

PART-A INTRODUCTION			
PROGRAM: B.ED. SYLLABUS	CLASS: (SEMESTER III)	YEAR: 2022	SESSION: 2022-24
SUBJECT: PEDAGOGY PART II PEDAGOGY TEACHING OF HINDI			
1.	PROGRAM CODE	0801	
2.	COURSE CODE	BED. 301A	
3.	COURSE TITLE	B.Ed. SEMESTER III	
4.	COURSE LEARNING OUTCOME	<ul style="list-style-type: none"> • भाषा के अलग-अलग भूमिकाओं को जानना • भाषा के स्वरूप और व्यवस्था को समझना • स्कूल की भाषा, बच्चों की भाषा और समझ के बीच के संबंध को जानना • भाषा के संदर्भ में पढ़ने के अधिकार, शांति और पर्यावरण के प्रति सचेत होना • भाषा सीखने के तरीके और प्रक्रिया को जानना और समझना • पाठ्यचर्या, पाठ्यक्रम और पाठ्यपुस्तक का विश्लेषण कर कक्षाविशेष और बच्चों की समझ के अनुसार ढालना • भाषा और साहित्य सम्बंध को जानेगें • भावों और विचारों की स्वतंत्र अभिव्यक्ति करना जानेगें • अनुवाद के महत्व और भूमिका को जानेगें • भाषा सीखने-सिखाने के सृजनात्मक दृष्टिकोण को समझना 	
5.	CREDIT VALUE	4	
6.	TOTAL MARKS	MAXIMUM MARKS: 100	INTERNAL :20
			EXTERNAL:80

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PART B- CONTENT OF COURSE		
UNIT	TOPICS	NUMBER OF LECTURES
UNIT-VI भाषा-साहित्य और सौंदर्य - 1	<p>(विभिन्न अभिव्यक्तियों भाषा की बारीकियों को जानने का सबसे अच्छा माध्यम है।)</p> <p>1. सृजनात्मक भाषा के विविध रूप - साहित्य के विविध रूप को जानना, स्कूली पाठ्यक्रम में साहित्य को पढ़ना-पढ़ाना, अनुवाद कला और सौंदर्य में भाषा, स्कूली पाठ्यचर्या में मीडिया की भूमिका, उद्देश्य प्रासंगिकता, अनुवाद का महत्व और जरूरत</p> <p>2. सृजनात्मक अभिव्यक्ति के रूप में हिंदी अनुवाद (अंग्रेजी और अन्य भारतीय भाषाओं के सदर्भ में) चुने हुए उदाहरण के आधार पर बताया जाएगा।</p> <p>गतिविधि/पोर्टफोलियो</p> <p>पशिक्षण के दौरान</p> <ul style="list-style-type: none"> • एक ही विषय पर किन्हीं तीन अखबारों के संपादकीय की भाषा पर बातचीत कर उनकी विषय प्रस्तुति को रेखांकित करें। • एक ही अंश के तीन अनुवाद को पढ़ें और अपनी भाषा में नया अनुवाद प्रस्तुत करें • समूह में बंट कर मीडिया लेखन के तीन अलग-अलग नमूनों (फीचर, रिपोर्ट, लेख आदि) को इकट्ठा कर उसमें समानता और अंतर को ध्यान में रखते हुए चर्चा करें। • अखबार की किसी खबर के आधार पर संवाद लिखना। <p>कक्षा शिक्षण के दौरान</p> <ul style="list-style-type: none"> • पानी से संबंधित पाठ पढ़ाने के बाद जलचक्र की जानकारी देना, पानी की बचत पर बातचीत, जल की तरल अवस्था से ठोस अवस्था का हल्का होने के कारण का पता लगाने का कार्य करवाना 	8
UNIT VII भाषा साहित्य और सौंदर्य - 2	<p>साहित्यिक अभिव्यक्ति के विविध रूप - कविता को पढ़ना-पढ़ाना, गद्य की विविध विधाओं को पढ़ना-पढ़ाना, नाटक को पढ़ना-पढ़ाना, समकालीन साहित्य की पढ़ाई (बाल साहित्य, दलित साहित्य, स्त्री साहित्य) हिंदी के विविध विधाओं के आधार पर गतिविधियों का निर्माण, कविता, कहानी, नाटक, निबंध, उपन्यास की पाठ विधि तैयार करना।</p>	8

