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.

21/6/23
(P C Choudhury)

(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.

Dr. Sushama Mishra 12.6.2023

2/6/23

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.

Dr. Sushama Mishra

21/6/23

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

Max. Marks:75 Qualifying Marks:26
Total credits: 05

Paper-II	Mark's	Period's	Credit
Unit-I **Flamingo : A Textbook for college students** **Publication : Macmillan Publishers**	3x5=15	18	01
Unit -II • 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 • (a) Unseen Passage (Normal) • (b) Vocabulary (Text-based)	1x5=05 1xl0=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 • 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.			

Dr. Sushama Mishra

2/6/23

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

23.02.2023 23/2/23 23/2/23 23-2-2023 23/2/23

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 क्रमश:08 एवं 07 होंगे। प्रश्नपत्र का पूर्णांक75 निर्धारित है।

प्रश्नपत्रकेपूर्णांककादसप्रतिशतअंकआंतरिकमूल्यांकनकेलिएनिर्धारितहै।

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:-

23/2/23

23.2.23

23/2/23

23.2.2023

Scheme of B.Sc./ B.Sc. (Hons.) Biotechnology

Year	Course Code	Subject Name	Theory/ Practical	Total Credit	Total Marks	
					Max	Min
First year	BIOT -1T	Biochemistry, Biostatics and Computers	Theory	4	50	17
	BIOT -2T	Cell Biology, Genetics and Microbiology	Theory	4	50	17
	BIOT -1P	LAB 1: Microbiology and Biochemical Techniques	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 university concern.

Part A: Introduction				
Program: **Certificate Course**		Class: **B.Sc. I Year**	Year: **2022**	Session:**2022-2023**
1	Course Code	BIOT-1T		
2	Course Title	**Biochemistry, Biostatistics and Computers**		
3	Course Type	Theory		
4	Pre-requisite (if any)	As per Govt. norms		
5	Course Learning. Outcomes (CLO)	At the end of this course, the students will be able to: • Understand on fundamentals of biological molecules. • Understand the concept of proteins, carbohydrates, lipids, vitamins and nucleic acid. • Understand the types and structures of proteins, carbohydrates, lipids, vitamins and nucleic acid.		
6	Credit Value	Theory: 4		
7	Total Marks	**Max. Marks:** 50	**Min Passing Marks:** 17	

Part B: Content of the Course		
Total No. of Teaching – Periods- 60 / Hours – 40		
Unit	**Topics**	**No. of Period / Hour**
1	1. Introduction to Biochemistry: History, Scope and Development. 2. Carbohydrates: Classification, Structure and Function of Mono, Oligo and Polysaccharides. 3. Lipids: Structure, Classification and Function. 4. pH, pK, buffer, covalent and non-covalent bond.	12 Periods / 08 Hours
2	1. Amino acids and Proteins: Classification, Structure and Properties of amino acids, Types of Proteins and their Classification and Function. 2. Enzymes: Nomenclature and Classification of enzyme, Mechanism of enzyme action, Enzyme Kinetics and Factors affecting the enzymes action. Immobilization of enzyme and their application. 3. Enzyme inhibition: Competitive and non-competitive, feedback mechanism	12 Periods / 08 Hours
3	1. Carbohydrates, Proteins and Lipid Metabolism - Glycolysis, Glycogenesis, Glyconeogenesis, Glycogenolysis and Krebs cycle. Electron Transport Chain, β-oxidation of Fatty acids and Urea cycle 2. Vitamins - Structure, Classification and Function	12 Periods / 08 Hours
4	1. Scope of Biostatistics- types of data: graphical and tabular presentation, Collection of data-sampling techniques 2. Measures of Central Tendency: Mean, Median and Mode and Standard Deviation. 3. Probability Calculation: Addition and multiplication rule. 4. Chi square test, Correlation coefficient and regression lines, ANOVA	12 Periods / 08 Hours
5	1. Computers - Organization of computer, Digital and Analogue Computers, Concept of Hardware and Software, computer languages – high and low level 2.Word, spreadsheet and presentation software 3. Application of computer in online classrooms, meeting, test and e-library	12 Periods / 08 Hours
Keywords: Biomolecules, amino acids, carbohydrates, lipids, vitamins, Biostatistics, Computers		

Part C - Learning Resource

Text Books, Reference Books, Other Resources

Suggested Readings:

1. Lehninger Principles of Biochemistry (4th Ed.) Nelson, D., and Cox, M.; W.H. Freeman and Company, New York, 2005
2. Todd and Howards Mason (2004) Text book of Biochemistry, Fourth Edition
3. Lubert Stryer and Berg ((2004) Biochemistry, Fifth Edition
4. Diana Rain, Marni Ayers Barby - (2006) Textbook on Q level Programming. 4th Edition.
5. Karl Schwartz: (2006) Guide of Micro Soft. Marina Raod, 4th Edition.
6. E Balaguruswamy by Programming in BASIC (1991).
7. RC Campbell by Statistics for Biologists. .
8. P Cassel et al by Inside Microsoft Office,
9. AC Wardlaw by Practical Statistics for Experimental Biologists,
10. JH Zar by Bio-statistical analysis
11. RR Sokal FJ Rohlf by Introduction to Biostatistics
12. L Y Kun (2003) Microbial Biotechnology: Principles and applications
13. Khan and Khanum (1994) Fundamental of Biostastics
14. Berg, J. M., Tymoczko, J. L. and Stryer, L.(2006). Biochemistry. 6th Edition. W.H Freeman & Co.
15. Buchanan, B., Gruissem, W. and Jones, R. (2000) Biochemistry and Molecular Biology of Plants. American Society of Plant Biologists.
16. Hopkins, W.G. and Huner, P.A. (2008) Introduction to Plant Physiology. John Wiley and Sons.
17. Salisbury, F.B. and Ross, C.W. (1991) Plant Physiology, Wadsworth Publishing Co. Ltd.
18. Le CT (2003) Introductory biostatistics. 1st edition, John Wiley, USA
19. Glaser AN (2001) High YieldTM Biostatistics. Lippincott Williams and Wilkins, USA
20. DSVGK Kaladhar, Molecular Biochemistry (2018) RBSA Publishers ISBN 9788176117708.
21. Edmondson A and Druce D (1996) Advanced Biology Statistics, Oxford University Press.
22. Danial W (2004) Biostatistics: A foundation for Analysis in Health Sciences, John Wiley and Sons Inc.

E-learning Resources

https://ncert.nic.in/textbook/pdf/lech205.pdf
https://www.pdfdrive.com/biomolecules-books.html
https://swayam.gov.in/
https://www.edx.org/search?q=biomolecules&tab=course
https://britannica.com
https://en.wikibooks.org/wiki/Biochemistry
https://nptel.ac.in

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	Not Applicable
External assessment University Exam (UE) Time		As per Govt. norms

Any remarks/ Suggestions: -

Declaration

Syllabus is framed as per the ToR

Name	Signature
Dr DSVGK Kaladhar, Prof & Chairperson CBoS Biotechnology, UTD ABVV	
Dr Pramod Kumar Mahish, Asst. Professor Govt. Digvijay College Rajnandgaon	
Dr Saumya Khare, Asst Prof, Kalyan PG. College Bhilai	
Dr Shubha Thakur, Asst Prof, St. Thomas College Bhilai	
Dr Akanksha Jain, Asst Prof. Shri Shankaracharya Mahavidyalaya, Bhilai	
Dr Arun Kumar Kashyap, Asst Professor, Govt. E raghavendra Rao PG. Science College Bilaspur	
Dr Tarun Kumar Patel, Asst Professor, Sant Guru Ghasidas PG. College Kurud	
Dr Neha Behar, Asst Prof. DLS PG. College Bilaspur	
Dr Sanjana Bhagat, Asst Prof. Govt Ngarjuna PG. Science College, Raipur	
Dr Kamlesh Shukla, PRSU, Raipur	
Dr Ashish Kumar, Sant Gahira Guru Vishwavidyalay Sarguja	

Part A: Introduction				
Program: **Certificate Course**		Class: **B.Sc. I Year**	Year: **2022**	Session:**2022-2023**
1	Course Code	BIOT-2T		
2	Course Title	**Cell Biology, Genetics and Microbiology**		
3	Course Type	Theory		
4	Pre-requisite (if any)	As per Govt. norms		
5	Course Learning. Outcomes (CLO)	At the end of this course, the students will be able to: • Understand on fundamentals of cellular organization, microorganisms and inheritance • Understand the concept of genetics and microbial fundamentals • Understand the types of cell organelles and various microbes		
6	Credit Value	Theory: 4		
7	Total Marks	**Max. Marks:** 50	**Min Passing Marks:** 17	

Part B: Content of the Course		
Total No. of Teaching – Periods- 60 / Hours – 40		
Unit	**Topics**	No. of Period / Hour
1	1. Cell theory and its modern interpretation 2. Diversity of Cell shape and size. 3. Prokaryotic cell structure: Function and ultra-structure of cell (Gram positive and Gram negative Bacteria), Flagella, Pilli, Endospore and Capsule. 4. Eukaryotic cell: Plants and animal.	12 Periods / 08 Hours
2	1. Cytoplasm: Structure and Functions of Endoplasmic reticulum, Ribosome, Golgi complex, Lysosomes, Nucleus, Mitochondria, Chloroplast and Chromosomes 2. Cytoskeleton: Microtubules, Microfilaments and Intermediate filaments. 3. Cell division: Mitosis and Meiosis. Cell cycle 4. Programmed Cell Death.	12 Periods / 08 Hours
3	1. Mendel's Laws of Inheritance. Non-mendelian inheritance 2. Linkage and Crossing over. 3. Chromosome variation in number and structure: Deletion, Duplication, Translocation, Inversion and Aneuploidy, Euploidy (Monoploidy, Polyploidy and its importance).	12 Periods / 08 Hours
4	1. History, Scope and Development of Microbiology. 2. Basic techniques of Microbial Culture 3. Microbial Growth & Nutrition of Bacteria: Isolation, media sterilization-physical and chemical agents, pure culture- pour plate method, streak plate method and spread plate method. 4. General features and Economic importance of Fungi, bacteria and cyanobacteria.	12 Periods / 08 Hours
5	1. Bacterial Reproduction: Conjugation, Transduction and Transformation. 2. Mycoplasma – History, Classification, Structure reproduction & Diseases. 3. Viruses – Basic features, Structure, Classification, Multiplication and Bacteriophages (Morphology, life cycle, infection and medicinal importance)	12 Periods / 08 Hours
Keywords: Cell, Cytoplasm, Law of inheritance, Gene interaction, Microbial culture, microbial reproduction.		

Part C - Learning Resource

Text Books, Reference Books, Other Resources

Suggested Readings:

1. C.B. Power- Cell biology, First Edition (2005), Himalaya Publishing House.
2. Gereld Karp - Dell and molecular biology, 4th Edition (2005)
3. P.K. Gupta - Cell and molecular biology, Second Edition (2003), Rastogi publications.
4. S.S. Purohit - Microbiology : Fundamentals and Applications, 6th Edition (2004)
5. R.C. Dubey and D.K. Maheshwari: Practical Microbiology. S.Chand Publication.
6. Tortora, Funke and Case - Microbiology, An introduction, sixth Edition (1995), Benjamin/Cummings Publishing Company.
7. Prescott, Harlyey and Klein - Microbiology, Third Edition, Wm. C. Brown Publishers (1996).
8. P. Chakraoborthy - Textbook of microbiology, Second Edition (2007).
9. Microbial Genetics, David Freifelder, John F Cronan, Stanley R Maloy, Jones and Bartlett Publishers.
10. Elements of Human Genetics. I.I. cavalla-Sfoeza, WA Benjamin Advanced Book Program.

E-learning Resources

https://www.easybiologyclass.com/topic-genetics/
https://freebookcentre.net/medical_text_books_journals/genetics_ebooks_online_texts_download.html
https://britannica.com
https://en.wikibooks.org/wiki/Biochemistry
https://nptel.ac.in

Part D: Assessment and Evaluation

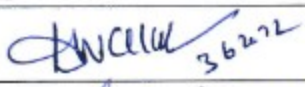
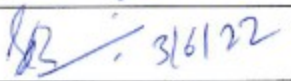
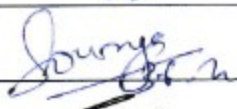
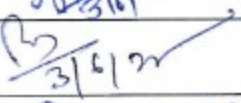
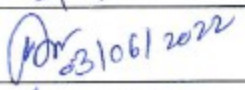
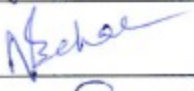
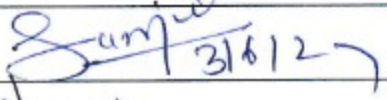
Suggested Continuous Evaluation Methods:
Maximum Marks: 50
Continuous Comprehensive Evaluation (CCE): Not Applicable
University Exam(UE): 50 Marks

Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	Not Applicable
External assessment University Exam (UE) Time 3Hours		As per Govt. norms.

Any remarks/ Suggestions: -

Declaration

Syllabus is framed as per the ToR

Name	Signature
Dr DSVGK Kaladhar, Prof & Chairperson CBoS Biotechnology, UTD ABVV	
Dr Pramod Kumar Mahish, Asst. Professor Govt. Digvijay College Rajnandgaon	
Dr Saumya Khare, Asst Prof, Kalyan PG. College Bhilai	
Dr Shubha Thakur, Asst Prof, St. Thomas College Bhilai	
Dr Akanksha Jain, Asst Prof. Shri Shankaracharya Mahavidyalaya, Bhilai	
Dr Arun Kumar Kashyap, Asst Professor, Govt. E raghavendra Rao PG. Science College Bilaspur	
Dr Tarun Kumar Patel, Asst Professor, Sant Guru Ghasidas PG. College Kurud	
Dr Neha Behar, Asst Prof. DLS PG. College Bilaspur	
Dr Sanjana Bhagat, Asst Prof. Govt Ngarjuna PG. Science College, Raipur	
Dr Kamlesh Shukla, PRSU, Raipur	
Dr Ashish Kumar, Sant Gahira Guru Vishwavidyalay Sarguja	

Part A: Introduction				
Program: **Certificate Course**		Class: **B.Sc. I Year**	Year: **2022**	Session: **2022-2023**
1	Course Code	**BIOT-1P**		
2	Course Title	**LAB 1 : Microbiology and Biochemical Techniques**		
3	Course Type	**Practical**		
4	Pre-requisite (if any)	As per Govt. norms.		
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: perform experiment related to biochemistry, microbial culture, statistical tools and computer applications		
6	**Credit Value**	**Practical: 2**		
7	**Total Marks**	**Max. Marks: 50**	**Min Passing Marks : 17**	

Part B: Content of the Course	
Total No. of Teaching Hours – 20 / 30 Periods	
Tentative Practical List	**Note:** This is tentative list; the teachers concern can add more practical's as per requirement. 1. Laboratory rules, Tools, Equipment and Other requirements in Microbiological laboratory. 2. Counting of bacteria by counting chamber, by plate count. 3. Preparation of media and cultivation techniques: (a) Basic liquid media (broth) (b) Basic Solid media, (agar slants and deep tubes) (c) Demonstration of selective and differential media (d) Isolation and enumeration of microorganisms (e) Isolation from air, water and Soil (f) Antibiotic sensitivity test 4. Smears and staining methods: (a) Preparation of bacterial smear (b) Gram Negative & Positive staining 5. Methods of obtaining pure cultures (a) Streak plate method (b) Pure plate method (c) Spread plate method (d) Broth cultures 6. Growth & Biochemical techniques (a) Determination of bacterial growth curve (b) Amylase production test (c) Cellulose production test (d) Estimation of Sugar in given solution (e) Extraction and separation of lipids (f) Estimation of proteins 7. Study of mitotic division 8. Biostatistics: (a) Graphical and tabular presentation of data (b) Problems on mean, mode and median. 9. Practical related to word, spreadsheet and presentation software

Part C - Learning Resource

Text Books, Reference Books, Other Resources

Suggested Readings:

1. Tortora GJ, Funke BR and Case CL. (2008). Microbiology: An Introduction. 9th edition. Pearson Education
2. Madigan MT, Martinko JM, Dunlap PV and Clark DP. (2014). Brock Biology of Microorganisms. 14th edition. Pearson International Edition
3. Cappucino J and Sherman N. (2010). Microbiology: A Laboratory Manual. 9th edition. Pearson Education Limited
4. Atlas RM. (1997). Principles of Microbiology. 2nd edition. WM.T.Brown Publishers.
5. Pelczar MJ, Chan ECS and Krieg NR. (1993). Microbiology. 5th edition. McGraw Hill Book Company.
6. Stanier RY, Ingraham JL, Wheelis ML, and Painter PR. (2005). General Microbiology. 5th edition. McMillan.
7. Carter J and Saunders V(2007). Virology; principles and Applications. John Wiley and Sons
8. Flint SJ, Enquist, LW, Krug, RM, Racaniello, VR Skalka, AM (2004) Principles of Virology, Molecular Biology, Pathogenesis and Control.2nd edition.ASM Press
9. Shors Teri (2013) Understanding Viruses 2nd edition Jones and Bartlett Learning Burlington USA
10. Willey JM, Sherwood LM, and Woolverton CJ. (2013). Prescott's Microbiology. 9th edition. McGraw Hill Higher Education.
11. Dimmock, NJ, Easton, AL, Leppard, KN (2007). Introduction to Modern Virology. 6th edition, Blackwell Publishing Ltd.
12. Cann AJ (2012) Principles of Molecular Virology, Academic Press Oxford UK

E-learning Resources:

https://www.coursehero.com/file/83673254/Genetics-Lab-Notespdf/
https://britannica.com
https://en.wikibooks.org/wiki/Biochemistry
https://nptel.ac.in
https://learn.genetics.utah.edu/content/labs/
https://onlinelabs.in/biology

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	Not Applicable
External assessment University Exam (UE)	As per Govt. norms.	

