2013) Chordate Zoology (14th edition). Saxena, R. K. and Saxena, S. (2015) Comparative Anatomy of Vertebrates (2nd edition). 	
<p>E- Resources –</p> <ol style="list-style-type: none"> SWAYAM- https://swayam.gov.in/explorer?searchText= https://academic.oup.com https://medineplus.gov https://ncin.nlon.nih.gov https://zoologylearningpoint.woodpress.com https://zoologyresources.com National digital library – https://ndl.iitkgp.ac.in e-PG Pathshala (MHRD) Portal, https://egpg.inflibnet.ac.in Science Direct Open Access Content – https://www.sciencedirect.com/book/9781843342038/open-Access https://egyankosh.ac.in 	

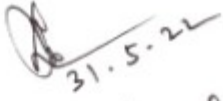
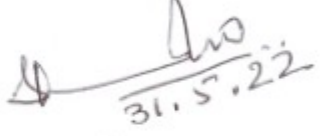
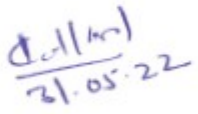

 Dr. K. R. Datta
 31.5.2022

Part D: Assessment and Evaluation

Maximum Marks, University exam. - :50

DECLARATION

This is to certify that the syllabus is framed by the central board of study (Zoology) as the guidelines of the department of higher education, Chhattisgarh.

1. Dr. K. R. Sahu - Chairman - Assistant Professor, Govt. Pandit Madhav Rao Sapre Collfge, Pendra Road  31.5.2022
2. Dr. Ajit Hundet - Member - Professor, Govt. D. B. Girls College, Raipur  31.05.2022
3. Dr. Prem Praksah Singh - Member - Professor, Govt. College, Kusmi  31/05/2022
4. Dr. Shubhada Rahalkar - Member - Professor, Govt. Bilasa Girls P. G. College, Bilaspur  31.5.22
5. Dr. Anil Kumar Shrivastava - Member - Professor, Govt. V. Y. T. P. G. Autonomous College, Durg  31.5.22
6. Dr. R. K. Tamboli - Member - Assistant Professor, Kirodimal Govt. Arts & Science College, Raigarh  31.5.22
7. Dr. Parmita Dubey - Member - Assistant Professor, Govt. J. Y. Chhattisgarh College, Raipur  31-5-22
8. Dr. Shashi Gupta - Member - Assistant Professor, Govt. Nagarjuna P. G. College of Science, Raipur  31.5.22
9. Dr. L. P. Miri - Member - Assistant Professor, Govt. J.P. Verma P. G. Arts & Commerce College, Bilaspur  31.5.22
10. Dr. Rajesh Kumar Rai - Member - Assistant Professor, Govt. Mahamaya College, Ratanpur, Bilaspur  31.05.2022
11. Dr. Kavita Krishnamoorti - Member - Assistant Professor, Govt. Lahiri P. G. College, Chirimiri, Koriya  31.05.22

Date : 31.05.2022

Part A: Introduction			
Program: Certificate Course	Class: B.Sc. 1 Year	Year: 2022	Session: 2022-2023
1	Course Code	ZOO-2T	
2	Course Title	Cell Biology, Histology and Comparative Anatomy & Physiology of Chordates	
3	Course Type	Theory	
4	Pre-requisite (if any)	To study this course, a student must have/had the subject Biology in class 12 th .	
5	Course Learning Outcomes (CLO)	<p>At the end of this course, the students will be able :</p> <ul style="list-style-type: none"> • Understand the basic structure, functioning of the cell and cell organelles and understand the intricate cellular mechanisms involved. • Understand the tissues, how tissues are produced from cells in a normal course and about any malfunctioning which may lead to benign or malignant tumor. • Develop an understanding of the evolution of vertebrates thus integrating structure, function and development. • Understand the morphological, anatomical and physiological adaptation in diverse habitats. • 5. Develop an understanding of the evolution of vertebrates thus integrating structure, function and development. 	
6	Credit Value	Theory : 4	
7	Total Marks	Max. Marks: 50	Min Passing Marks : 17