Declaration

Syllabus is framed as per the ToR

Name	Signature
Dr DSVGK Kaladhar, Prof & Chairperson CBoS Biotechnology, UTD ABVV	
Dr Pramod Kumar Mahish, Asst. Professor Govt. Digvijay College Rajnandgaon	
Dr Saumya Khare, Asst Prof, Kalyan PG. College Bhilai	
Dr Shubha Thakur, Asst Prof, St. Thomas College Bhilai	
Dr Akanksha Jain, Asst Prof. Shri Shankaracharya Mahavidyalaya, Bhilai	
Dr Arun Kumar Kashyap, Asst Professor, Govt. E raghavendra Rao PG. Science College Bilaspur	
Dr Tarun Kumar Patel, Asst Professor, Sant Guru Ghasidas PG. College Kurud	
Dr Neha Behar, Asst Prof. DLS PG. College Bilaspur	
Dr Sanjana Bhagat, Asst Prof. Govt Ngarjuna PG. Science College, Raipur	
Dr Kamlesh Shukla, PRSU, Raipur	
Dr Ashish Kumar, Sant Gahira Guru Vishwavidyalay Sarguja	

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 Archaegoniate 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)	At the end of this course, the students will be able to • 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. ofPeriod**
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 –*Volvox, Oedogonium, Chara, Vaucheria,Ectocarpus* and *Polysiphonia*. 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

for 13.6.22

IV	**Mycology , Mushroom Cultivation, Lichenology & Mycorrhiza:** General characteristic features, Economic importance and Classification of Fungi. Distinguishing characters of Myxomycota: General characters of Mastigomycota: *Phytophthora* and *Albugo*, Zygomycota: *Rhizopus* and *Mucor*, Ascomycota: *Saccharomyces*, *Penicillium, Peziza*. Basidiomycota: *Ustilago, Puccinia, Agaricus*; Deuteromycota: *Colletotrichum, Fusarium, Alternaria*. 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.	12
V	**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 **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, Alternaria 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 organizationand Integrated plant disease management, Biological control	12

Keywords: Microbial techniques, Mushroom cultivation, Mycology,Lichenology & Mycorrhiza, Plant diseases

Part C -Learning Resources

Suggested Readings:

1. Microbiology Fundamental and Applications (hindi) (pb) 9. ISBN: 9788188826230 Edition: 03Year : 2016Author : Dr. Purohit SS , Dr. Deo Publisher : Student Edition Language : Hindi
2. Modern Microbiology (hindi) (hb) ISBN: 9788177543599Edition : 1Year : 2018Author : 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, NewDelhi.
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., NewDelhi.
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

16. Rangaswamy, G. 2009, Disease of Crop Plants in India, Prientice Hall of India, New Delhi.

Online Resources

i. https://indianculture.gov.in/rarebooks/economic-botany-india

13.6.22

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_case_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/ppath/lect/plpath111/Lect.%201%20%20Introduction-Pl%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&sectionid=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

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

for 13.6.22

Part A: Introduction				
Program: **Certificate course in Microbial techniques and Archaegoniate 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 • 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. ofPeriod**
I	**Introduction to Archegoniates & Bryophytes:** Unique features of archegoniates, Bryophytes: General characteristic features and Affinities, adaptations to land habit, Range of thallus organization. Classification (up to family), morphology, anatomy and reproduction *of Riccia, Marchantia , Anthoceros* and *Sphagnum*. (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 *Psilotum, Lycopodium, Selaginella, Equisetum, Pteris* and *Marselia*.	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 *Cycas, Pinus*and *Ephedra*.	12
IV	**Palaeobotany:** General account, Geological time scale; Brief account of process of fossilization & types of fossils and their study techniques; Fossil plants: *Rhynia, Williamsonia, Cycadeoidea.* Contribution of Prof. BirbalSahni	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

for 13.6.22

	and types of seeds.	

Keywords: Archaegoniatae, 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

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

for
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:	After the completion of the course the students will be able to: • 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. *Rhizopus, Saccharomyces, Penicillium, Peziza, Ustilago, Puccinia; Fusarium, Alternaria. Agaricus*:

for Remedy 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.

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
13. 171339239%5D%20%281984%29.pdf
14. https://www.coursera.org/courses?query=plants
15. http://egyankosh.ac.in/handle/123456789/53530
16. https://www.classcentral.com/tag/microbiology
17. https://www.edx.org/learn/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

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

for
13.6.22

Scheme of B.Sc.-IT (Information Technology)

Year	Course Code	Subject Name	Theory/ Practical	Total Credit	Total Marks	
					Max	Min
First	BSCIT-1T	Computer Fundamental and Operating System	Theory	4	50	17
	BSCIT-2T	Programming with C and C++	Theory	4	50	17
	BSCIT-1P	LAB 1: Programming with C and C++	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 concern university and is not mandatory.

Part A: Introduction				
Program: **Certificate Course**		Class: **B.Sc.-IT I Year**	Year: **2022**	Session:**2022-2023**
1	Course Code	**BSCIT-1T**		
2	Course Title	Computer Fundamental and Operating System		
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: • Understand the history and types of computers and various input/output devices. • Understand the concept of memory and its types. • Understand the concept of operating system and process management with scheduling algorithms. • Understand the threads and their management with deadlock detection and prevention. • Understand the working principles of Operating System.		
6	**Credit Value**	**Theory:** 4		
7	**Total Marks**	**Max. Marks:** 50		**Min Passing Marks:** 17

Part B: Content of the Course		
Total No. of Periods: 60		
Unit	**Topics**	**No. of Periods**
I	**Fundamental of Computer**: History of computer, Generation of computer, Types of Computers, Block diagram of CPU, Digital and Analogue computers and its evolution. Major components of digital computers, types of digital computers, Memory addressing capability of CPU, Word length and processing speed of computers, Microprocessors, Single chip Microcomputer, Large and small computers, Users interface, hardware, software and firmware, multiprogramming multiuser system, Dumb smart and intelligent terminals, Number system & Computer Codes.	12
II	**Peripheral devices:** I/O devices-Keyboard, Mouse, Monitor, Impact and Non-Impact Printers, Plotters, Scanner, other Input/output devices: Scan method of Display, Raster Scan, Vector Scan, Bit Mapped Scan, CRT Controller, I/O Port, Programmable and Non Programmable I/O port, Inbuilt I/O ports, Parallel and Serial ports, USB, IEEE 1394, AGP, Serial data transfer scheme, Microcontroller, Signal Processor, I/O processor, Arithmetic Processor.	12
III	**Memory:** Memory hierarchy, Primary and Secondary Memory, Cache memory, Virtual Memory, Direct Access storage devices (DASD) Destructive and Non-destructive Readout, Program and data memory, Memory Management Unit (MMU), PCMCIA cards and Slots.	12
IV	**Operating System Concepts:** Evolution of Operating Systems: Types of operating systems - Different views of the operating systems, Principles of Design and Implementation. The process concept, operating system services for process management. Process scheduling, Schedulers, Scheduling Algorithms.	12
V	**Process Management and Deadlock:** Structural overview, Concept of process and Process synchronization, Process Management and Scheduling, Hardware requirements: protection, context switching, privileged mode; Threads and their Management; Tools and Constructs for Concurrency, Detection and Prevention of Deadlocks, Mutual Exclusion: Algorithms, semaphores.	12

Keywords: Computer, Input /Output Devices, Memory, Operating System, Process Management, Scheduling Algorithms, Semaphores, Deadlock.

Part C - Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

1. Computer Fundamentals, P.K. Sinha, BPB Publication, Sixth Edition.
2. Fundamentals of Computers, V. Rajaraman, PHI Sixth Edition.
3. Computer Fundamentals Architecture and Organization, B. Ram, New Age International Publishers, Fifth Edition.
4. Fundamental of Computers, Raja Raman V., Prentice Hall of India, New Delhi.
5. Operating System Concepts – Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, 8th edition, Wiley-India, 2009.
6. Modern Operating Systems, Andrew S. Tanenbaum, 3rd Edition, PHI
7. Operating Systems: A Spiral Approach – Elmasri, Carrick, Levine, TMH Edition

E-learning Resources:

Introduction to Computer Fundamental:

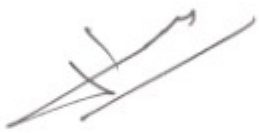
1. https://www.w3schools.blog/computer-fundamentals-tutorial
2. https://vikaspedia.in/education/digital-litercy/it-literacy-courses-in-associating-with-msup/computer-fundamentals
3. https://www.tutorialspoint.com/computer_fundamentals/index.htm
4. https://vikaspedia.in/education/digital-litercy/it-literacy- courses-in-associating-with-msup/computer-fundamentals
5. https://nptel.ac.in/courses/106/103/106103068/

Introduction to Operating System:

6. https://www.w3schools.in/operating-system/tutorials/

Part D: Assessment and Evaluation

Maximum Marks: 50



Declaration

The syllabus of this subject is frame as per the TOR of department of higher education, Chhattisgarh.

1. Dr. H.S. Hota - Chairman
   Prof. and Head, Dept. of Computer Science and Application
2. Dr. Sanjay Kumar - Member
   Prof. and Head, SoS in Computer Science, Pt. Ravishankar Shukla University, Raipur
3. Mr. Jitendra Kumar - Member
   Asst. Prof., Dept. of Computer Science and Application
   Atal Bihari Vajpayee Vishwavidyalaya, Bilaspur
4. Mr. H.S.P. Tonde - Member
   Asst. Prof. and Head, Dept. of Computer Science,
   Sant Gahira Guru University Sarguja, Ambikapur
5. Dr. Mamta Singh - Member
   Asst. Prof. and Head, Sai College, Bhilai
   Hemchand Yadav Vishwavidyalaya, Durg
6. Mr. Sushil Kumar Sahu - Member
   Asst. Prof. and Head, Christ College, Jagdalpur
   Shaheed Mahendra Karma Vishwavidyalaya, Bastar
7. Mr. Vikrant Gupta - Member
   Prof. and Head, Batmul Ashram College, Salheana
   Shaheed Nand Kumar Patel University, Raigarh
8. Mr. L.K. Gavel - Member
   Asst. Prof. and Head, Govt. Ghanshyam Singh Gupt, PG College, Balod
   Hemchand Yadav Vishwavidyalaya, Durg
9. Dr. Anil Kumar Sharma - Member
   Asst. Prof. and Head, A.P.S.G.M.N.S, Govt. PG College, Kawardha
   Hemchand Yadav Vishwavidyalaya, Durg
10. Mr. Vishwnath Tamrakar - Member
    Asst. Prof. and Head, Sant Guru Ghasidas Govt. PG College, Kurud,
    Pt. Ravishankar Shukla University, Raipur
11. Ms. Anjeeta Kujur - Member
    Asst. Prof. and Head, Govt. R.B.R.N.E.S. PG College, Jashpur
    Sant Gahira Guru University Sarguja, Ambikapur
12. Mr. Suresh Kumar Thakur - Member
    Asst. Prof. and Head, Indira Gandhi Govt. PG College, Vaishali Nagar
    Hemchand Yadav Vishwavidyalaya, Durg
13. Dr. Ugrasen Suman - Member (Present Online)
    Prof. and Head, Dept. of Computer Science
    Devi Ahila Vishwavidyalaya, Indore

Date : 03/06/2022

Part A: Introduction				
Program: **Certificate Course**		Class: **B.Sc.-IT I Year**	Year: **2022**	Session:**2022-2023**
1.	Course Code	**BSCIT-2T**		
2.	Course Title	**Programming with C and C++**		
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: • Develop programming skill and learn how to implement a new software. • Develop programming and logical concepts which helps to build up source code of concern programming language. • Understand the concept of programming like Compilation, Debugging, Executing, Linking and Loading. • Familiar about the structure of C and C++ program. • Understand about the cursor movement and control structure of C and C++ program. • Write simple C and C++ programs using programming concepts. • Familiar about procedure oriented and object oriented concepts. • Understand the concept of inheritance and polymorphism which helps them to develop programs to solve real world problems. • Use file handling concepts in C and C++ to develop programs for real life projects. • Develop new applications with C and C++ which helps them to switch in Software Industry.		
6.	**Credit Value**	**Theory: 5**		
7.	**Total Marks**	**Max. Marks: 50**	**Min Passing Marks : 17**	

Part B: Content of the Course		
Total Periods: 60		
Unit	**Topics**	**No. of Periods**
I	**Introduction and Programming Concepts :** Definition of Program, Source file, Object file, Executable file, Header file, Language Translator- Assembler, Interpreter, Compiler, Testing, Debugging, Linker and Loader, Algorithms, Flow Charts, History of C language, Structure of C program , C Tokens: Identifiers , Keywords, Constants, Variables, Operators , Data Types , Control structure : Conditional and looping statements, Operator Precedence and Associativity, Array and it's types.	12
II	**Core Concepts of C Programming:** Functions : Standard Library and User defined functions, function prototype, Call by value and Call by reference, recursive functions, String functions, Structure : Declaration and Definition, Nested structure, array within structure. Union: Declaration and Definition, union variables, Pointers: Declaration and Definition, using & and * operators, pointer arithmetic, pointer to pointer, Dynamic memory allocation functions: malloc, calloc, realloc, free, File Handling: Basics, File Pointer, various file accessing functions.	12

III.	**Introduction to Object Oriented Programming :** Concepts, Features of C++, Bottom up Approach, Structure of C++ program, Data types, Class and Objects, Access Specifiers : Private, Public, Protected, I/O statements, Insertion and Extraction operator, Scope resolution operator, Array, this pointer, **Constructor**, Default constructor, Copy constructor, Parameterized constructor , Destructor.	12
IV.	**Inheritance:** Definition, Concept of base and derived class, Types of Inheritance: Single, Multilevel, Multiple, Hierarchical and Hybrid Inheritance. **Polymorphism:** Definition, Compile time polymorphism: Function overloading, Operator overloading, Run time polymorphism: Virtual Function, pure virtual function. Inline function, friend function, friend class.	12
V.	**Input-Output and File Handling :** I/O classes, File and Stream classes, Char I/O, String I/O, Object I/O, File Pointer, Opening and Closing file. **Exception Handling and Standard Template Library :** Definition, Exception basics, try, catch and throws keywords, Template, Components of STL.	12
Keywords: Token, Datatypes, Operators, Functions, Class, Inheritance, Polymorphism, Friend function, Abstraction.		

Part C - Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

1. Program Design, Peter Juliff, PHI Publications.
2. Let us C: Yashwant Kanetkar, BPB Publications.
3. Programming in ANSI C , E. Balaguruswamy, Tata McGraw Hill
4. Let us C++ ,Y. Kanetkar, B.P.B Publication.
5. Programming in C++, E. Balaguruswamy, Tata McGraw Hill.

E Resources:

1. Introduction (from SWAYAM/NPTEL)
   https://onlinecourses.nptel.ac.in/noc19_cs38/preview
   https://onlinecourses.nptel.ac.in/noc22_cs103/preview
   https://www.youtube.com/watch?v=KG4hjVDw-p8&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=2

2. Constant and Inline Function
   https://www.youtube.com/watch?v=pX6LufLso2M&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=10

3. Pointer and Reference
   https://www.youtube.com/watch?v=GtsBZ5e1-cE&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=12

4. Function Overloading
   https://www.youtube.com/watch?v=uJGmGAShHeU&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=13

5. Operator Overloading
   https://www.youtube.com/watch?v=0jpOwe4d-FE&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=17

6. Dynamic Memory Management
   https://www.youtube.com/watch?v=lkFK2X6qIc0&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=18

7. Class and Object
   https://www.youtube.com/watch?v=wtuks_f3vP4&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=24

8. Access Specifiers
   https://www.youtube.com/watch?v=6ki_W7cXdM0&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=22

9. Constructor and Destructor
   https://www.youtube.com/watch?v=wtuks_f3vP4&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=24

- **C different topics from W3School**
  https://www.w3schools.com/c/
- **C++ different topics from W3School**
  https://www.w3schools.com/CPP/default.asp
- **C different topics from Javatpoint**
  https://www.javatpoint.com/c-programming-language-tutorial
- **C++ different topics from Javatpoint**
  https://www.javatpoint.com/cpp-tutorial

Part D: **Assessment and Evaluation**

Maximum Marks: 50

Declaration

The syllabus of this subject is frame as per the TOR of department of higher education, Chhattisgarh.

1. Dr. H.S. Hota - Chairman
   Prof. and Head, Dept. of Computer Science and Application
2. Dr. Sanjay Kumar - Member
   Prof. and Head, SoS in Computer Science, Pt. Ravishankar Shukla University, Raipur
3. Mr. Jitendra Kumar - Member
   Asst. Prof., Dept. of Computer Science and Application
   Atal Bihari Vajpayee Vishwavidyalaya, Bilaspur
4. Mr. H.S.P. Tonde - Member
   Asst. Prof. and Head, Dept. of Computer Science,
   Sant Gahira Guru University Sarguja, Ambikapur
5. Dr. Mamta Singh - Member
   Asst. Prof. and Head, Sai College, Bhilai
   Hemchand Yadav Vishwavidyalaya, Durg
6. Mr. Sushil Kumar Sahu - Member
   Asst. Prof. and Head, Christ College, Jagdalpur
   Shaheed Mahendra Karma Vishwavidyalaya, Bastar
7. Mr. Vikrant Gupta - Member

Prof. and Head, Batmul Ashram College, Salheana
Shaheed Nand Kumar Patel University, Raigarh

8. Mr. L.K. Gavel - Member
   Asst. Prof. and Head, Govt. Ghanshyam Singh Gupt, PG College, Balod
   Hemchand Yadav Vishwavidyalaya, Durg
9. Dr. Anil Kumar Sharma - Member
   Asst. Prof. and Head, A.P.S.G.M.N.S, Govt. PG College, Kawardha
   Hemchand Yadav Vishwavidyalaya, Durg
10. Mr. Vishwnath Tamrakar - Member
    Asst. Prof. and Head, Sant Guru Ghasidas Govt. PG College, Kurud,
    Pt. Ravishankar Shukla University, Raipur
11. Ms. Anjeeta Kujur - Member
    Asst. Prof. and Head, Govt. R.B.R.N.E.S. PG College, Jashpur
    Sant Gahira Guru University Sarguja, Ambikapur
12. Mr. Suresh Kumar Thakur - Member
    Asst. Prof. and Head, Indira Gandhi Govt. PG College, Vaishali Nagar
    Hemchand Yadav Vishwavidyalaya, Durg
13. Dr. Ugrasen Suman - Member
    Prof. and Head, Dept. of Computer Science (Present Online)
    Devi Ahila Vishwavidyalaya, Indore

Date: 03/06/2022

Part A: Introduction				
Program: **Certificate Course**		Class: **B.Sc.-IT I Year**	Year: **2022**	Session: **2022-2023**
1	Course Code	**BSCIT-1P**		
2	Course Title	**LAB 1 : Programming with C and C++**		
3	Course Type	**Practical**		
4	Pre-requisite (if any)	Theoretical knowledge of C and C++		
5	Course Learning Outcomes (CLO)	At the end of course, Students will be able to: • Understand the fundamental programming concepts and methodologies which are essential to create good C/C++ programs. • Code, test, and implement a well-structured, robust computer program using the C/C++ programming language. • Write reusable modules (collections of functions). • Understand design/implementation issues involved with variable allocation and binding, control flow, types, subroutines, parameter passing. • Develop an in-depth understanding of functional, logic, and object-oriented programming paradigms.		
6	**Credit Value**	**Practical: 2**		
7	**Total Marks**	**Max. Marks: 50**	**Min Passing Marks : 17**	

Part B: Content of the Course	
Total Periods: 30	
Tentative Practical List	**Note:** This is tentative list; the teachers concern can add more program as per requirement. 1. Write a program in C/C++ for addition of two numbers using float data type. 2. Write a program in C/C++ to find the biggest number between two numbers. 3. Write a program in C/C++ to find the factorial value of any entered number using do – while loop. 4. Write a program in C/C++ for various arithmetic operations using switch case statements. 5. Write a program in C/C++ for Multiplication of two 3X3 matrix. 6. Write a program in C/C++ to store five books information using structure. 7. Write a program in C/C++ to store six employee information using union. 8. Write a program in C/C++ to calculate simple interest using call by value and call by reference method. 9. Write a program in C/C++ for swapping of two numbers using pointer. 10. Write a program in C/C++ to make a text file using file handling. 11. Write a program to count word, space and lines in a text file. 12. Write a program to demonstrate work of calloc(). 13. Write a program to demonstrate work of malloc(), realloc() and free().