Part B: Content of the Course		
Total Lecturer: 60		
Unit	Topics	No. of Lectures
I	<p>Prokaryotic and Eukaryotic cells : General structure of prokaryotes, bacteria, archaea and eukaryotes. Ultra structure and function of endoplasmic reticulum, ribosomes, Golgi apparatus, lysosome, Mitochondria, nuclear apparatus.</p> <p>Cell membrane and transport mechanism : Structure, composition, models and function. Fluid mosaic model Junctional complexes, membrane receptor modifications : microvilli, desmosomes and plasmodesmata.</p>	12
II	<p>Cell cycle, cell signaling and cell culturing : Cell cycle, cell division – mitosis and meiosis. Cell division check points and their regulation. Role of growth factors. Programmed cell death (Apoptosis).</p> <p>Cell regulation and cell signaling : Signaling molecules and their receptors. Functions of cell surface receptors. Regulation of signaling pathways.</p> <p>Cell culture : Types of cell culture – monolayer and suspension culture. Types of culture media. Basic characteristics of tissue culture media. Tissue culture and engineering.</p>	12
III	<p>Structure and functional significance of animal tissues : Introduction to tissues. Epithelial tissue: types, structure and characteristics. Exocrine and endocrine glands: type and structure. Structure and function of loose, dense and adipose tissue. Muscular tissue: Ultra structure of smooth, skeletal and cardiac muscles. Muscle contraction. Membrane of the brain and spinal cord.</p>	11
IV	<p>Structure and function of integument, skeletal, digestive, circulatory system :</p> <p>Integument : Structure of integument from fish to mammals. Function of integument. Epidermal and dermal derivatives of integument and their functional significance.</p> <p>Skeletal system : Comparative account of pelvic and pectoral girdles from fishes (cartilaginous and bony) to mammals.</p> <p>Digestive system : Dentition in mammals. Comparative study of alimentary canal and digestive glands from fish to mammal. Physiology of digestion in mammal.</p>	13


 31/5-2022

	Circulatory system: Evolution of aortic arches and their significance. Structure and evolution of heart in vertebrates. Cardiac cycle. Blood : Composition and function.	
V	Structure and function of circulatory, respiratory, excretory, reproductive and endocrine system : Respiratory system : Aquatic and terrestrial respiration. Comparative anatomy of lungs in amphibian, reptile, bird and mammals. Excretory system : Physiology of excretion, urine formation. Reproductive system : Comparative details of testes and ovaries from fishes to mammals. Estrous and menstrual cycle. Endocrine system : Types and functional significance of endocrine glands and hormones.	12
Keywords: Tissue, Endocrine glands, Girdles, Cell signaling, Cell culture, Excretion, Circulatory system, Aortic arches, Heart, Reproductive cycle.		

Part C - Learning Resource	
Text Books, Reference Books, Other Resources -	
<ol style="list-style-type: none"> Books of M. P. Hindi Granth Academy Rastogi V. B. : Introduction to Cytology Cell Biology and Molecular Biology : N. Arumugam Cell Biology : N. Arumugam Molecular Cell Biology : N. Arumugam Cell Biology, Genetics, Molecular Biology and Evolution : Verma P. S., Agrawal V. K. Sheelar and Binachi : Cell and Molecular Biology Karp : Cell and Molecular Biology De Robertis : Cell and Molecular Biology Powar C. B. : Cell Biology A Textbook of Animal Histology : A. K. Berry, Emkey Publication, Delhi A Textbook of Histology and Practical guide: J. P. Gunasegram Animal Cell Culture : R. Freshney Animal Cell and Tissue Culture : Shivangi Mathur Chordate Zoology : R. L. Kotpal & P. S. Verma Modern Text Book of Zoology – Vertebrate : R. L. Kotpal A Text Book of Chordates : A. Thangamani, N. Arumugam, Saras Pulpication Biology of Animals, Volume – II, Sinha, Adhikari, Ganguly Comparative Anatomy of vertebrates, 2nd edition : R. K. Saxena, Sunita Saxena Comparative Anatomy and Developmental Biology : Kotpal, Shastry and Shukla Chordata and Comparative Anatomy : R. L. Kotpal Chordate Zoology : Jordan E. L. and Verma P. S. Anatomy of Chordates, 4th edition : Weichert C. K. Comparative vertebrate Anatomy : L. H. Hyman 	
E-Resources –	
<ol style="list-style-type: none"> SWAYAM- https://swayam.gov.in/explorer?searchText= https://academic.oup.com https://medineplus.gov https://ncin.nlon.nih.gov https://zoologylearningpoint.woodpress.com https://zoologyresources.com National digital library – https://ndl.iitkgp.ac.in e-PG Pathshala (MHRD) Portal, https://egpg.inflibnet.ac.in Science Direct Open Access Content – https://www.sciencedirect.com/book/9781843342038/ open – Access https://egyankosh.ac.in 	


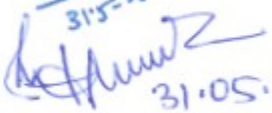
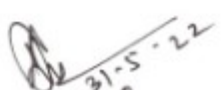
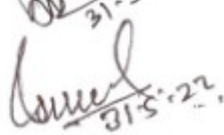

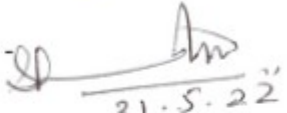
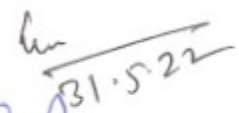
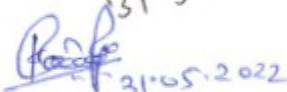
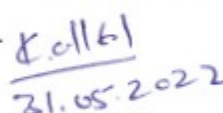

 A-K Pathshala
 31-5-2022

Part D: Assessment and Evaluation

University Exam(UE): Maximum Marks: 50 Marks

DECLARATION


This is to certify that the syllabus is framed by the central board of study (Zoology) as the guidelines of the department of higher education, Chhattisgarh.