14. Write a program in C++ to find the sum and average of five numbers using class and objects.
15. Write a program in C++ to multiply two numbers using private and public member functions.
16. Write a program in C++ to print structure like this using scope resolution operator
    1
    1 2
    1 2 3
    1 2 3 4
    1 2 3 4 5
17. Write a program in C++ for constructor and Destructor.
18. Write a program in C++ for multiple inheritance.
19. Write a program in C++ for operator overloading.
20. Write a program in C++ for friend class and friend function.
21. Write a program in C++ for virtual function and virtual class.
22. Write a program in C++ for Exception Handling.
23. Write a program in C++ to open and close a file using file Handling.
24. Given two ordered arrays of integers, write a program to merge the two-arrays to get an ordered array.
25. WAP to display Fibonacci series (i) using recursion, (ii) using iteration
26. WAP to calculate Factorial of a number (i) using recursion, (ii) using iteration
27. WAP to calculate GCD of two numbers (i) with recursion (ii) without recursion.
28. Create Matrix class using templates. Write a menu-driven program to perform following Matrix Operations (2-D array implementation): a) Sum b) Difference c) Product d) Transpose 22. Create the Person class. Create some objects of this class (by taking information from the user). Inherit the class Person to create two classes Teacher and Student class. Maintain the respective information in the classes and create, display and delete objects of these two classes (Use Runtime Polymorphism).
29. Create a class Triangle. Include overloaded functions for calculating area. Overload assignment operator and equality operator.
30. Create a class Box containing length, breath and height. Include following methods in it: a) Calculate surface Area b) Calculate Volume c) Increment, Overload ++ operator (both prefix & postfix) d) Decrement, Overload -- operator (both prefix & postfix) e) Overload operator == (to check equality of two boxes), as a friend function f) Overload Assignment operator g) Check if it is a Cube or cuboid Write a program which takes input from the user for length, breath and height to test the above class.
31. Create a structure Student containing fields for Roll No., Name, Class, Year and Total Marks. Create 10 students and store them in a file.
32. Write a program to retrieve the student information from file created in previous

	question and print it in following format: Roll No. Name Marks 33. Copy the contents of one text file to another file, after removing all whitespaces. 34. Write a function that reverses the elements of an array in place. The function must accept only one pointer value and return void. 35. Write a program for exception handling.

Part C - Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

1. Program Design, Peter Juliff, PHI Publications .
2. Let us C: Yashwant Kanetkar, BPB Publications .
3. Programming in ANSI C , E. Balaguruswamy, Tata McGraw Hill
4. Let us C++ ,Y. Kanetkar, B.P.B Publication .
5. Programming in C++, E. Balaguruswamy, Tata McGraw Hill.

E Resources:

C/C++ different topics from SWAYAM/NPTEL

1. Introduction
   https://onlinecourses.nptel.ac.in/noc19_cs38/preview
   https://onlinecourses.nptel.ac.in/noc22_cs103/preview
   https://www.youtube.com/watch?v=KG4hjVDw-p8&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=2

2. Constant and Inline Function
   https://www.youtube.com/watch?v=pX6LufLso2M&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=10

3. Pointer and Reference
   https://www.youtube.com/watch?v=GtsBZ5e1-cE&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=12

4. Function Overloading
   https://www.youtube.com/watch?v=uJGmGAShHeU&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=13

5. Operator Overloading
   https://www.youtube.com/watch?v=0jpOwe4d-FE&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=17

6. Dynamic Memory Management
   https://www.youtube.com/watch?v=lkFK2X6qIc0&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=18

B4KrM9uOEdvPIVFUkU3jNc6D2&index=18

7. Class and Object
https://www.youtube.com/watch?v=wtuks_f3vP4&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=24

8. Access Specifiers
https://www.youtube.com/watch?v=6ki_W7cXdM0&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=22

9. Constructor and Destructor
https://www.youtube.com/watch?v=wtuks_f3vP4&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=24

10. C different topics from W3School
https://www.w3schools.com/c/

11. C++ different topics from W3School
https://www.w3schools.com/CPP/default.asp

12. C different topics from Javatpoint
https://www.javatpoint.com/c-programming-language-tutorial

13. C++ different topics from Javatpoint
https://www.javatpoint.com/cpp-tutorial

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	Not Applicable

Declaration

The syllabus of this subject is frame as per the TOR of department of higher education, Chhattisgarh.

1. Dr. H.S. Hota - Chairman
Prof. and Head, Dept. of Computer Science and Application
2. Dr. Sanjay Kumar - Member
Prof. and Head, SoS in Computer Science, Pt. Ravishankar Shukla University, Raipur
3. Mr. Jitendra Kumar - Member
Asst. Prof., Dept. of Computer Science and Application

Atal Bihari Vajpayee Vishwavidyalaya, Bilaspur

4. Mr. H.S.P. Tonde - Member
   Asst. Prof. and Head, Dept. of Computer Science,
   Sant Gahira Guru University Sarguja, Ambikapur
5. Dr. Mamta Singh - Member
   Asst. Prof. and Head, Sai College, Bhilai
   Hemchand Yadav Vishwavidyalaya, Durg
6. Mr. Sushil Kumar Sahu - Member
   Asst. Prof. and Head, Christ College, Jagdalpur
   Shaheed Mahendra Karma Vishwavidyalaya, Bastar
7. Mr. Vikrant Gupta - Member
   Prof. and Head, Batmul Ashram College, Salheana
   Shaheed Nand Kumar Patel University, Raigarh
8. Mr. L.K. Gavel - Member
   Asst. Prof. and Head, Govt. Ghanshyam Singh Gupt, PG College, Balod
   Hemchand Yadav Vishwavidyalaya, Durg
9. Dr. Anil Kumar Sharma - Member
   Asst. Prof. and Head, A.P.S.G.M.N.S, Govt. PG College, Kawardha
   Hemchand Yadav Vishwavidyalaya, Durg
10. Mr. Vishwnath Tamrakar - Member
    Asst. Prof. and Head, Sant Guru Ghasidas Govt. PG College, Kurud,
    Pt. Ravishankar Shukla University, Raipur
11. Ms. Anjeeta Kujur - Member
    Asst. Prof. and Head, Govt. R.B.R.N.E.S. PG College, Jashpur
    Sant Gahira Guru University Sarguja, Ambikapur
12. Mr. Suresh Kumar Thakur - Member
    Asst. Prof. and Head, Indira Gandhi Govt. PG College, Vaishali Nagar
    Hemchand Yadav Vishwavidyalaya, Durg
13. Dr. Ugrasen Suman - Member
    Prof. and Head, Dept. of Computer Science (Present Online)
    Devi Ahila Vishwavidyalaya, Indore

Date: 03.06.2022

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.

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 • 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 *s* and *p*-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	**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 *s*, *p*, *d* orbitals, Aufbau and Pauli exclusion principles, Hund's Multiplicity rule, electronic configuration of the elements. **Periodic properties:** Detailed discussion of the following periodic properties of the elements, with reference to *s*- and *p*- block. Trends in periodic table and applications in predicting and explaining the chemical behavior. 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.	**15**
II	**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	**15**

	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_2O, NH_3, PCl_3, H_3O^+, 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 3. Chemistry, Wiley, 3rd Edition, 2006 4. Atkins, P.W. & Paula, J. Physical Chemistry, 10th Ed., Oxford University Press, 2014. 5. Puri, B. R., Sharma, L. R. and Kalia, K. C., Principles of Inorganic Chemistry, Milestone Publishers/ Vishal Publishing Co.; 33rd Edition 2016 6. Madan, R. D. Modern Inorganic Chemistry, S Chand Publishing, 1987.

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 Learniong 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 Chemsitry, 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

3. Mr. Vijay Kumar Lahare, - Member
Assistant Professor,
Govt. Lahiri P.G. College Chirimiri(C.G.)

4. Dr. Rajmani Patel, - Member
Assistant Professor,
Hemchand Yadav University, Durg (C.G.)

5. Dr. A.K. Singh, - Member
Professor,
Govt. V.Y.T. P.G. College Durg (C.G.)

6. Dr. P.K. Singh, - Member
Assistant Professor,
Govt. T.C.L. P.G. College Janjgir(C.G.)

7. Dr. P.K. Agnihotri, - Member
Professor,
Govt. Yuganandam Chhattisgarh College Raipur(C.G.)

8. Dr. B.D. Diwan, - Member
Professor,
Govt. M.M.R. P.G. College Champa(C.G.)

9. Dr. Sandhya Patre, - Member
Assistant Professor,
Sant Shiromani Guru Ravidas Govt. College Sargaon,
Mungeli(C.G.)

10. Mrs. Mousami Lahare, - Member
Assistant Professor,
Govt. G.N.A. P.G. College Bhatapara, (C.G.)

11. Dr. Alka Shukla, - Member
Assistant Professor,
Mohan Lal Jain(Mohan Bhaiya) Govt. College Khursipar,
Bhilai(C.G.)

12. Dr. Arti Gupta, - Member
Professor, Govt. Dr. W.W.P. Girl's P.G. College Durg (C.G.)

13. Dr. Deepti Tikariha, - Member
Assistant Professor, APSGMNS Govt. P.G. College
Kawardha(C.G.)

14. Dr. Seema Negi, - Member
Assistant Professor, Govt. J.M.P. College, Takhatpur (C.G.)

15. Dr. Vikesh Kumar Jha, - Member
Assistant Professor, Govt. R.R.M. P.G. College Surajpur
(C.G.)

16. Dr. Ashish Tiwari, - Member
Assistant Professor,
Dr. Bhimrao Ambedkar Govt. College Pamgarh(C.G.)

17. Mr. Laxmi Chand Manwani, - Member
Assistant Professor,
Government Vivekand PG College Manendragarh(C.G.)

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)	At the end of this course, the students will be able to learn the following aspects of Chemistry • 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, E1cb 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**

	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_2O, (Oxymercuration-reduction and hydroboration -oxidation), HOX, H_2SO_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_2O (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, Liquification 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**

Amrd
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 :

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:

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

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 • 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_2S 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_3COO^-, Cl^- , Br^-, I^- , NO_3^-, SO_4^{2-} (Spot tests may be carried out wherever feasible) **B. Acid-Base Titrations** • 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	**10**

Aws
3/6

	C. Redox Titrations • 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 $K_2Cr_2O_7$ using internal (diphenylamine, anthranilic acid) and external indicator.	
	Organic chemistry 1. Demonstration of laboratory Glassware's and Equipments. 2. Calibration of the thermometer. 80^o –82^o (Naphthalene), 113.5^o – 114^o (Acetanilide), 132.5^o -133^o (Urea), 100^o (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^o –82^o , Benzoic acid 121.5^o –122^o , Urea 132.5^o –133^o Succinic acid 184.5^o – 185^o , Cinnamic acid 132.5^o –133^o , Salicylic acid 157.5^o –158^o, Acetanilide 113.5^o –114^o , m-Dinitrobenzene 90^o , p-Dichlorobenzene 52^o , Aspirin 135^o . 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^o, Cyclohexane 81.4^o, Toluene 110.6^o, Benzene 80^o. 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, CarbonyI, 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**
	Physical chemistry 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**

3/6

	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 & H_2SO_4 by studying the kinetics of hydrolysis of ethyl acetate. 4. Colloids To prepare colloidal solution of silver nanoparticles (reduction method) and other metal nanoparticles using capping agents.	

Keywords: Semi-micro qualitative analysis, Qualitative analysis, Titrations, Chemical Kinetics, Colloids, Viscosity, Surface tension, Decolorization and crystallization, Distillation, Sublimation, Soap, biodiesel.

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

PRACTICAL EXAMINATION B. Sc. – I	05 Hrs. M.M. 50
Three experiments are to be performed	
1. Inorganic Mixture Analysis, four radicals two basic & two acid (excluding insoluble, Interfering & combination of acid radicals) **OR** Two Titrations (Acid Bases, Redox and Iodo/Iodiometry/Complexometric titration)	**12 marks**
2. Detection of functional group in the given organic compound and determine its MPt/BPt. **OR** Crystallization of any one compound as given in the prospectus along with the determination of mixed MPt. **OR** Decolorisation of brown sugar along with sublimation of camphor/ Naphthlene.	**8 marks** **14 marks**
3. Any one physical experiment that can be completed in two hours including calculations.	**10 marks**
4. Viva	**06 marks**
5. Sessionals	
In case of Ex-Students two marks will be added to each of the experiments	

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, - Chairman
   Assistant Professor,
   Govt. E.V.P.G. College, Korba
2. Smt. Priyanka Tiwari, - Member
   Assistant Professor,
   Govt. J.P. Verma P.G. College, Bilaspur
3. Mr. Vijay Kumar Lahare, - Member
   Assistant Professor,
   Govt. Lahiri P.G. College Chirimiri(C.G.)
4. Dr.Rajmani Patel, - Member
   Assistant Professor,
   Hemchand Yadav University, Durg
5. Dr. A.K. Singh, - Member
   Professor,
   Govt. V.Y.T. P.G. College Durg
6. Dr. P.K. Singh, - Member
   Assistant Professor,
   Govt. T.C.L. P.G. College Janjgir(C.G.)
7. DR. P.K. Agnihotri, - Member
   Professor,
   Govt. Yuganandam Chhattisgarh College Raipur(C.G.)
8. Dr. B.D. Diwan, - Member

Professor,
Govt. M.M.R. P.G. College Champa(C.G.)

9. Dr. Sandhya Patre, - Member
Assistant Professor,
Sant Shiromani Guru Ravidas Govt. College Sargaon,
Mungeli(C.G.)

10. Mrs. Mousami Lahare, - Member
Assistant Professor,
Govt. G.N.A. P.G. College

11. Dr. Alka Shukla, - Member
Assistant Professor,
Mohan Lal Jain(Mohan Bhaiya) Govt. College Khursipar,
Bhilai(C.G.)

12. Dr. Arti Gupta, - Member
Professor, Govt. Dr. W.W.P. Girlas P.G. College Durg (C.G.)

13. Dr. Deepti Tikariha, - Member
Assistant Professor, APSGMNS Govt. P.G. College
Kawardha(C.G.)

14. Dr. Seema Negi, - Member
Assistant Professor, Govt. J.M.P. College, Takhatpur (C.G.)

15. Dr. Vikesh Kumar Jha, - Member
Assistant Professor, Govt. R.R.M. P.G. College Surajpur
(C.G.)

16. Dr. Ashish Tiwari, - Member
Assistant Professor,
Dr. Bhimrao Ambedkar Govt. College Pamgarh(C.G.)

17. Mr. Laxmi Chand Manwani, - Member
Assistant Professor,
Government Vivekand PG College Manedragarh(C.G.)

Scheme of B.Sc. Computer Science

Year	Course Code	Subject Name	Theory/ Practical	Total Credit	Total Marks	
					Max	Min
First	COMP-1T	Computer Fundamental and Operating System	Theory	4	50	17
	COMP-2T	Programming with C and C++	Theory	4	50	17
	COMP-1P	LAB 1: Programming with C and C++	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 concern university and is not mandatory.

Part A: Introduction				
Program: **Certificate Course**		Class: **B.Sc.-CS I Year**	Year: **2022**	Session:**2022-2023**
1	Course Code	**COMP-1T**		
2	Course Title	**Computer Fundamental and Operating System**		
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: • Understand the history and types of computers and various input/output devices. • Understand the concept of memory and its types. • Understand the concept of operating system and process management with scheduling algorithms. • Understand the threads and their management with deadlock detection and prevention. • Understand the working principles of Operating System.		
6	**Credit Value**	**Theory: 4**		
7	**Total Marks**	**Max. Marks: 50**	**Min Passing Marks: 17**	

Part B: Content of the Course		
Total No. of Periods: 60		
Unit	**Topics**	**No. of Periods**
I	**Fundamental of Computer**: History of computer, Generation of computer, Types of Computers, Block diagram of CPU, Digital and Analogue computers and its evolution. Major components of digital computers, types of digital computers, Memory addressing capability of CPU, Word length and processing speed of computers, Microprocessors, Single chip Microcomputer, Large and small computers, Users interface, hardware, software and firmware, multiprogramming multiuser system, Dumb smart and intelligent terminals, Number system & Computer Codes.	12
II	**Peripheral devices:** I/O devices-Keyboard, Mouse, Monitor, Impact and Non-Impact Printers, Plotters, Scanner, other Input/output devices: Scan method of Display, Raster Scan, Vector Scan, Bit Mapped Scan, CRT Controller, I/O Port, Programmable and Non Programmable I/O port, Inbuilt I/O ports, Parallel and Serial ports, USB, IEEE 1394, AGP, Serial data transfer scheme, Microcontroller, Signal Processor, I/O processor, Arithmetic Processor.	12
III	**Memory:** Memory hierarchy, Primary and Secondary Memory, Cache memory, Virtual Memory, Direct Access storage devices (DASD) Destructive and Non-destructive Readout, Program and data memory, Memory Management Unit (MMU), PCMCIA cards and Slots.	12
IV	**Operating System Concepts:** Evolution of Operating Systems: Types of operating systems - Different views of the operating systems, Principles of Design and Implementation. The process concept, operating system services for process management. Process scheduling, Schedulers, Scheduling Algorithms.	12
V	**Process Management and Deadlock:** Structural overview, Concept of process and Process synchronization, Process Management and Scheduling, Hardware requirements: protection, context switching, privileged mode; Threads and their Management; Tools and Constructs for Concurrency, Detection and Prevention of Deadlocks, Mutual Exclusion: Algorithms, semaphores.	12

Keywords: Computer, Input /Output Devices, Memory, Operating System, Process Management, Scheduling Algorithms, Semaphores, Deadlock.

Part C - Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

1. Computer Fundamentals, P.K. Sinha, BPB Publication, Sixth Edition.
2. Fundamentals of Computers, V. Rajaraman, PHI Sixth Edition.
3. Computer Fundamentals Architecture and Organization, B. Ram, New Age International Publishers, Fifth Edition.
4. Fundamental of Computers, Raja Raman V., Prentice Hall of India, New Delhi.
5. Operating System Concepts – Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, 8th edition, Wiley-India, 2009.
6. Modern Operating Systems, Andrew S. Tanenbaum, 3rd Edition, PHI
7. Operating Systems: A Spiral Approach – Elmasri, Carrick, Levine, TMH Edition

E-learning Resources:

Introduction to Computer Fundamental:

1. https://www.w3schools.blog/computer-fundamentals-tutorial
2. https://vikaspedia.in/education/digital-litercy/it-literacy-courses-in-associating-with-msup/computer-fundamentals
3. https://www.tutorialspoint.com/computer_fundamentals/index.htm
4. https://vikaspedia.in/education/digital-litercy/it-literacy- courses-in-associating-with-msup/computer-fundamentals
5. https://nptel.ac.in/courses/106/103/106103068/

Introduction to Operating System:

6. https://www.w3schools.in/operating-system/tutorials/

Part D: Assessment and Evaluation

Maximum Marks: 50

Declaration

The syllabus of this subject is frame as per the TOR of department of higher education, Chhattisgarh.

1. Dr. H.S. Hota - Chairman
   Prof. and Head, Dept. of Computer Science and Application
2. Dr. Sanjay Kumar - Member
   Prof. and Head, SoS in Computer Science, Pt. Ravishankar Shukla University, Raipur
3. Mr. Jitendra Kumar - Member
   Asst. Prof., Dept. of Computer Science and Application
   Atal Bihari Vajpayee Vishwavidyalaya, Bilaspur
4. Mr. H.S.P. Tonde - Member
   Asst. Prof. and Head, Dept. of Computer Science,
   Sant Gahira Guru University Sarguja, Ambikapur
5. Dr. Mamta Singh - Member
   Asst. Prof. and Head, Sai College, Bhilai
   Hemchand Yadav Vishwavidyalaya, Durg
6. Mr. Sushil Kumar Sahu - Member
   Asst. Prof. and Head, Christ College, Jagdalpur
   Shaheed Mahendra Karma Vishwavidyalaya, Bastar
7. Mr. Vikrant Gupta - Member
   Prof. and Head, Batmul Ashram College, Salheana
   Shaheed Nand Kumar Patel University, Raigarh
8. Mr. L.K. Gavel - Member
   Asst. Prof. and Head, Govt. Ghanshyam Singh Gupt, PG College, Balod
   Hemchand Yadav Vishwavidyalaya, Durg
9. Dr. Anil Kumar Sharma - Member
   Asst. Prof. and Head, A.P.S.G.M.N.S, Govt. PG College, Kawardha
   Hemchand Yadav Vishwavidyalaya, Durg
10. Mr. Vishwnath Tamrakar - Member
    Asst. Prof. and Head, Sant Guru Ghasidas Govt. PG College, Kurud,
    Pt. Ravishankar Shukla University, Raipur
11. Ms. Anjeeta Kujur - Member
    Asst. Prof. and Head, Govt. R.B.R.N.E.S. PG College, Jashpur
    Sant Gahira Guru University Sarguja, Ambikapur
12. Mr. Suresh Kumar Thakur - Member
    Asst. Prof. and Head, Indira Gandhi Govt. PG College, Vaishali Nagar
    Hemchand Yadav Vishwavidyalaya, Durg
13. Dr. Ugrasen Suman - Member (Present Online)
    Prof. and Head, Dept. of Computer Science
    Devi Ahila Vishwavidyalaya, Indore

Date : 03.06.2022

Part A: Introduction				
Program: **Certificate Course**		Class: **B.Sc.-CS I Year**	Year: **2022**	Session:**2022-2023**
1.	Course Code	**COMP-2T**		
2.	Course Title	**Programming with C and C++**		
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: • Develop programming skill and learn how to implement new software. • Develop programming and logical concepts which helps to build up source code of concern programming language. • Understand the concept of programming like Compilation, Debugging, Executing, Linking and Loading. • Familiar about the structure of C and C++ program. • Understand about the cursor movement and control structure of C and C++ program. • Write simple C and C++ programs using programming concepts. • Familiar about procedure oriented and object oriented concepts. • Understand the concept of inheritance and polymorphism which helps them to develop programs to solve real world problems. • Use file handling concepts in C and C++ to develop programs for real life projects. • Develop new applications with C and C++ which helps them to switch in Software Industry.		
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 Periods**
I	**Introduction and Programming Concepts :** Definition of Program, Source file, Object file, Executable file, Header file, Language Translator- Assembler, Interpreter, Compiler, Testing, Debugging, Linker and Loader, Algorithms, Flow Charts, History of C language, Structure of C program , C Tokens : Identifiers, Keywords, Constants, Variables, Operators , Data Types , Control structure: Conditional and looping statements, Operator Precedence and Associativity, Array and it's types.	12
II	**Core Concepts of C Programming : Functions :** Standard Library and User defined functions, function prototype, Call by value and Call by reference, recursive functions, String functions, **Structure :** Declaration and Definition, Nested structure, array within structure. **Union:** Declaration and Definition, union variables, **Pointers:** Declaration and Definition, using & and * operators, pointer arithmetic, pointer to pointer, **Dynamic memory allocation functions:** malloc, calloc, realloc, free, **File Handling**: Basics, File Pointer, various file accessing functions.	12

III.	**Introduction to Object Oriented Programming:** Concepts, Features of C++, Bottom up Approach, Structure of C++ program, Data types, Class and Objects, Access Specifiers: Private, Public, Protected, I/O statements, Insertion and Extraction operator, Scope resolution operator, Array, this pointer, **Constructor:** Default constructor, Copy constructor, Parameterized constructor, Destructor.	12
IV.	**Inheritance:** Definition, Concept of base and derived class, Types of Inheritance: Single, Multilevel, Multiple, Hierarchical and Hybrid Inheritance. **Polymorphism:** Definition, Compile time polymorphism: Function overloading, Operator overloading, Run time polymorphism: Virtual Function, pure virtual function. Inline function, friend function, friend class.	12
V.	**Input-Output and File Handling :** I/O classes, File and Stream classes, Char I/O, String I/O, Object I/O, File Pointer, Opening and Closing file. **Exception Handling and Standard Template Library :** Definition, Exception basics, try, catch and throws keywords, Template, Components of STL.	12
Keywords: Token, Datatype, Operators, Functions, Class, Inheritance, Polymorphism.		

Part C - Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

1. Program Design, Peter Juliff, PHI Publications .
2. Let us C: Yashwant Kanetkar, BPB Publications .
3. Programming in ANSI C , E. Balaguruswamy, Tata McGraw Hill
4. Let us C++ ,Y. Kanetkar, B.P.B Publication .
5. Programming in C++, E. Balaguruswamy, Tata McGraw Hill.

E Resources:

1. Introduction to C and C++ from SWAYAM/NPTEL
   https://onlinecourses.nptel.ac.in/noc19_cs38/preview
   https://onlinecourses.nptel.ac.in/noc22_cs103/preview
   https://www.youtube.com/watch?v=KG4hjVDw-p8&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=2
2. Constant and Inline Function
   https://www.youtube.com/watch?v=pX6LufLso2M&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=10
3. Pointer and Reference
   https://www.youtube.com/watch?v=GtsBZ5e1-cE&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=12
4. Function Overloading
   https://www.youtube.com/watch?v=uJGmGAShHeU&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=13
5. Operator Overloading
   https://www.youtube.com/watch?v=0jpOwe4d-FE&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=17

6. Dynamic Memory Management
   https://www.youtube.com/watch?v=lkFK2X6qIc0&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=18

7. Class and Object
   https://www.youtube.com/watch?v=wtuks_f3vP4&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=24

8. Access Specifiers
   https://www.youtube.com/watch?v=6ki_W7cXdM0&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=22

9. Constructor and Destructor
   https://www.youtube.com/watch?v=wtuks_f3vP4&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=24

10. C different topics from W3School
    https://www.w3schools.com/c/

11. C++ different topics from W3School
    https://www.w3schools.com/CPP/default.asp

12. C different topics from Javatpoint
    https://www.javatpoint.com/c-programming-language-tutorial

13. C++ different topics from Javatpoint
    https://www.javatpoint.com/cpp-tutorial

Part D: Assessment and Evaluation

Maximum Marks: 50

Declaration

The syllabus of this subject is frame as per the TOR of department of higher education, Chhattisgarh.

1. Dr. H.S. Hota - Chairman
   Prof. and Head, Dept. of Computer Science and Application
2. Dr. Sanjay Kumar - Member
   Prof. and Head, SoS in Computer Science, Pt. Ravishankar Shukla University, Raipur
3. Mr. Jitendra Kumar - Member
   Asst. Prof., Dept. of Computer Science and Application
   Atal Bihari Vajpayee Vishwavidyalaya, Bilaspur
4. Mr. H.S.P. Tonde - Member
   Asst. Prof. and Head, Dept. of Computer Science,
   Sant Gahira Guru University Sarguja, Ambikapur
5. Dr. Mamta Singh - Member
   Asst. Prof. and Head, Sai College, Bhilai
   Hemchand Yadav Vishwavidyalaya, Durg
6. Mr. Sushil Kumar Sahu - Member
   Asst. Prof. and Head, Christ College, Jagdalpur

Shaheed Mahendra Karma Vishwavidyalaya, Bastar

7. Mr. Vikrant Gupta - Member
   Prof. and Head, Batmul Ashram College, Salheana
   Shaheed Nand Kumar Patel University, Raigarh
8. Mr. L.K. Gavel - Member
   Asst. Prof. and Head, Govt. Ghanshyam Singh Gupt, PG College, Balod
   Hemchand Yadav Vishwavidyalaya, Durg
9. Dr. Anil Kumar Sharma - Member
   Asst. Prof. and Head, A.P.S.G.M.N.S, Govt. PG College, Kawardha
   Hemchand Yadav Vishwavidyalaya, Durg
10. Mr. Vishwnath Tamrakar - Member
    Asst. Prof. and Head, Sant Guru Ghasidas Govt. PG College, Kurud, Not agree because Syllabus is lengthy
    Pt. Ravishankar Shukla University, Raipur
11. Ms. Anjeeta Kujur - Member
    Asst. Prof. and Head, Govt. R.B.R.N.E.S. PG College, Jashpur
    Sant Gahira Guru University Sarguja, Ambikapur
12. Mr. Suresh Kumar Thakur - Member
    Asst. Prof. and Head, Indira Gandhi Govt. PG College, Vaishali Nagar
    Hemchand Yadav Vishwavidyalaya, Durg
13. Dr. Ugrasen Suman - Member (Present Online)
    Prof. and Head, Dept. of Computer Science
    Devi Ahila Vishwavidyalaya, Indore

Date: 03.06.2022

Part A: Introduction				
Program: **Certificate Course**		Class: **B.Sc.-CS I Year**	Year: **2022**	Session: **2022-2023**
1	Course Code	**COMP-1P**		
2	Course Title	**LAB 1 : Programming with C and C++**		
3	Course Type	**Practical**		
4	Pre-requisite (if any)	Theoretical knowledge of C and C++		
5	Course Learning Outcomes (CLO)	At the end of course, Students will be able to: • Understand the fundamental programming concepts and methodologies which are essential to create good C/C++ programs. • Code, test, and implement a well-structured, robust computer program using the C/C++ programming language. • Write reusable modules (collections of functions). • Understand design/implementation issues involved with variable allocation and binding, control flow, types, subroutines, parameter passing. • Develop an in-depth understanding of functional, logic, and object-oriented programming paradigms.		
6	**Credit Value**	**Practical: 2**		
7	**Total Marks**	**Max. Marks: 50**	**Min Passing Marks : 17**	

Part B: Content of the Course	
Total Periods: 30	
Tentative Practical List	**Note:** This is tentative list; the teachers concern can add more program as per requirement. 1. Write a program in C/C++ for addition of two numbers using float data type. 2. Write a program in C/C++ to find the biggest number between two numbers. 3. Write a program in C/C++ to find the factorial value of any entered number using do – while loop. 4. Write a program in C/C++ for various arithmetic operations using switch case statements. 5. Write a program in C/C++ for Multiplication of two 3X3 matrix. 6. Write a program in C/C++ to store five books information using structure. 7. Write a program in C/C++ to store six employee information using union. 8. Write a program in C/C++ to calculate simple interest using call by value and call by reference method. 9. Write a program in C/C++ for swapping of two numbers using pointer. 10. Write a program in C/C++ to make a text file using file handling. 11. Write a program to count word, space and lines in a text file. 12. Write a program to demonstrate work of calloc(). 13. Write a program to demonstrate work of malloc(), realloc() and free().

14. Write a program in C++ to find the sum and average of five numbers using class and objects.
15. Write a program in C++ to multiply two numbers using private and public member functions.
16. Write a program in C++ to print structure like this using scope resolution operator

    1
    1 2
    1 2 3
    1 2 3 4
    1 2 3 4 5
17. Write a program in C++ for constructor and Destructor.
18. Write a program in C++ for multiple inheritance.
19. Write a program in C++ for operator overloading.
20. Write a program in C++ for friend class and friend function.
21. Write a program in C++ for virtual function and virtual class.
22. Write a program in C++ for Exception Handling.
23. Write a program in C++ to open and close a file using file Handling.
24. Given two ordered arrays of integers, write a program to merge the two-arrays to get an ordered array.
25. WAP to display Fibonacci series (i) using recursion, (ii) using iteration
26. WAP to calculate Factorial of a number (i) using recursion, (ii) using iteration
27. WAP to calculate GCD of two numbers (i) with recursion (ii) without recursion.
28. Create Matrix class using templates. Write a menu-driven program to perform following Matrix Operations (2-D array implementation): a) Sum b) Difference c) Product d) Transpose 22. Create the Person class. Create some objects of this class (by taking information from the user). Inherit the class Person to create two classes Teacher and Student class. Maintain the respective information in the classes and create, display and delete objects of these two classes (Use Runtime Polymorphism).
29. Create a class Triangle. Include overloaded functions for calculating area. Overload assignment operator and equality operator.
30. Create a class Box containing length, breath and height. Include following methods in it: a) Calculate surface Area b) Calculate Volume c) Increment, Overload ++ operator (both prefix & postfix) d) Decrement, Overload -- operator (both prefix & postfix) e) Overload operator == (to check equality of two boxes), as a friend function f) Overload Assignment operator g) Check if it is a Cube or cuboid Write a program which takes input from the user for length, breath and height to test the above class.
31. Create a structure Student containing fields for Roll No., Name, Class, Year and Total Marks. Create 10 students and store them in a file.
32. Write a program to retrieve the student information from file created in previous question and print it in following format: Roll No. Name Marks

	33. Copy the contents of one text file to another file, after removing all whitespaces. 34. Write a function that reverses the elements of an array in place. The function must accept only one pointer value and return void. 35. Write a program for exception handling.

Part C - Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

1. Program Design, Peter Juliff, PHI Publications.
2. Let us C: Yashwant Kanetkar, BPB Publications.
3. Programming in ANSI C , E. Balaguruswamy, Tata McGraw Hill
4. Let us C++ ,Y. Kanetkar, B.P.B Publication.
5. Programming in C++, E. Balaguruswamy, Tata McGraw Hill.

E Resources:

1. Introduction from SWAYAM/NPTEL
   https://onlinecourses.nptel.ac.in/noc19_cs38/preview
   https://onlinecourses.nptel.ac.in/noc22_cs103/preview
   https://www.youtube.com/watch?v=KG4hjVDw-p8&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=2

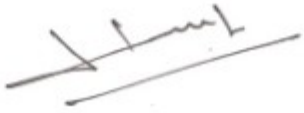
2. Constant and Inline Function
   https://www.youtube.com/watch?v=pX6LufLso2M&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=10

3. Pointer and Reference
   https://www.youtube.com/watch?v=GtsBZ5e1-cE&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=12

4. Function Overloading
   https://www.youtube.com/watch?v=uJGmGAShHeU&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=13

5. Operator Overloading
   https://www.youtube.com/watch?v=0jpOwe4d-FE&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=17

6. Dynamic Memory Management
   https://www.youtube.com/watch?v=lkFK2X6qIc0&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=18



B4KrM9uOEdvPIVFUkU3jNc6D2&index=18

7. Class and Object
https://www.youtube.com/watch?v=wtuks_f3vP4&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=24

8. Access Specifiers
https://www.youtube.com/watch?v=6ki_W7cXdM0&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=22

9. Constructor and Destructor
https://www.youtube.com/watch?v=wtuks_f3vP4&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=24

- **C different topics from W3School**
https://www.w3schools.com/c/
- **C++ different topics from W3School**
https://www.w3schools.com/CPP/default.asp
- **C different topics from Javatpoint**
https://www.javatpoint.com/c-programming-language-tutorial
- **C++ different topics from Javatpoint**
https://www.javatpoint.com/cpp-tutorial

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	Not Applicable

Declaration

The syllabus of this subject is frame as per the TOR of department of higher education, Chhattisgarh.

1. Dr. H.S. Hota - Chairman
Prof. and Head, Dept. of Computer Science and Application
2. Dr. Sanjay Kumar - Member
Prof. and Head, SoS in Computer Science, Pt. Ravishankar Shukla University, Raipur
3. Mr. Jitendra Kumar - Member
Asst. Prof., Dept. of Computer Science and Application
Atal Bihari Vajpayee Vishwavidyalaya, Bilaspur
4. Mr. H.S.P. Tonde - Member

Asst. Prof. and Head, Dept. of Computer Science,
Sant Gahira Guru University Sarguja, Ambikapur

5. Dr. Mamta Singh - Member
   Asst. Prof. and Head, Sai College, Bhilai
   Hemchand Yadav Vishwavidyalaya, Durg
6. Mr. Sushil Kumar Sahu - Member
   Asst. Prof. and Head, Christ College, Jagdalpur
   Shaheed Mahendra Karma Vishwavidyalaya, Bastar
7. Mr. Vikrant Gupta - Member
   Prof. and Head, Batmul Ashram College, Salheana
   Shaheed Nand Kumar Patel University, Raigarh
8. Mr. L.K. Gavel - Member
   Asst. Prof. and Head, Govt. Ghanshyam Singh Gupt, PG College, Balod
   Hemchand Yadav Vishwavidyalaya, Durg
9. Dr. Anil Kumar Sharma - Member
   Asst. Prof. and Head, A.P.S.G.M.N.S, Govt. PG College, Kawardha
   Hemchand Yadav Vishwavidyalaya, Durg
10. Mr. Vishwnath Tamrakar - Member
    Asst. Prof. and Head, Sant Guru Ghasidas Govt. PG College, Kurud,
    Pt. Ravishankar Shukla University, Raipur
11. Ms. Anjeeta Kujur - Member
    Asst. Prof. and Head, Govt. R.B.R.N.E.S. PG College, Jashpur
    Sant Gahira Guru University Sarguja, Ambikapur
12. Mr. Suresh Kumar Thakur - Member
    Asst. Prof. and Head, Indira Gandhi Govt. PG College, Vaishali Nagar
    Hemchand Yadav Vishwavidyalaya, Durg
13. Dr. Ugrasen Suman - Member
    Prof. and Head, Dept. of Computer Science (Present Online)
    Devi Ahila Vishwavidyalaya, Indore

Date: 03.06.2022

B.Sc. Electronics (Three Year)

Programme Outcomes (PO)

PO creates an educational environment to train the students to meet the challenges of modern Electronics & Communication industry through state of the art technical knowledge and present challenges. Following are the expected programme outcomes.