1. Dr. K. R. Sahu - Chairman -
Assistant Professor, Govt. Pandit Madhav Rao Sapre College, Pendra Road

31.5.2022
2. Dr. Ajit Hundet - Member -
Professor, Govt. D. B. Girls College, Raipur

31.05.22
3. Dr. Prem Prakash Singh - Member -
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- Prem Prakash Singh
31/05/2022
4. Dr. Shubhada Rahalkar - Member -
Professor, Govt. Bilasa Girls P. G. College, Bilaspur
- Rahalkar
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5. Dr. Anil Kumar Shrivastava - Member -
Professor, Govt. V. Y. T. P. G. Autonomous College, Durg
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6. Dr. R. K. Tamboli - Member -
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7. Dr. Parmita Dubey - Member -
Assistant Professor, Govt. J. Y. Chhattisgarh College, Raipur
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31.5.22
8. Dr. Shashi Gupta - Member -
Assistant Professor, Govt. Nagarjuna P. G. College of Science, Raipur
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31.5.22
9. Dr. L. P. Miri - Member -
Assistant Professor, Govt. J.P. Verma P. G. Arts & Commerce College, Bilaspur
- 
31.5.22
10. Dr. Rajesh Kumar Rai - Member -
Assistant Professor, Govt. Mahamaya College, Ratanpur, Bilaspur
- 
31.05.2022
11. Dr. Kavita Krishnamoorti - Member -
Assistant Professor, Govt. Lahiri P. G. College, Chirimiri, Koriya
- 
31.05.2022

Date : 31.05.2022

Part A: Introduction			
Program: Certificate Course	Class: B.Sc. I Year	Year: 2022	Session: 2022-2023
1	Course Code	ZOOL-1P	
2	Course Title	Lab Course - I	
3	Course Type	Practical	
4	Pre-requisite (if any)	No	
5	Course Learning Outcomes (CLO)	After completion of practical work the outcome will be : <ul style="list-style-type: none"> • Able to know animal diversity in the form of museum/slide for invertebrate and vertebrates. • Capable to enumerate biology of invertebrates. • Capable to explore anatomy of animals. • Able to understand cytological, histological and osteological configuration for animal life. • Capable to explain hematology of animal system. 	
6	Credit Value	2	
7	Total Marks	Max. Marks: 50	Min Passing Marks : 17

Part B: Content of the Course		
Total classes: 30		
	Content	No. of classes
	<p>Tentative list of practical/exercise :</p> <p>The practical's work will be based on theory syllabus and the students will be required to show the knowledge of the following –</p> <ol style="list-style-type: none"> 1. Study of museum specimens representing to invertebrate phyla. 2. Study of permanent slides : Paramecium, Euglena, T. S. Sycon, Sponge Spicules, Sponge gemmule, Obelia colony, Obelia medusa, Ephyra larva, Fasciola larval forms (miracidium, Radia, Cercaria, Metacercaria), Trochophore larva, Zoea larva, Bipinnaria larva. 3. Dissection/ demonstration/ clay model of – <ol style="list-style-type: none"> a) Pheretima : Digestive system, Reproductive system, Nervous system b) Palaemon : Appendages, Nervous system c) Periplaneta : Mouth parts, Digestive system d) Pila : Nervous system 4. Exercise based on cytology : squash preparation from onion root tip and study of cell division. 5. Study of museum specimens representing the chordata from cyclostomes to mammals. 6. Study of permanent slides of chordates – Fish skin, scales, V. S. Skin of frog, reptile, bird, mammal, T.S. liver, pancreas, testes, ovary of frog and mammal. 7. Osteology : Study of girdles of amphibian, reptile, bird and mammal. 8. Temporary mounting : <ol style="list-style-type: none"> a) Palaemon : Statocyst b) Pila : Ctenidium, osphradium c) Pheretima : Septal nephridia d) Fish scale : Placoid, Cycloid, Ctenoid 9. Exercise based on blood : blood group, blood pressure measure 10. Field visit report : Photography & identification of any five local invertebrate or vertebrate fauna. 	30


 A.K. Palan
 31-5-2022

Part C - Learning Resource

Text Books, Reference Books, Other Resources -

1. Practical zoology Invertebrate : S. S. Lal
2. Practical zoology vertebrate : S. S. Lal
3. A Manual of practical zoology invertebrates : P. S. Verma
4. A Manual of practical zoology Chordates : P. S. Verma
5. Saras Practical zoology Vol. I, Vol. II, N. Arumugam

Part D: Assessment and Evaluation

University Exam(UE): Maximum Marks: 50 Marks

DECLARATION

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Date : 31.05.2022