- Analyze, plan and apply the acquired knowledge in basic sciences and mathematics in solving Electronics and Communication Engineering problems with technical, economic, environmental and social contexts.
- Design, build and test analog & digital electronic systems for given specifications.
- Architect modern communication systems to meet stated requirements.
- Work in a team using technical knowhow, common tools and environments to achieve project objectives.
- Engage in lifelong learning, career enhancement and adapt to changing professional and societal needs.
- In addition the course caters to the requirements of providing complete exposure to NET/SET syllabus for Electronics farmed by the U.G.C.

Programme Specific Outcomes (PSO)

PSO enables the students

- To understand basic facts and concepts in Electronics while retaining the exciting aspects of Electronics so as to develop interest in the study of Electronics as a discipline.
- To develop the ability to apply the electronic circuits.
- To get benefited with the present state of art of the electronic based circuit and serve society with its applications.
- To develop the capability to work hands-on on the electronic circuits that is becoming vital for the mankind for the purpose of work regulation
- To be familiarized with the emerging areas of Electronics and their applications in various spheres of Electronic sciences.
- To appraise the capability of students to make its relevance in future studies.
- To develop skills in the building and studying the circuits along with the software implementation.
- To be exposed to get compete with present scenario of the industrial automation.

Three Year (Yearly) Syllabus for Undergraduates

As recommended by Central Board of Studies of Electronics
For approval of Kuladhipati, Governor of Chhattisgarh
For Three Years 2023-26
July 2023 onwards
Class: B.Sc. Electronics

Program: Certificate/Diploma/Degree

Paper Code	Courses Opted	Title of Course	Total Credit (per year)	Total No. of (L-T-P) (Per week)
First Year (Under Graduate Certificate in Electronics)				
ELC-101T	Core Course-1	Network Analysis and Analog Electronics	**4**	**2-0-0**
ELC-102T	Core Course-2	Digital Electronics	**4**	**2-0-0**
ELC-103P	Core Course-1 &2 Practical/Tutorial	Network Analysis, Analog and Digital Lab	**2**	**0-0-2**

1. **Internship/Apprenticeship providing agencies would be enlisted by the concerned University.**
2. **15 Periods (10 hrs. of teaching) = 1 Credit**

22.2.23 22.2.2023

Three Year (Yearly) Syllabus for Undergraduates

As recommended by Central Board of Studies of Electronics
For approval of Kuladhipati, Governor of Chhattisgarh
For Three Years 2023-26
July 2023 onwards
Class: B.Sc. Electronics

Scheme of Examination

Paper Code	Course Opted	Title of Course	Theory	Practical	Grand Total	Minimum Passing Marks
First Year (Under Graduate Certificate in Electronics)						
ELC-101T	Core Course-1	Network Analysis and Analog Electronics	50	--	100	33
ELC-102T	Core Course-2	Digital Electronics	50	--		
ELC-103P	Core Course-1 &2 Practical/Tutorial	Network Analysis, Analog and Digital Lab	--	50	50	17

22.2.2023

22-2-2023

Syllabus

B.Sc. Part I

ELECTRONICS

Paper-I

ELC-101T: NETWORK ANALYSIS AND ANALOGELECTRONICS

Theory: **Maximum Marks 50**

Aims & Objectives

To identify the electronics circuit components- active and passive, understand basic concept of circuits, filters, semiconductor diodes, transistor, power devices, amplifiers and oscillators.

Course Learning Outcomes:

After the completion of the course, Students will be able to

1. Apply their knowledge in analyzing Circuits by using network theorems.
2. Describe the behavior of semiconductor material.
3. Understand working and applications of semiconductor devices.
4. Understand the current voltage (I-V) characteristics of semiconductor devices (Diode/BJT/MOSFET)
5. Apply standard device models to explain/calculate critical internal parameters of semiconductor devices.
6. Explain the behavior and characteristics of power devices such as SCR/UJT etc.
7. Know the concept of feedback amplifier and their characteristics.

Unit-I

Components and Circuit Concepts: Resistors, Inductors and Capacitors (types and specifications) Voltage and Current Sources

AC Circuit Analysis: Sinusoidal Voltage and Current, Definition of Instantaneous, Peak, Peak to Peak, Root Mean Square and Average Values. Impedance and reactance, Series and parallel RLC circuit, Series and Parallel Resonance, condition for Resonance, Resonant Frequency, Bandwidth, and significance of Quality Factor (Q).

Passive Filters: Low Pass, High Pass and Band Pass

Network Theorems: Principal of Duality, Superposition Theorem, Thevenin's, Norton's Theorem, Reciprocity Theorem, Millman's Theorem, Maximum Power Transfer Theorem. AC circuit analysis using Network theorems.

22.2.23 22-2-2023

Unit-2

Junction Diode and its Applications: Energy bands in Solids, Extrinsic and Intrinsic Semiconductor, P and N type semiconductors, Formation of PN junction, Shifting of Fermi level.

PN junction diode, Diode Equation and I-V characteristics. Idea of static and dynamic resistance, dc load line analysis, Quiescent (Q) point,Zener diode, Reverse saturation current, Zener and avalanche breakdown. Rectifiers- Half wave rectifier, Full wave rectifiers (center tapped and bridge), circuit diagrams, working and waveforms, ripple factor and efficiency. Filter-Shunt capacitor filter, its role in power supply, output waveform, and working. Regulation- Line and load regulation, Zener diode as voltage regulator

Unit-3

Bipolar Junction Transistor: PNP and NPN transistor, Basic Transistor action, Transistor biasing, CE, CB , CC configurations, Input and Output characteristics DC load line, operating point,

Field Effect Transistors: JFET, Construction, Idea of Channel formation, Pinch off and Saturation Voltages, Working and Characteristics. MOSFET(N channel and P channel), Construction, Working and Characteristics.

Power Devices: UJT, Construction, Working and Characteristics. SCR, Diac, Triac, Construction, Working and Characteristics.

Unit-4

Amplifiers: Transistor biasing and Stabilization circuits- Fixed Bias and Voltage Divider Bias. Thermal runaway, stability and stability factor, Current, voltage and Power gain, Transistor as a two port network, h-parameter equivalent circuit. Small signal analysis of single stage CE amplifier, Input and Output impedance, Class A, B and C Amplifiers. Application of common Collector Amplifier.

Cascaded Amplifiers: Two stage RC Coupled Amplifier and its Frequency Response.

Unit-5

Feedback in Amplifiers: Concept of feedback, negative and positive feedback, advantages of negative feedback (Qualitative only).

Sinusoidal Oscillators: Barkhausen criterion for sustained oscillations. Phase shift, Weinsbridge, Crystal and Colpitt's oscillator. Determination of Frequency and Condition of oscillation.

Reference Books:

[1] Electric Circuits, S. A. Nasar, Schaum's outline series, Tata McGraw Hill (2004)

[2] Electrical Circuits, M. Nahvi& J. Edminister, Schaum's Outline Series, Tata McGraw-Hill (2005)

[3] Electrical Circuits, K.A. Smith and R.E. Alley, 2014, Cambridge University Press

[4] Network, Lines and Fields, J.D.Ryder, Prentice Hall of India.

[5] Electronic Devices and Circuits, David A. Bell, 5th Edition 2015, Oxford University Press.

[6] Electronic Circuits: Discrete and Integrated, D.L. Schilling and C. Belove, Tata McGraw Hill

[7] Electrical Circuit Analysis, Mahadevan and Chitra, PHI Learning

[8] Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, 2014, 6thEdn., Oxford University Press.

[9] J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill (2001)

[10] J. J. Cathey, 2000 Solved Problems in Electronics, Schaum's outline Series, Tata McGraw Hill (1991)

22.2.23

22-2-2023

Paper- II

ELC-102T: DIGITAL ELECTRONICS

Theory: **Maximum Marks 50**

Aims & Objectives

To understand the digital electronics and its components namely building block, combinational & sequential circuits, analog to digital converter, digital to analog converter, clock and timer circuits.

Course Outcomes:

After the completion of the course, Students will be able to

1. Understand fundamentals of Number Systems, Boolean algebra and minimization techniques.
2. Design combinational and sequential digital circuits.
3. Understand working and applications of analog to digital and digital to analog converters.

Unit-1

Number System and Codes: Decimal, Binary, Octal and Hexadecimal number systems, base conversions, Representation of signed and unsigned numbers, BCD code, Binary, octal and hexadecimal arithmetic; addition, subtraction by 2's complement method, multiplication.

Logic Gates and Boolean Algebra: Truth Tables of OR, AND, NOT, NOR, NAND, XOR, XNOR, Universal Gates, Basic postulates and fundamental theorems of Boolean algebra.

Unit-2

Logic Families: Negative and Positive logic, Saturated and unsaturated logic gates, Logic families RTL, DTL, TTL, ECL, CMOS working, circuit and characteristics

Combinational Logic Analysis and Design: Standard representation of logic functions (SOP and POS), Minimization Techniques (Karnaugh map minimization up to 4variables for SOP). Arithmetic Circuits: Binary Addition. Half and Full Adder, Half and Full Subtractor, 4-bit binary Adder/Subtractor.

Unit-3

Data Processing Circuits: Multiplexers, De-multiplexers, Decoders, Encoders.

Sequential Circuits: One bit storage, Flip- flop, SR and JK Flip-Flops. Race-around conditions in JK Flip-Flop. Master-slave JK Flip-Flop. T and D flip-flop, Clocked (Level and Edge Triggered) Flip-Flops. Preset and Clear operations.

22.2.23 22-2-2023

Unit-4

Shift Registers: Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers (only up to 4 bits).

Counters (4 bits): Asynchronous counters, Ripple Counter, Decade Counter Ring Counter. Synchronous Counter.

Unit-5

Clock and Timer (IC 555): Introduction, Block diagram of IC 555, Astable and Monostable multivibrator circuits. **Basic Concept of Arithmetic Logic Unit**

D-A and A-D Conversion: 4 bit binary weighted and R-2R D-A converters, circuit and working, Accuracy and Resolution. A-D conversion characteristics, successive approximation ADC. (Mention of relevant ICs for all).

Reference Books:

[1] Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., 2011, Tata McGraw

[2] Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.

[3] Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.

[4] Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer, 2001, PHI Learning.

[5] Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia (1994)

[6] R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw- Hill (1994)

20.2.23 22-2-2023

ELECTRONICS LABORATORY

ELC-103P: Network Analysis, Analog and Digital Lab

A student is required to do at least 15 experiment in an academic year. The scheme of practical examination will be as follows-

Experiment	--	**30**
Viva	--	**10**
Sessional	--	**10**
Total	--	**50**

List of Experiments:

1. Study of Electronic Components, Digital Multimeter, function Generator and Oscilloscope.
2. Determination of Energy Band –gap of a Diode.
3. Study of P-N Junction Diode Characteristics.
4. Study of Zener diode characteristics.
5. Study of tunnel diode characteristics.
6. Study of LED Characteristics.
7. Study of Transistor characteristics in Common Base Mode (CB).
8. Study of Transistor characteristics in Common Emitter Mode (CE).
9. Study of Transistor bias stability.
10. Study of Frequency response of a single CE amplifier.
11. Study of Field Effect Transistor Characteristics.
12. Verification of Norton's Theorem.
13. Verification of Super position Theorem.
14. Verification of Thevenin's Theorem.
15. Verification of Maximum Power Transfer Theorem.
16. Design a digital to Analog convertor (DAC) of given specifications.
17. Verification of Truth table of basic logic gates.
18. Verification of De Morgan's theorem.
19. Study of half adders and full adders using IC's
20. Study of RS flip-flops.
21. Study of D and T type flip fop.
22. Study of JK master slave flips flop.
23. Study of the decade counter as MOD-3and MOD-4 and verify the truth table.
24. Study of the decade counter as MOD-8 and MOD-9 and verify the truth table.
25. Study of seven segment Display.
26. Study of Binary Counter.

Note:

1. Out of above twenty six experiments at least fifteen experiments should be done, use of bread board and soldering is expected for at least four experiments.
2. Other experiments of equal standard may also be set.

Scheme of B. Sc. Mathematics

Year	Course Code	Subject Name	Theory/ Practical	Total Credit	Total Marks	
					Max	Min
First year	MATH-1T	Calculus	Theory	4	50	33
	MATH-2T	Algebra	Theory	4	50	
	MATH-1P **(Any One)**	Lab 1 : Calculus and Algebra	Practical	2	50	17
		Project 1 : History of Mathematicians	Project	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 concern university and is not mandatory.

Part A: Introduction				
Program: Certificate Course		Class: B. A. / B.Sc. Part I	Year: 2022	Session:2022-2023
1	Course Code	Paper – MATH- 1T		
2	Course Title	Calculus		
3	Course Type	Theory		
4	Pre-requisite (if any)	No		
5	Course Learning Outcome (CLO)	**This Course will enable the students to:** • Calculate the limit and examine the continuity and understand the geometrical interpretation of differentiability. • Understand the consequences of various mean value theorems. • Draw curves in cartesian and polar coordinate systems. • Understand conceptual variations while advancing from one variable to severalvariables in calculus. • Inter-relationship amongst the line integral, double and triple integral formulations. • Realize importance of Green, Gauss and Stokes' theorems in other branches ofmathematics.		
6	Credit Value	4		
7	Total Marks	Maximum Marks : 50	Minimum Passing Marks :	

Part B: Content of the Course Total Periods: 60		
Unit	Topics	No. of Periods
I	**Sequences, Continuity and Differentiability:** Notion of convergence of sequences and series of real numbers, ϵ-δ definition of limit and continuity of a real valued function; Differentiability and its geometrical interpretation; Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem and their geometrical interpretations, Darboux's theorem.	12
II	**Expansion of Functions:** Successive differentiation and Leibnitz theorem, Maclaurin's and Taylor's theorems for expansion of a function, Taylor's theorem in finite form with Lagrange, Cauchy and Roche–Schlömilch forms of remainder.	12
III	**Curvature, Asymptotes and Curve Tracing:** Curvature; Asymptotes of general algebraic curves, parallel asymptotes, Asymptotes parallel to axes; symmetry, concavity and convexity, points of inflexion, Tangents at origin, Multiple points, Position and nature of double points; Tracing of	12

	cartesian, polar and parametric curves; Envelopes and Evolutes.	
IV	**Functions of Several Variables:** Limit, continuity and first order partial derivatives, Higher order partial derivatives, Change of variables, Euler's theorem for homogeneous functions, Taylor's theorem, Total differentiation and Jacobians.	12
V	**Double and Triple Integrals:** Double integration over rectangular and non-rectangular regions, Double integrals in polar co-ordinates, Triple integral over a parallelepiped and solid regions, Volume by triple integrals, Line integrals, Green's theorem, Area as a line integral, Surface integrals, Stokes' theorem, The Gauss divergence theorem.	12

Part C - Learning Resource

Text Books and Reference Books:

1. Howard Anton, I. Bivens & Stephan Davis. Calculus (10th edition). Wiley India. 2016
2. Gabriel Klambauer. Aspects of Calculus. Springer-Verlag. 1986
3. Wieslaw Krawcewicz & Bindhyachal Rai. Calculus with Maple Labs. Narosa. 2003
4. Gorakh Prasad Differential Calculus (19th edition). Pothishala Pvt. Ltd. 2016
5. George B. Thomas Jr., Joel Hass, Christopher Heil & Maurice D. Weir. Thomas' Calculus (14th edition). Pearson Education 2018
6. Jerrold Marsden, Anthony J. Tromba & Alan Weinstein. Basic Multivariable Calculus, Springer India Pvt. Limited.2009
7. James Stewart. Multivariable Calculus (7th edition). Brooks/Cole. Cengage 2012.
8. Monty J. Strauss, Gerald L. Bradley & Karl J. Smith. Calculus (3rd edition). Pearson Education. Dorling Kindersley (India) Pvt. Ltd. 2011

E- Resources :

1. Suggested Equivalent **online courses:** Web link NPTEL/ SWAYAM/ MOOCs
2. https://www.youtube.com/watch?v=tffrrtzUhmw&list=PL7oBzLzHZ1wXBSiJEgqz_iwVoLiY8qhbv
3. https://www.youtube.com/watch?v=XzaeYnZdK5o&list=PLtKWB-wrvn4nA2h8TFxzWL2zy8O9th_fy
4. https://www.youtube.com/watch?v=zxbHsPB8m-M&list=PLBCEh9iawVM75FaeqS-z7olBKTSLfAC4A

Part D: Assessment and Evaluation	
Suggested Continuous Evaluation Methods: Maximum Marks:	50 Marks

Declaration

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

1. Dr. Premlata Verma
   Asst. Prof.
   Govt. Bilasa Girls PG College, Bilaspur - Chairman
2. Prof. R.R. Sahu
   Asst. Prof.
   Govt. MMR PG College, Champa - Member
3. Mr. Yetendra Upadhyay
   Asst. Prof.
   Govt. N.K. College, Kota - Member
4. Ram Lakhan Pandey
   Asst. Prof.
   Dr. B.R. Ambedkar Govt. College, Baloda - Member
5. Dr. Arun Kumar Mishra
   Professor
   Govt. DT PG College, Utai - Member
6. Dr. Shabnam Khan
   Professor
   Govt. Digvijay PG College, Rajnandgaon - Member
7. Dr. Padmavati
   Professor
   Govt. VYT PG Auto. College, Durg - Member
8. Dr. Anjali Chandravanshi
   Asst. Prof.
   Govt. J.Y. Chhattisgarh College, Raipur - Member
9. Manisha Gupta
   Asst. Prof.
   GNA Govt. PG College, Bhatapara, Raipur - Member
10. Mrs. Sangeeta Pandey
    Asst. Prof.
    R.G. Govt. PG College, Ambikapur - Member
11. Dr. S.K. Bohre
    Asst. Prof.
    I.G. Govt. PG College, Vaishalinagar, Bhilai - Member
12. Dr. Samir Dashputre

Asst. Prof.
Govt. College, Arjunda, Balod

13. Dr. Chandrajeet Singh Rathore - Member
Asst. Prof.
Govt. Jajwalyadev Naveen Girls PG College, Janjgir

14. Dr. Shri Nath Gupta - Member
K. Govt. Arts & Science College, Raigarh

15. Dr. Raghu Nandan Patel - Member
Asst. Prof.
Govt. MLS College, Seepat

Part A: Introduction				
Program: Certificate Course		Class: B. A. / B.Sc. Part I	Year: 2022	Session:2022-2023
1	Course Code	Paper – MATH-2T		
2	Course Title	Algebra		
3	Course Type	Theory		
4	Pre-requisite (if any)	No		
5	Course Learning Outcome (CLO)	**This Course will enable the students to:** • Employ De Moivre's theorem in a number of applications to solve numerical problems. • Learn about the fundamental concepts of groups, subgroups, normal subgroups, isomorphism theorems, cyclic and permutation groups. • Recognize consistent and inconsistent systems of linear equations by the row echelon form of the augmented matrix, using rank. • Find eigen values and corresponding eigen vectors for a square matrix. • Understand real vector spaces, subspaces, basis, dimension and their properties.		
6	Credit Value	4		
7	Total Marks	Maximum Marks : 50	Minimum Passing Marks :	

Part B: Content of the Course Total Periods: 60		
Unit	Topics	No. of Periods
I	**Set Theory and Theory of Equations:** Sets, Relations, Equivalence relations, Equivalence classes; Finite, countable and uncountable sets; The division algorithm, Divisibility and the Euclidean algorithm, Modular arithmetic and basic properties of congruence's; Elementary theorems on the roots of polynomial equations, Imaginary roots, The fundamental theorem of algebra (statement only); The n^{th} roots of unity, De Moivre's theorem for integer and rational indices and its applications.	12
II	**Groups, Subgroups, Normal Subgroups and Isomorphism Theorems :** Definition and properties of a group, Abelian groups, Examples of groups including D_n (dihedral groups), Q_8	12

	(quarternian group), $GL(n, \mathbb{R})$ (general linear groups) and $SL(n, \mathbb{R})$ (special linear groups); Subgroups and examples, Cosets and their properties, Lagrange's theorem and its applications, Normal subgroups and their properties, Simple groups, Factors groups; Group homomorphisms and isomorphisms with properties; First, second and third isomorphism theorems for groups.	
III	**Cyclic and Permutation Groups:** Cyclic groups and properties, Classifications of subgroup of cyclic groups, Cauchy theorem for finite abelian groups; Centralizer, Normalizer, Center of a group, Product of two subgroups, Permutation group and properties, Even and odd permutations, Cayley's theorem.	12
IV	**Row Echelon Form of Matrices and Applications:** Systems of linear equations, Row reduction and echelon forms, The rank of a matrix and its applications in solving system of linear equations; Matrix operations, Symmetric, skew- symmetric, self-adjoint, orthogonal, Hermition, skew-Hermition and unitary matrices; Determinant of a square matrix, The inverse of a square matrix, Eigen vectors and eigen values, The characteristic equation and the Cayley□Hamilton theorem, Applications of matrices to computer graphics and search engines.	12
V	**Vector Spaces and Linear Transformations:** Definitions of field and vector space with examples, Subspaces, Linear span, Quotient space and direct sum, Linearly independent and dependent sets, Bases and dimension, Linear transformation and matrix of a linear transformation, Change of coordinates, Rank and nullity of linear transformation, Rank-nullity theorem.	12

Part C - Learning Resource

Text Books and Reference Books

1. Michael Artin *Algebra* (2nd edition). Pearson 2014.
2. John B. Fraleigh. *A First Course in Abstract Algebra* (7th edition). Pearson 2007.
3. Stephen H. Friedberg, Arnold J.Insel& Lawrence E. Spence. *Linear Algebra* (4thedition). Prentice-Hall of India Pvt. Ltd. 2003
4. Joseph A. Gallian. *Contemporary Abstract Algebra* (9th edition). Cengage. 2017
5. Kenneth Hoffman & Ray Kunze. *Linear Algebra* (2nd edition). Prentice-Hall. 2015

6. I. N. Herstein. *Topics in Algebra* (2nd edition). Wiley India. 2006
7. Nathan Jacobson. *Basic Algebra* I (2nd edition). Dover Publications. 2009
8. Ramji Lal. *Algebra 1: Groups, Rings, Fields and Arithmetic*. Springer. 2017
9. I.S. Luthar & I.B.S. Passi. *Algebra: Volume 1: Groups*. Narosa. 2013

E- Resources

1. Suggested Equivalent **online courses:** Web link NPTEL/ SWAYAM/ MOOCs
2. Linear Algebra
   https://www.youtube.com/watch?v=9h_Q-R6sXbM&list=PL7oBzLzHZ1wXQvQ938Wg1-soq09GywgOw
3. Group theory
   https://www.youtube.com/watch?v=pMzcLG6s3z0&list=PLEAYkSg4uSQ1Yhxu2U-BxtRjZElrfVVcO

Part D: Assessment and Evaluation	
Suggested Continuous Evaluation Methods: Maximum Marks:	50 Marks

Declaration

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

1. Dr. Premlata Verma - Chairman
   Asst. Prof.
   Govt. Bilasa Girls PG College, Bilaspur
2. Prof. R.R. Sahu - Member
   Asst. Prof.
   Govt. MMR PG College, Champa
3. Mr. Yetendra Upadhyay - Member
   Asst. Prof.
   Govt. N.K. College, Kota
4. Ram Lakhan Pandey - Member
   Asst. Prof.
   Dr. B.R. Ambedkar Govt. College, Baloda
5. Dr. Arun Kumar Mishra - Member
   Professor
   Govt. DT PG College, Utai
6. Dr. Shabnam Khan - Member

Professor
Govt. Digvijay PG College, Rajnandgaon

7. Dr. Padmavati - Member
Professor
Govt. VYT PG Auto. College, Durg

8. Dr. Anjali Chandravanshi - Member
Asst. Prof.
Govt. J.Y. Chhattisgarh College, Raipur

9. Manisha Gupta - Member
Asst. Prof.
GNA Govt. PG College, Bhatapara, Raipur

10. Mrs. Sangeeta Pandey - Member
Asst. Prof.
R.G. Govt. PG College, Ambikapur

11. Dr. S.K. Bohre - Member
Asst. Prof.
I.G. Govt. PG College, Vaishalinagar, Bhilai

12. Dr. Samir Dashputre - Member
Asst. Prof.
Govt. College, Arjunda, Balod

13. Dr. Chandrajeet Singh Rathore - Member
Asst. Prof.
Govt. Jajwalyadev Naveen Girls PG College, Janjgir

14. Dr. Shri Nath Gupta - Member
K. Govt. Arts & Science College, Raigarh

15. Dr. Raghu Nandan Patel - Member
Asst. Prof.
Govt. MLS College, Seepat

Part A: Introduction				
Program: **Certificate Course**		Class: **B.A./ B.Sc. I Year**	Year: **2022**	Session: **2022-2023**
1	Course Code	**MATH-1P (I)**		
2	Course Title	I - Lab 01 - Calculus and Algebra		
3	Course Type	**Practical**		
4	Pre-requisite (if any)	No		
5	Course Learning Outcomes (CLO)	At the end of course, Students will be able to • Learn Free and Open Source Software (FOSS) tools for computer programming • Solve problems on Calculus and Algebra theories studied in Mathematics Paper 1and 2 by using FOSS softwares. • Acquire knowledge of applications of Calculus and Algebra through FOSS.		
6	**Credit Value**	**2**		
7	**Total Marks**	**Max. Marks: 50**	**Min Passing Marks : 17**	

Part B: Content of the Course	
	Total Periods: 30
Tentative Practical List	Mathematics practical with Free and Open Source Software (FOSS) tools forcomputer programs, such as GeoGebra/Maxima/Scilab/ Octave /Python/R. **Course Objectives:** • To learn Free and Open Source Software (FOSS) tools for computerprogramming • Acquire knowledge of applications of algebra and calculus through FOSS **List of Practicals**: (At least 15 practicals) • Programs to illustrate left hand and right hand limits for discontinuous functions. • Program to illustrate continuity of a function • Program to illustrate differentiability of a function • Program to verify Rolle's theorem • Program to verify Lagrange's theorem • Programs to verify Cauchy's mean value theorem and finding Taylor's theorem for a given function. • Program to illustrate nth derivative without Leibnitz rule.

	• Program to construct series using Maclaurin's expansion for functions of two variables. • Program to finding the asymptotes of curves. • Program to finding radius of curvature of cycloid. • Program to finding partial derivative of a given function. • Program to calculating the area under two curves. • Obtaining partial derivatives of some standard functions. • Evaluation of the line integral with constant limits. • Evaluation of the line integral with variable limits. • Evaluation of the double integral with constant limits. • Evaluation of the double integral with variable limits. • Evaluation of the triple integral with constant limits. • Evaluation of the triple integral with variable limits. • Programs for area and volume. • Verifying whether given operator is binary or not • To find identity element of a group • To find inverse element of a group. • To construct Cayley's table • Verification of a subgroup of a given subset of a group • Finding all possible subgroups of a finite group. • Examples to verify Lagrange's theorem. • To find the left and right cosets and index of a subgroup • To find all the cyclic subgroups of a given group • Verification of normality of a given subgroup of a group • Illustrating homomorphism and isomorphism of groups • Examples on different types of rings.

	• Examples on integral domains and fields. • Examples on subrings, ideals and subrings which are not ideals. • Homomorphism and isomorphism of rings- illustrative examples. • Solving polynomial equations. • Finding G.C.D of polynomials. • Finding product of two matrices • To test linear independency of a given set of a vectors in a vector space.

Part C - Learning Resource		
Text Books, Reference Books, Other Resources		
SUPPORT FROM THE GOVT FOR STUDENTS AND TEACHERS IN UNDERSTANDING AND LEARNING FOSS TOOLS: As a national level initiative towards learning FOSS tools, IIT Bombay for MHRD, government of India is giving free training to teachers interested in learning open source software's like scilab, maxima, octave, geogebra and others. (Website: http://spoken-tutorial.org;) (email: info@spokentutorial.org; contact@spoken-tutorial.org)		
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	Not Applicable

Declaration

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

1. Dr. Premlata Verma - Chairman
   Asst. Prof.
   Govt. Bilasa Girls PG College, Bilaspur
2. Prof. R.R. Sahu - Member
   Asst. Prof.
   Govt. MMR PG College, Champa
3. Mr. Yetendra Upadhyay - Member
   Asst. Prof.
   Govt. N.K. College, Kota
4. Ram Lakhan Pandey - Member
   Asst. Prof.
   Dr. B.R. Ambedkar Govt. College, Baloda
5. Dr. Arun Kumar Mishra - Member
   Professor
   Govt. DT PG College, Utai
6. Dr. Shabnam Khan - Member
   Professor
   Govt. Digvijay PG College, Rajnandgaon
7. Dr. Padmavati - Member
   Professor
   Govt. VYT PG Auto. College, Durg
8. Dr. Anjali Chandravanshi - Member
   Asst. Prof.
   Govt. J.Y. Chhattisgarh College, Raipur
9. Manisha Gupta - Member
   Asst. Prof.
   GNA Govt. PG College, Bhatapara, Raipur
10. Ms Sangeeta Pandey - Member
    Asst. Prof.
    R.G. Govt. PG College, Ambikapur
11. Dr. S.K. Bohre - Member
    Asst. Prof.
    I.G. Govt. PG College, Vaishalinagar, Bhilai
12. Dr. Samir Dashputre - Member
    Asst. Prof.
    Govt. College, Arjunda, Balod
13. Dr. Chandrajeet Singh Rathore - Member
    Asst. Prof.
    Govt. Jajwalyadev Naveen Girls PG College, Janjgir
14. Dr. Shri Nath Gupta - Member
    K. Govt. Arts & Science College, Raigarh

15. Dr. Raghu Nandan Patel
Asst. Prof.
Govt. MLS College, Seepat

- Member

Part A: Introduction				
Program: **Certificate Course**		Class: **B.A./B.Sc. I Year**	Year: **2022**	Session: **2022-2023**
1	Course Code	**MATH-1P (II)**		
2	Course Title	II - Project 01 - History of Mathematician		
3	Course Type	**Project**		
4	Pre-requisite (if any)	NIL		
5	Course Learning Outcomes (CLO)	Studying history of mathematicians help students: • Develop a deeper understanding of the mathematics they hare already studied by seeing how it was developed over time and in various places. • Know the rich intellectual heritage of the country. • Develop an appreciation of mathematics and build positive attitude towards mathematics increasing student's motivation decreasing anxiety related the subject. • To acquire knowledge about development of mathematics in ancient , medieval and modern period of history.		
6	**Credit Value**	**2**		
7	**Total Marks**	**Max. Marks: 50**	**Min Passing Marks : 17**	

Part B: Content of the Course	
	Total Periods: 30
Project List	**Course Objectives:** An elective course designed to acquire special / advance knowledge, such as supplement study / support study to a project work and a candidate will study such a course on his own with an advisory support a teacher / faculty member. **Project** Contributions and biographies of Indian Mathematicians- Bodhayan, Apasthambh, Katyayan and Mahaveeracharya, Brahmagupta, and Bhaskaracharya in special context of Leelavati and contributions of mathematicians involved in context of the paper of calculus and algebra. (10 Mathematicians)

Part C - Learning Resource		
Text Books, Reference Books, Other Resources		
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	Not Applicable

Declaration

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

1. Dr. Premlata Verma
   Asst. Prof.
   Govt. Bilasa Girls PG College, Bilaspur
   - Chairman
2. Prof. R.R. Sahu
   Asst. Prof.
   Govt. MMR PG College, Champa
   - Member
3. Mr. Yetendra Upadhyay
   Asst. Prof.
   Govt. N.K. College, Kota
   - Member
4. Ram Lakhan Pandey
   Asst. Prof.
   Dr. B.R. Ambedkar Govt. College, Baloda
   - Member
5. Dr. Arun Kumar Mishra
   Professor
   Govt. DT PG College, Utai
   - Member
6. Dr. Shabnam Khan
   Professor
   Govt. Digvijay PG College, Rajnandgaon
   - Member
7. Dr. Padmavati
   Professor
   Govt. VYT PG Auto. College, Durg
   - Member
8. Dr. Anjali Chandravanshi
   Asst. Prof.
   Govt. J.Y. Chhattisgarh College, Raipur
   - Member
9. Manisha Gupta
   Asst. Prof.
   GNA Govt. PG College, Bhatapara, Raipur

10. Mrs. Sangeeta Pandey - Member
Asst. Prof.
R.G. Govt. PG College, Ambikapur

11. Dr. S.K. Bohre - Member
Asst. Prof.
I.G. Govt. PG College, Vaishalinagar, Bhilai

12. Dr. Samir Dashputre - Member
Asst. Prof.
Govt. College, Arjunda, Balod

13. Dr. Chandrajeet Singh Rathore - Member
Asst. Prof.
Govt. Jajwalyadev Naveen Girls PG College, Janjgir

14. Dr. Shri Nath Gupta - Member
K. Govt. Arts & Science College, Raigarh

15. Dr. Raghu Nandan Patel - Member
Asst. Prof.
Govt. MLS College, Seepat

Scheme of B. Sc./ B.Sc. (Hons.) Microbiology

Year	Course Code	Subject Name	Theory/ Practical/Project	Total Credit	Total Marks	
					Max	Min
First year	MICRO -1T	Microbial World and Microbial Techniques	Theory	4	50	17
	MICRO -2T	Bacteriology, Virology & Proto-zoology	Theory	4	50	17
	MICRO -1P	LAB 1: BASIC MICROBIOLOGY	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 is not mandatory.

Part-A: Introduction

Program: *Certificate Course*	Class: **B. Sc. Part - 1**	Year: **2022**	Session:2022-2023

1	Course Code	**MICRO -1T**	
2	Course Title	**Microbial World and Microbial Techniques**	
3	Course Type	**Core Course**	
4	Pre-requisite (if, any)	As per Government norms	
5	Course Learning. Outcomes (CLO)	At the end of this course, the students will be able - ➢ ***to understand the nature, occurrence and diversity of Microorganisms in the environment*** ➢ ***to learn basic techniques microbial culture, identification and handling.*** ➢ ***to become familiar with the eminent microbiologists, historical background and scope of microbiology.***	
6	Credit Value	**04**	
7	TotalMarks	**Max.Marks:50**	**Min Passing Marks: 17**

PART B: Content of the Course

Total No. of Teaching – Periods- 60 / Hours – 40

Unit	Topics (Course contents)	No. of Periods/ Hours
I	**Development of microbiology as a discipline**: Fundamental, History & Developments Introduction to various fields of Microbiology; Contributions of eminent scientists i.e. Antony von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming, Martinus W. Beijerinck, Sergei N. Winogradsky, Selman A. Waksman, Paul Ehrlich, Elie Metchnikoff, Edward Jenner, Hans Christian Gram.	12 Periods / 08 Hours
II	**Systems of classification:** Binomial Nomenclature, Haeckel's three kingdom concept, Whittaker's five kingdom classification and Carl Woese's three domain classification system. Concept of prokaryotic and eukaryotic microorganisms.	12 Periods / 08 Hours
III	**Diversity of Microbial World:** General features structure, reproduction and economic importance of major groups of microorganisms i.e.Virus, Bacteria, Fungi, Algae, Yeast, Protozoa, Cyanobacteria, Chlamydia, Actinomycetes, Mycoplasma.	12 Periods / 08 Hours
IV	**Basic Microbial Techniques:** Introduction to Microscopy (Bright Field, Dark Field, Phase Contrast Fluorescent Microscope and Electron Microscope) Staining Techniques (Gram staining, negative staining, acid fast staining) and Sterilization techniques (Physical and Chemical).	12 Periods / 08 Hours

V	**Pure Culture and Staining Techniques:** Culture media and theirs types (Natural, Synthetic, Complex Media- Differential, Enriched, Enrichment, Selective Media) Pure culture isolation Technique: (Streak plate, Waskman serial dilution and plating methods) Maintenance and Preservation of pure culture.	12 Periods / 08 Hours
Keywords	*Microbial Diversity, Microbial world. Microbes, Microbial techniques, Microbial culture*	

PART – C

Learning Resources: Text Books, Reference Books and Others

Suggested Readings:

Text Books Recommended

1. General Microbiology; Vol I & II, Powar C.B. and Daginawala H.I., Himalay Pub. House, Bombay.
2. A Text Book of Microbiology; Dubey & Maheshwari.
3. Microbiology: An Introduction; Tortora, G. J, Funke B. R. and Case C. L.
4. Practical Microbiology; Dubey and Maheshwari.
5. Experiments in Microbiology: Plant Pathology and Biotechnology; K. R. Aneja.
6. A Text Book of Microbiology; R. P. Singh.
7. Prescott's Microbiology. Wiley JM, Sherwood LM and Woolverton CJ
8. Microbiology. 5th edition. Pelczar MJ, Chan ECS and Krieg NR.
9. General Microbiology. 5th edition. Stanier RY, Ingraham JL, Wheelis ML, and Painter PR.

Online Resources –

- **e-Resources / e-books and e-learning portals**
- **Use of following sites**
  1. **https://nptel.ac.in/courses/102103015**
  2. **https://onlinecourses.swayam2.ac.in/cec19_bt11/preview**
  3. **https://www.britannica.com**

Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods: Maximum Marks: Continuous Comprehensive Evaluation (CCE): Annual /University Exam(UE):		50 Marks NA 50 Marks
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment /Field work	NA

Dr. Swetlana Nagal
Govt. MK-GC Mahasamund
HOD Microbiology

Dr. Rachana Choudhary
Subject Expert
HOD Dept. of Microbiology
S.S.M.V. Junwani, Bhilai

Dr. DK Shrivastava
Member
HOD Microbiology
GTERR PG SC
College, Bilaspur

Dr. Seema Belorkar
Subject Expert,
MBBI, ABVV, Bilaspur

Dr. Richa Mishra
Member
HOD Microbiology
APSCMNS Govt. P.G.
College Kawardha (CG)

Rashmi
Dr. Rashmi Parihar
subject expert
Dept. of microbiology
govt. E.R.R. PG. Science
College, Bilaspur

Dr. K.K. Patel
Govt. T.C.L P.G. College
Jashpur

Dr. Sadhana Jaiswal
HOD - Microbiology
Govt. N.P.G. College of
Science, Raipur

Dr. Shubhraja Pandey
Chancellor Nominated
Chairperson
HOD, Microbiology
D. PVIPRA College
Bilaspur (C.G.)

Prof DSVGK Kalidhar
CBOS chairperson
HOD Microbiology & Biotech
UTD. ABVV, Bilaspur

Part-A: Introduction				
Program: *Certificate Course*		Class: **B. Sc. Part - I**	Year: **2022**	Session:2022-2023
1	Course Code	**MICRO - 2T**		
2	Course Title	**Bacteriology, Virology & Proto-zoology**		
3	Course Type	**Core Course**		
4	Pre-requisite (if, any)	As per Government norms		
5	Course Learning. Outcomes (CLO)	At the end of this course, the students will be able to - ➢ ***understand ecological distribution of microorganism and their significance for society*** ➢ ***aware with the essential and current knowledge of bacteria, virus and protozoa*** ➢ ***become familiar with beneficial & harmful behavior of Viruses, Bacteria, Protozoan and other microbes***		
6	Credit Value	**04**		
7	Total Marks	**Max. Marks: 50**	**Min Passing Marks**: 17	

PART B: Content of the Course

Total No. of Teaching Periods – 60 / Hours - 40

Unit	Topics (Course contents)	No. of Period / Hours
I	**Morphology and Ultra structure of Bacteria:** Cell size, shape and arrangements. Composition, structure and function of cell membrane and cell wall of gram-positive, gram-negative and archaea bacteria, capsule, flagella, pili, ribosomes, inclusions, nucleoid, plasmids. Structure and stages of spore formation.	12 / 08
II	**Ecological significance and economic importance Archaea**: methanogens, thermophiles and halophiles. Eubacteria: Gram negative(non-proteobacteria– *Deinococcus, Spirochetes*. Alpha proteobacteria-, *Rhizobium, Agrobacterium*. Gamma proteo-bacteria– *Escherichia, Pseudomonas)*. Gram positive low G+C; *Bacillus, Clostridium, Staphylococcus*. High G+C: *Streptomyces, Frankia*.	12 / 08
III	**Morphology and ultrastructure of viruses;** General Introduction, morphologyand ultra- structure of viruses, capsid and their arrangements, types of envelopes and their composition. Viral genome; their types and structure, viral related forms-virions, viroids, virusoids, and prions.	12 / 08

IV	**Classification and multiplication of viruses;** Classification of Bacterial Plant and animal viruses. Salient features and life cycle of viruses: Bacteriophages (T4 & Lambda), Plant (TMV & CMV), Animal (Adenovirus, Pox virus & retrovirus).	12 / 08
V	**Basic Introduction to protozoa;**occurrence and classification of protozoa. Structure, reproduction, life cycle and diseases caused by important protozoans- *Entamoeba, Giardia, Leishmania, Trypanosoma* and *Plasmodium.*	12 / 08
Keywords	***Bacteria, Virus, Protozoan,***	

PART – C

Learning Resources: Text Books, Reference Books and Others

Suggested Readings:

Text Books Recommended -

1. General Microbiology; Vol I & II, Powar C.B. and Daginawala H.I., Himalay Pub. House, Bombay.
2. A Text Book of Microbiology; Dubey & Maheshwari.
3. Microbiology: An Introduction.Tortora GJ, Funke BR and Case CL.
4. Practical Microbiology; Dubey and Maheshwari.
5. Experiments in Microbiology: Plant Pathology and Biotechnology; K. R. Aneja.
6. A Text Book of Microbiology; R. P. Singh.
7. Prescott's Microbiology. Wiley JM, Sherwood LM and Woolverton CJ.
8. Microbiology. Pelczar MJ, Chan ECS and Krieg NR.
9. General Microbiology. Stanier RY, Ingraham JL, Wheelis ML, and Painter PR.

Online Resources –

- **e-Resources / e-books and e-learning portals**
- **Use of following sites**

1. ***www.nos.org/media/documents/dmlt/microbiology***
2. ***www.columbia.edu/itc/hs/medical/pathophys/id/2009***
3. ***https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/botany/04._plant_genetic_engineering/strategies_for_resistance_to_plant_viral_diseases/lm/403_lm_edited_module_27_m.pdf***

Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods: Maximum Marks: 50 Marks Continuous Comprehensive Evaluation (CCE)/Field work NA Annual /University Exam(UE): 50 Marks		
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Field work	NA

Dr. K.K. Patel
Member
Govt. T.C.L. P.G. College Janjgir

Dr. Richa Mishra
Member
HOD Microbiology
APSGMNS Govt. P.G. College Kawardha (C.G.)

Dr. D.K. Shrivastava
HOD Microbiology
Govt. E.R.R. P.G. Sc. College, Bilaspur

Rashmi
Dr. Rashmi Parihar
Subject Expert
Dept. of Microbiology
Govt. E.R.R. PG. Science College, Bilaspur.

Dr. Sadhana Jaiswal
Subject Expert
HOD - Microbiology
Govt. N.P.G. College of Science Raipur

Dr. Swetlana Nagal
HOD-Microbiology
Govt. MKGC Mahasamund

Dr. Shubhraja Pandey
Chancellor Nominated Chairperson
HOD, Microbiology
D.P. Vipra College Bilaspur (C.G.)

Dr. Seema Belorkar
Subject Expert,
MBBT, ABVV,
Bilaspur

Dr. Rachana Choudhary
Subject Expert
H.O.D Microbiology
S.S.M.V. Junwani, Bhilai

Prof. DSVGK Kaladhar
CBOS Chairperson
HOD Microbiology & Bioinformatics
UTD ABVV, Bilaspur

Part - A: Introduction

Program: *Certificate Course*	Class: B. Sc. Part - I	Year: 2022	Session:2022-2023

1	Course Code	**MICRO -1P**	
2	Course Title	**BASIC MICROBIOLOGY**	
3	Course Type	**Laboratory Course**	
4	Pre-requisite (if, any)	As per Govt. norms	
5	Course Learning. Outcomes (CLO)	At the end of this course, the students will be able to ➢ ***handle instruments in microbiology lab.*** ➢ ***isolate, purify and observe microorganisms.*** ➢ ***maintain and preserve microbial culture***	
6	Credit Value	**02**	
7	Total Marks	**Max. Marks: 50**	**Min Passing Marks: 17**

PART -B: Content of the Course

Total No. of Teaching Hours – 20 / 30 Periods

Group	Topics (Course contents) • It is a tentative list that can be amended by teacher/ department concerned.	No. of Period / Hour
A	1. Basic information about autoclave, hot air oven, laminar air flow and other laboratory instrument 2. Microscopy - Different parts of compound microscope. Handling and care of compound microscope 3. Preparation of solid &liquid culture media 4. Isolation of microorganism from soil, Isolation of single colonies on solid media by streak plate method. 5. Enumeration of bacteria by serial dilution and plating. 6. Measurement of microorganism (micrometry) and camera Lucida drawing of isolated organism. 7. Determination of bacterial growth by optical density measurements.	15 / 10
B	1. Preparation of laboratory Glass wares (Chemical washing, cleaning and drying) and Preparation of culture media (Liquid & solid). 2. Observation of microorganisms through permanent slides - Bacteria, Cyanobacteria, Protozoa, Fungi, Yeasts, and Algae 3. Observation of bacterial motility–Hanging drop technique / Agar Stab culture 4. Staining Techniques-Simple, Differential staining; Gram staining. Aseptic transfer techniques–types–Plate to slant/ slant to slant/ broth to broth. 5. Maintenance and preservation/stocking of pure cultures. 6. Study of the methods of isolation and propagation of plant viruses. 7. Study of cytopathic effects of viruses using photographs.	15 / 10
Keywords	***Isolation method, pure culture, culture media***	

PART – C

Learning Resources: Text Books, Reference Books and Others

Suggested Readings:

Text Books Recommended:

1. Laboratory Manual of Microbiology and Biotechnology. by Aneja K. R
2. Practical Microbiology, R. C. Dubey and D. K. Maheshwari.
3. Laboratory Manual In Microbiology. By P. Gunasekaran.

OnlineResources –

1. https://open.umn.edu/opentextbooks/textbooks/499
2. https://vlab.amrita.edu/?sub=3&brch=73&sim=720&cnt=1

Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods: Maximum Marks: Continuous Comprehensive Evaluation (CCE): Annual /University Exam(UE):		50 Marks NA 50 Marks
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment /Field work	NA

Sadhana

Dr. Sadhana Jaiswal
Subject - Expert
HOD - Microbiology
Govt. N. P. G. College of
Science Raipur

Dr. Rachana Choudhary
Subjet Expert
H.O.D. Microbiology
S.S.M.V. Junwani, Bhilai

Dr. DK. Shrivastava
Member.
HOD Microbiology
Govt. ERR PG. Sc. College
Bilaspur (C.G.)

DR. K K Patel
Member
Govt. T.C.L P.G. College
Jangir

Dr. Richa Mishra
Member
HOD Microbiology
APSGMNS Govt. PG.
College Kawardha (C.G.)

Dr. Swetlana Nagal
HOD Microbiology
Govt. M. K. G College
Mahasamund

Rashmi
Dr. Rashmi Parihar
Subject expert
Dept of microbiology
Govt. E. R. R. PG. science Colleg,
Bilaspur

Dr. Seema Anil Belorkar
Subject- Expert-
MBBT, ABVV.
Bilaspur

Dr. Shubhraja Pandey
Chancellor Nominated
Chairperson
HOD, Microbiology
D. P Vipra College
Bilaspur (C.G.)

CBOS chairperson
Head Microbiology & Biotech.
UTD, ABVV, Bilaspur

Scheme of B. Sc. Physics

Year	Course Code	Subject Name	Theory/ Practical	Total Credit	Total Marks	
					Max	Min
First year	PHY-1T	Mechanics	Theory	4	50	17
	PHY-2T	Electricity and Magnetism	Theory	4	50	17
	PHY-1P	LAB 1: Mechanics, Electricity and Magnetism	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.**	Year: **First**	Session: **2022-2023**
1	Course Code	**PHY – 1T**		
2	Course Title	**MECHANICS**		
3	Course Type	**Theory**		
4	Pre-requisite (if any)	No		
5	Course Learning Outcomes (CLO)	**After completion of the course students will be able to:** • Get knowledge about the vectors and differential equations used in physics. • Get an idea of different types of motions and conservation laws. • Get an idea about rotational motion and various properties of matter like elasticity and viscosity. • Understand various types of oscillatory motion and GPS system. • Get an idea about Frame of reference and special theory of relativity. • Solve numerical problems based on entire syllabus.		
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	**Topic**	**Number of Periods**
I	**Vectors**: Vector algebra, Derivatives of a vector with respect to a parameter, Scalar and vector products of two, three and four vectors, Gradient, divergence and curl of vectors fields, Polar and Axial vectors. **Ordinary Differential Equations:** 1st order homogeneous differential equations, exact and non-exact differential equations, 2nd order homogeneous and nonhomogeneous differential equations with constant coefficients (Operator Method Only).	12
II	**Laws of Motion:** Review of Newton's Laws of motion. Dynamics of a system of particles, Concept of Centre of Mass, determination of center of mass for discrete and continuous systems having cylindrical and spherical symmetry. **Work and Energy:** Motion of rocket, Work-Energy theorem for conservative forces, Force as a gradient of Potential Energy, Conservation of momentum	12

	and energy, Elastic and in-elastic Collisions.	
III	**Rotational Dynamics:** Angular velocity, Angular momentum, Torque, Conservation of angular momentum, Moment of Inertia, Theorem of parallel and perpendicular axes (statements only), Calculation of Moment of Inertia of discrete and continuous objects (rod, disc, cylinder, solid sphere). **Elasticity:** Hooke's Law – Stress – strain diagram – Elastic moduli – Relation between elastic constants – Poisson's Ratio – Expression for Poisson's Ratio in terms of Elastic Constants – Work done in stretching and work done in twisting a wire – Twisting couple on a cylinder – Determination of Rigidity modules, Elementary idea of Surface tension and Viscosity, flow of fluids, coefficient of viscosity, Stoke's law, expression for terminal velocity, wetting.	12
IV	**Gravitation:** Newton's Law of Gravitation, Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant), Kepler's Laws (statements only), Satellite in circular orbit and applications, Geosynchronous orbits. **Oscillations:** Simple harmonic motion, Differential equation of SHM and its solutions, Kinetic and Potential Energy, Total Energy and their time averages, Compound pendulum, Differential equations of damped oscillations and forced oscillations (Conceptual only).	12
V	**Special Theory of Relativity:** Frame of reference, Galilean Transformations, Inertial and Non-inertial frames, Outcomes of Michelson Morley's Experiment, Postulates of Special Theory of Relativity, Length contraction, Time dilation, Relativistic transformation of velocity, Relativistic variation of mass, Mass-energy equivalence, Transformation of Energy and Momentum.	12

Part C - Learning Resource

Text Books, Reference Books, Other Resources

Reference Books:

1. University Physics. FW Sears, MW Zemansky & HD Young 13/e, 1986.AddisonWesley
2. Mechanics Berkeley Physics course, v.1:Charles Kittel, et.al. 2007, Tata McGrawHill
3. Physics – Resnick, Halliday & Walker 9/e, 2010, Wiley
4. Engineering Mechanics, Basudeb Bhattacharya, 2nd edn., 2015, Oxford University Press
5. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.

Link for e-Books for Physics:

1. *All e-books of physics* *https://www.e-booksdirectory.com/listing.php?category=2*
2. *Free physics text book in PDF* *https://www.motionmountain.net/?gclid=CjwKCAjwmq3kBRB_EiwAjkNDp5v8Yy6xK1s0*

Kma0VR0AWGlichRwFfCC0-vpZK1jrPoEOAnBq8fcqRoCILsQAvD_BwE

3. *Cambridge University Books for Physics https://www.cambridgeindia.org/*
4. *Books for solving physics problems https://bookboon.com/en/physics-ebooks*

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 50
Min Marks : 17
Continuous Comprehensive Evaluation (CCE): As per University Guideline
University Exam(UE): 50 Marks

Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	As per University Guideline

DECLARATION

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

01/ Dr.S.K.Gupta, Govt. E.R.R. P.G Science College, Bilaspur - Chairman

02/ Dr. Jagjeet Kaur Saluja, Govt. V Y T P.G. College, Durg - Member

03/ Dr.Meera Gupta, Govt. Dr. W.W.Patankar Girls P.G. College, Durg, - Member

04/ Dr.S.J. Dhoble, R.T.M Nagpur University Nagpur - Member

05/ Dr.D.P.Bisen, Pt.R.S.U. Raipur - Member

06/ Dr.R.S. Kher, Principal, Govt.M.L.S. College Seepat - Member

07/ Dr. Anjali Oudhia, Govt. N.P.G. College of Science Raipur - Member 8/6/22

08/ Dr.Smriti Agrawal, Govt. College ,Vaishali nagar, bhilai - Member 8/6/22

09/ Dr.S.K.Shrivastava, Govt.P.G. College, Ambikapur - Member

10/ Dr.Kamal K.Prasad Govt.N.E.S.College, Jaspur - Member

11/ Dr. A.P.Goswami, Govt.Bilasa Girls P.G. College, Bilaspur - Member

12/ Dr. V.K. Dubey, Govt.N.P.G. Science College, Raipur - Member

13/ Dr. Anil Kumar Panigrahi, Kirodimal Govt. Arts/Science College, Raigarh - Member

14/ Dr. Ugendra Kumar Kurrey, Govt.C.L.C Arts & Science College, Patan, Durg, - Member

15/ Dr.Dipti Jha , Dr. Radhabai Govt. Navin Kanya Mahavidyalya, Raipur, - Member 8.6.22

16/ Dr.Shashi Kant Rathor,Dr. B.R. Ambedkar Govt.College,Baloda,Dist-Janjgir-Champa- Member

17/ Dr. Vikas Gulhare, Govt. G.N.A. P.G. College, Bhathapara - Member

Part A: Introduction				
Program: **Certificate Course**		Class: **B.Sc.**	Year: **First**	Session: **2022-2023**
1	Course Code	**PHY – 2T**		
2	Course Title	**ELECTRICITY AND MAGNETISM**		
3	Course Type	**Theory**		
4	Pre-requisite (if any)	No		
5	Course Learning Outcomes (CLO)	**After completion of the course students will be able to –** • Get knowledge about the vectors analysis and able to apply in electrostatic and Magnetostatics. • Get idea about electric fields, force and potential. • Get idea about Dielectric and Electric currents and also the application in AC circuits. • Get idea about Magnetic properties of material. • To get idea about Electromagnetic Induction and Maxwell's equation and Electromagnetic wave propagation. • Solve numerical problems based on entire syllabus.		
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	Topic	Number of Periods
I	**Vector Analysis**: Vector Integration, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors and its application in electrostatics and magnetostatics.	12
II	**Electrostatics:** Electrostatic Field, electric flux, Gauss's theorem of electrostatics, Applications of Gauss theorem- Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor. Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere, Calculation of electric field from potential, Capacitance of an isolated spherical conductor, Parallel plate, spherical and cylindrical condenser, Energy per unit volume in electrostatic field.	12

III	**Dielectric & Electric Currents:** Dielectric medium, Polarisation, Displacement vector, Gauss's theorem in dielectrics, Parallel plate capacitor completely filled with dielectric. Steady current, current density J, non – steady current an ontinuity equation, Kirchoff's law (statement only), Ideal constant – voltage and constant – current sources, Thevenin theorem, Norton theorem, Superposition theorem, Reciprocity theorem and maximum power transfer theorem, Rise and decay of current in LR, CR, LCR circuits.	12
IV	**Magnetism:** Magnetostatics: Biot-Savart's law and its applications- straight conductor, circular coil, solenoid carrying current, Divergence and curl of magnetic field, Magnetic vector potential, Ampere's circuital law, Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility, Brief introduction of dia, para and ferro-magnetic materials.	12
V	**Electromagnetic Induction:** Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils, Energy stored in magnetic field. **Maxwell`s equations and Electromagnetic wave propagation:** Equation of continuity of current, Displacement current, Maxwell's equations, Wave equation in free space.	12

Part C - Learning Resource

Text Books, Reference Books, Other Resources

Reference Books:

1. Vector analysis – Schaum's Outline, M.R. Spiegel, S. Lipschutz, D. Spellman, 2nd Edn., 2009, McGraw- Hill Education.
2. Electricity and Magnetism, Edward M. Purcell, 1986, McGraw-Hill Education.
3. Electricity & Magnetism, J.H. Fewkes & J.Yarwood. Vol. I, 1991, Oxford Univ. Press
4. Electricity and Magnetism, D C Tayal, 1988, Himalaya Publishing House.
5. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
6. D.J.Griffiths, Introduction to Electrodynamics, 3rd Edn, 1998, Benjamin Cummings.

Link for e-Books for Physics:

1. *All e-books of physics* https://www.e-booksdirectory.com/listing.php?category=2
2. *Free physics text book in PDF* https://www.motionmountain.net/?gclid=CjwKCAjwmq3kBRB_EiwAjkNDp5v8Yy6xK1s0Kma0VR0AWGlichRwFfCC0-vpZK1jrPoEOAnBq8fcqRoCILsQAvD_BwE
3. *Cambridge University Books for Physics* https://www.cambridgeindia.org/
4. *Books for solving physics problems* https://bookboon.com/en/physics-ebooks

Part D: **Assessment and Evaluation**		
Suggested Continuous Evaluation Methods: Maximum Marks: 50 Min Marks: 17 Continuous Comprehensive Evaluation (CCE): As per University Guideline University Exam(UE): 50 Marks		
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	As per University Guideline

DECLARATION

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

01/ Dr.S.K.Gupta, Govt. E.R.R. P.G Science College, Bilaspur - Chairman

02/ Dr. Jagjeet Kaur Saluja, Govt. V Y T P.G. College, Durg - Member

03/ Dr.Meera Gupta, Govt. Dr. W.W.Patankar Girls P.G. College, Durg, - Member

04/ Dr.S.J. Dhoble, R.T.M Nagpur University Nagpur - Member

05/ Dr.D.P.Bisen, Pt.R.S.U. Raipur - Member

06/ Dr.R.S. Kher, Principal, Govt.M.L.S. College Seepat - Member

07/ Dr. Anjali Oudhia, Govt. N.P.G. College of Science Raipur - Member 8/6/22

08/ Dr.Smriti Agrawal, Govt. College ,Vaishali nagar, bhilai - Member 8.6.22

09/ Dr.S.K.Shrivastava, Govt.P.G. College, Ambikapur - Member

10/ Dr.Kamal K.Prasad Govt.N.E.S.College, Jaspur - Member

11/ Dr. A.P.Goswami, Govt.Bilasa Girls P.G. College, Bilaspur - Member

12/ Dr. V.K. Dubey, Govt.N.P.G. Science College, Raipur - Member

13/ Dr. Anil Kumar Panigrahi, Kirodimal Govt. Arts/Science College, Raigarh - Member

14/ Dr. Ugendra Kumar Kurrey, Govt.C.L.C Arts & Science College, Patan, Durg, - Member 8/6/22

15/ Dr.Dipti Jha , Dr. Radhabai Govt. Navin Kanya Mahavidyalya, Raipur, - Member 8.6.22

16/ Dr.Shashi Kant Rathor,Dr. B.R. Ambedkar Govt.College,Baloda,Dist-Janjgir-Champa- Member

17/ Dr. Vikas Gulhare, Govt. G.N.A. P.G. College, Bhathapara - Member

Part A: Introduction				
Program: **Certificate Course**		Class: **B.Sc.**	Year: **First**	Session: **2022-2023**
1	Course Code	**PHY 1P**		
2	Course Title	**LAB 1: Mechanics, Electricity and Magnetism**		
3	Course Type	**Practical**		
4	Pre-requisite (if any)	NO		
5	Course Learning Outcomes (CLO)	**Expected Outcomes:** • To get knowledge about the use of various measuring instruments. • To get understanding about the simple harmonic motion, elasticity, surface tension and viscosity. • Students will be able to understand applications of basic principle of Electricity and Magnetism theory in real world.		
6	**Credit Value**	**Practical : 2**		
7	**Total Marks**	**Max. Marks: 50**	**Min Passing Marks : 17**	

Part B: Content of the Course	
	Total Lectures: 30
Tentative Practical List	At least 14 experiments from the following: 1. Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope. 2. To study the random error in observations.

	3. To study the motion of the spring and calculate (a) Spring constant and, (b) g. 4. To determine the Moment of Inertia of a Flywheel. 5. To determine g and velocity for a freely falling body using Digital Timing Technique. 6. To determine Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method). 7. To determine the Young's Modulus of a Wire by Optical Lever Method. 8. To determine the Modulus of Rigidity of a Wire by Maxwell's needle. 9. To determine the elastic constants of a wire by Searle's method. 10. To determine the value of g using Bar Pendulum. 11.To determine the value of g using Kater's Pendulum. 12. To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c)DC Current, and (d) checking electrical fuses. 13. To compare capacitances using De'Sauty's bridge. 14. Measurement of field strength B and its variation in a Solenoid (DeterminedB/dx). 15. To study the Characteristics of a Series RC Circuit. 16.To study the ı series LCR circuit and determine its (a) Resonant Frequency, (b)Quality Factor. 17. To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q. 18. To determine a Low Resistance by Carey Foster's Bridge. 19. To verify the Thevenin and Norton theorem. 20. To verify the Superposition, and Maximum Power Transfer Theorem.

Part C - Learning Resource
Text Books, Reference Books, Other Resources
Reference Books: 1. Advanced Practical Physics for students, B.L.Flint & H.T.Worsnop, 1971, Asia Publishing House. 2. Engineering Practical Physics, S.Panigrahi & B.Mallick,2015, Cengage Learning India Pvt. Ltd. 3. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi. **Link for e-Books for Physics:**

Physics Practical: https://www.uou.ac.in/sites//default/files/slm/BSCPH-104.pdf		
Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods: Maximum Marks: 50 Continuous Comprehensive Evaluation (CCE): As per University Guideline University Exam(UE): 50 Marks		
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	As per University Guideline

DECLARATION

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

01/ Dr.S.K.Gupta, Govt. E.R.R. P.G Science College, Bilaspur -- Chairman

02/ Dr. Jagjeet Kaur Saluja, Govt. V Y T P.G. College, Durg -- Member

03/ Dr.Meera Gupta, Govt. Dr. W.W.Patankar Girls P.G. College, Durg - Member

04/ Dr.S.J. Dhoble, R.T.M Nagpur University Nagpur -- Member

05/ Dr.D.P.Bisen, Pt.R.S.U. Raipur -- Member

06/ Dr.R.S. Kher, Principal, Govt.M.L.S. College Seepat -- Member

07/ Dr. Anjali Oudhia, Govt. N.P.G. College of Science Raipur -- Member

08/ Dr.Smriti Agrawal, Govt. College ,Vaishali nagar, bhilai -- Member

09/ Dr.S.K.Shrivastava, Govt.P.G. College, Ambikapur -- Member

10/ Dr.Kamal K.Prasad Govt.N.E.S.College, Jaspur -- Member

11/ Dr. A.P.Goswami, Govt.Bilasa Girls P.G. College, Bilaspur -- Member

12/ Dr. V.K. Dubey, Govt.N.P.G. Science College, Raipur -- Member

13/ Dr. Anil Kumar Panigrahi, Kirodimal Govt. Arts/Science College Raigarh- Member

14/ Dr. Ugendra Kumar Kurrey, Govt.C.L.C Arts & Science College, Patan, Durg, -- Member

15/ Dr.Dipti Jha , Dr. Radhabai Govt. Navin Kanya Mahavidyalya, Raipur, -- Member

16/ Dr.Shashi Kant Rathor, Dr. B.R. Ambedkar Govt.College, Baloda, ist-Janjgir-Champa-Member

17/ Dr. Vikas Gulhare, Govt. G.N.A. P.G. College, Bhathapara -- Member

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 : • 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 ofanimals of different phyla. • Get the knowledge about economic,ecological and medical significance ofvarious animals in human welfare. • Understand the important parasites andtheir 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 Haswell7th 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 *(Plasmodium vivax).* 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, Nemathelminthes :** **Coelenterata-** PhylumCoelenterata: 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 Studyof Liverfluke. **Nemathelminthes-** PhylumNemathelminthes: 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 (*Pheretima*). **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 *Pila.*	12

A. K. Rahman
31.5.2022

IV	**Echinodermata, Hemichordata, Classification of Chordata :** **Echinodermata** - Phylum Echinodermata: General characters of the phylum and classification up to order with characters and suitable examples. Type study of Starfish*(Asterias)*. **Hemichordata** - PhylumHemichordata: General characters of the phylum hemichordate and relationship with non-chordates and chordates. Type study ofBalanoglossus **Classification of Chordata** - Classification of Chordata up to order withcharacters andsuitable examples. Brief account of Urochordata, Cephalochordata and Vertebrata.	11
V	**Comparative Anatomy and Physiology of Non-chordates:** Coelom and coelomductsin 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.	13
Keywords : Locomotary organ, feeding and digestion, respiration, International Comission on Zoological Nomenclature (ICZN), Classification, Protozoa, Classification, Liver Fluke, Trochophore, Arthropoda, Crustacea larva , Echinodermata larva		

Part C -Learning Resource

1. **Text Books, Reference Books, Other Resources –**

2. Parker, J, Haswell, WA, "A Text Book of Zoology", VII edition, Vol. I & II, Low Price Publications, Delhi, 1990.
3. Barnes, RD, "Invertebrate Zoology", VII Edition, Cengage Learning, India, 2006.
4. Pechenik, JA, "Biology of the Invertebrates" McGraw-Hill Educations, VII Edition, 2015.
5. Sedgwick, A, "A Students Text Book of Zoology", Vol.I, II & Vol. III., Low Price Publications, Delhi, 1990.
6. Dhami and Dhami, "Invertebrate Zoology" R., Chand & Co., India, 2009.
7. Jordan and Verma, "Invertebrate Zoology," S. Chand & Company, New Delhi, 2013.
8. Agarwal, VK, "Zoology for Degree Students: Non-Chordata", S Chand & Company, 2017.
9. Kotpal, R, "Modem Text Book of Invertebrates", Rastogi Publications, Meerut, 2017.
10. Kotpal, R, "Protozoa to Echinodermata (Phylum Series)", Rastogi Publications, Meerut, 2017.
11. Kardong, K.V. (2006) Vertebrates: Comparative Anatomy, Function, Evolution (4th edition), McGraw-Hill
12. Jordan, E. L. and Verma, P. S. (2013) Chordate Zoology (14th edition).
13. Saxena, R. K. and Saxena,S. (2015) Comparative Anatomy of Vertebrates (2nd edition).

E- Resources –

1. SWAYAM- .https://swayam.gov.in/explorer?searchText=
2. https://academic.oup.com
3. https://medineplus.gov
4. https://ncin.nlon.nih.gov
5. https://zoologylearningpoint.woodpress.com
6. https://zoologyresources.com
7. National digital library – https://ndl.iitkgp.ac.in
8. e-PG Pathshala (MHRD) Portal, https://egpg.inflibnet.ac.in
9. Science Direct Open Access Content – https://www.sciencedirect.com/book/9781843342038/ open – Access
10. https://egyankosh.ac.in

Dr. K. R. Lahu
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
2. Dr. Ajit Hundet - Member --
   Professor, Govt. D. B. Girls College, Raipur
3. Dr. Prem Praksah Singh - Member - Prem Prakash Singh
   Professor, Govt. College, Kusmi
4. Dr. Shubhada Rahalkar - Member -
   Professor, Govt. Bilasa Girls P. G. College, Bilaspur
5. Dr. Anil Kumar Shrivastava - Member -
   Professor, Govt. V. Y. T. P. G. Autonomous College, Durg
6. Dr. R. K. Tamboli - Member -
   Assistant Professor, Kirodimal Govt. Arts & Science College, Raigarh
7. Dr. Parmita Dubey - Member -
   Assistant Professor, Govt. J. Y. Chhattisgarh College, Raipur
8. Dr. Shashi Gupta - Member -
   Assistant Professor, Govt. Nagarjuna P. G. College of Science, Raipur
9. Dr. L. P. Miri - Member -
   Assistant Professor, Govt. J.P. Verma P. G. Arts & Commerce College, Bilaspur
10. Dr. Rajesh Kumar Rai - Member -
    Assistant Professor, Govt. Mahamaya College, Ratanpur, Bilaspur
11. Dr. Kavita Krishnamoorti - Member -
    Assistant Professor, Govt. Lahiri P. G. College, Chirimiri, Koriya

Date : 31.05.2022

Part A: Introduction				
Program: **Certificate Course**		Class: **B.Sc. I Year**	Year: **2022**	Session:**2022-2023**
1	Course Code	ZOOL- 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 12th.		
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able : • 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	**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. **Cell membrane and transport mechanism :** Structure, composition, models and function. Fluid mosaic model Junctional complexes, membrane receptor modifications : microvilli, desmosomes and plasmodesmata.	12
II	**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). **Cell regulation and cell signaling :** Signaling molecules and their receptors. Functions of cell surface receptors. Regulation of signaling pathways. **Cell culture :** Types of cell culture – monolayer and suspension culture. Types of culture media. Basic characteristics of tissue culture media. Tissue culture and engineering.	12
III	**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.	11
IV	**Structure and function of integument, skeletal, digestive, circulatory system :** **Integument :** Structure of integument from fish to mammals. Function of integument. Epidermal and dermal derivatives of integument and their functional significance. **Skeletal system :** Comparative account of pelvic and pectoral girdles from fishes (cartilaginous and bony) to mammals. **Digestive system :** Dentition in mammals. Comparative study of alimentary canal and digestive glands from fish to mammal. Physiology of digestion in mammal.	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 -

1. Books of M. P. Hindi Granth Academy
2. Rastogi V. B. : Introduction to Cytology
3. Cell Biology and Molecular Biology : N. Arumugam
4. Cell Biology : N. Arumugam
5. Molecular Cell Biology : N. Arumugam
6. Cell Biology, Genetics, Molecular Biology and Evolution : Verma P. S., Agrawal V. K.
7. Sheelar and Binachi : Cell and Molecular Biology
8. Karp : Cell and Molecular Biology
9. De Robertis : Cell and Molecular Bology
10. Powar C. B. : Cell Biology
11. A Textbook of Animal Histology : A. K. Berry, Emkey Publication, Delhi
12. A Textbook of Histology and Practical guide: J. P. Gunasegram
13. Animal Cell Culture : R. Freshney
14. Animal Cell and Tissue Culture : Shivangi Mathur
15. Chordate Zoology : R. L. Kotpal & P. S. Verma
16. Modern Text Book of Zoology – Vertebrate : R. L. Kotpal
17. A Text Book of Chordates : A. Thangamani, N. Arumugam, Saras Puplication
18. Biology of Animals, Volume – II, Sinha, Adhikari, Ganguly
19. Comparative Anatomy of vertebrates, 2nd edition : R. K. Saxena, Sunita Saxena
20. Comparative Anatomy and Developmental Biology : Kotpal, Shastry and Shukla
21. Chordata and Comparative Anatomy : R. L. Kotpal
22. Chordate Zoology : Jordan E. L. and Verma P. S.
23. Anatomy of Chordates, 4th edition : Weichert C. K.
24. Comparative vertebrate Anatomy : L. H. Hyman

E-Resources –

1.SWAYAM- .https://swayam.gov.in/explorer?searchText=
2. https://academic.oup.com
3. https://medineplus.gov
4. https://ncin.nlon.nih.gov
5. https://zoologylearningpoint.woodpress.com
6. https://zoologyresources.com
7. National digital library – https://ndl.iitkgp.ac.in
7. e-PG Pathshala (MHRD) Portal, https://egpg.inflibnet.ac.in
8. Science Direct Open Access Content – https://www.sciencedirect.com/book/9781843342038/ open – Access
9. https://egyankosh.ac.in

A-K-Salam
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
2. Dr. Ajit Hundet - Member --
   Professor, Govt. D. B. Girls College, Raipur
3. Dr. Prem Praksah Singh - Member - Prem Prakash Singh 31/05/2022
   Professor, Govt. College, Kusmi
4. Dr. Shubhada Rahalkar - Member - Rahalkar 31.5.22
   Professor, Govt. Bilasa Girls P. G. College, Bilaspur
5. Dr. Anil Kumar Shrivastava - Member - 31.5.22
   Professor, Govt. V. Y. T. P. G. Autonomous College, Durg
6. Dr. R. K. Tamboli - Member - 31.5.22
   Assistant Professor, Kirodimal Govt. Arts & Science College, Raigarh
7. Dr. Parmita Dubey - Member - Parmita 31.5.22
   Assistant Professor, Govt. J. Y. Chhattisgarh College, Raipur
8. Dr. Shashi Gupta - Member - 31.5.22
   Assistant Professor, Govt. Nagarjuna P. G. College of Science, Raipur
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 - 31.05.2022
    Assistant Professor, Govt. Mahamaya College, Ratanpur, Bilaspur
11. Dr. Kavita Krishnamoorti - Member - K.Ollol 31.05.2022
    Assistant Professor, Govt. Lahiri P. G. College, Chirimiri, Koriya

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 : • Able to know animal diversity in the form of museum/slide for invertebrate and invertebrates. • Capable to enumerate biology of invertebrates. • Capable to explore anatomy of animas. • 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
	Tentative list of practical/exercise :. The practical's work will be based on theory syllabus and the students will be required to show the knowledge of the following – 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 – a) Phretima : 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 : 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

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

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

Date : 31.05.2022