गतिविधि / पोर्टफोलियो

पशिक्षण के दौरान

- एक कहानी का चार अलग-अलग समूह द्वारा विश्लेषण और उसकी प्रस्तुति
- सभी विद्यार्थी किसी एक रचना की समीक्षा करें तथा एक-दूसरे की समीक्षित बिंदुओं पर कक्षा में चर्चा करें
- समूह में एक ही विषय पर अलग-अलग विधियों की रचनाओं का संकलन और उनका तुलनात्मक विश्लेषण
- वर्तमान बाल साहित्य की समीक्षा
- अपनी मनपसंद तीन कहानियों की समीक्षा

कक्षा शिक्षण के दौरान

- बच्चों से एक ही विषय जैसे 'बादल' पर स्वतंत्र रूप से कुछ लिखने को कहें (कोई विधा न सुझाएँ).
- रचना को जानें और कक्षा विशेष को ध्यान में रखते हुए कक्षा प्रविधि तैयार करें (किसी एक रचना को सुनकर)

(क) एक रचना अनेक स्तर, अलग-अलग कक्षाओं में एक ही रचना को पढ़ाने से संबंधित)

(ख) एक रचना अनेक अर्थ (अलग-अलग नजरिये से एक ही रचना को पढ़ना)

(ग) एक रचना विभिन्न बच्चे (संदर्भ: चुनौतीपूर्ण बच्चे)

- कोई नाटक या उपन्यास पढ़वाने के बाद उसके पात्रों के रहन-सहन, बोली आदि की चर्चा कर समाज में इनमें आए बदलाव पर चर्चा करना, विभिन्न व्यवसाय तथा व्यवसाय से जुड़े लोगों, उनके कार्यों, समस्याओं पर बातचीत
- कक्षा छह हिंदी की पुस्तक में से झांसी की रानी कविता, नौकर (निबंध) पाठ के बाद -1857 के पहले, दौरान और बाद में घटी घटनाओं का टाइम लाइन (चार्ट) बनाना, गांधी जी के जीवन की महत्वपूर्ण घटनाओं का टाइम लाइन (चार्ट), गांधी जी द्वारा चलाए गए आंदोलनों का टाइम लाइन (चार्ट)

परियोजना कार्य

- (क) विद्यालयी अनुभव कार्यक्रम के दौरान भाषा शिक्षण को लेकर आने वाली कठिनाई पर क्रियात्मक शोध
- (ख) भाषा की कक्षा में उन अनुभवों को पिरोते हुए शिक्षण योजना बनाना स्थानीय कलाकार/कवि/लेखक से साक्षात्कार
- कक्षा 6 से 12 तक की हिंदी की पाठ्यपुस्तकों में से किसी एक कविता को चुनकर परिवेश से जोड़ते हुए उसवेफ शिक्षण बिंदु तैयार करना

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<p>Unit VIII: पाठ्यक्रम आर पाठ्य-सामग्री का निमाण और विश्लेषण</p>	<p>पाठ्यक्रम आर पाठ्य-सामग्री का निमाण और विश्लेषण (पाठ्यपुस्तक शिक्षण का एक साधन है, एकमात्र साधन नहीं)</p> <p>पाठ्यचर्या और पाठ्यक्रम एक पाठ्य-सामग्री अनेक - पाठ्यचर्या, पाठ्यक्रम तथा पाठ्यपुस्तकों का संबंध, पाठ्यक्रम को बच्चों के अनुरूप ढालना (शिक्षण को स्कूल के बाहरी जीवन से जोड़ते हुए तथा रटत-प्रणाली का निषेध करते हुए सामग्री चयन, गतिविधि और अभ्यास सामग्री का निर्माण), शोधकर्ता के रूप में शिक्षक (अलग-अलग बच्चों की आवश्यकताओं को ध्यान में रखते हुए)</p> <p>गतिविधि/पोर्टफोलियो पशिक्षण के दौरान</p> <ul style="list-style-type: none"> ➤ नवीन पाठ्यचर्या की समीक्षा और प्रस्तुतीकरण (समूह कार्य) <ul style="list-style-type: none"> (क) नवीन पाठ्यचर्या में भाषा शिक्षण से संबंधित अध्याय पर चर्चा (ख) नवीन पाठ्यचर्या में भाषा शिक्षण से संबंधित अध्याय का विश्लेषण और प्रस्तुतीकरण (समूह) ➤ 'बच्चे की भाषा' या ऐसे अन्य किसी विषय पर एक संगोष्ठी आयोजित करें <p>परियोजना कार्य</p> <ul style="list-style-type: none"> ● विभिन्न राज्यों के हिंदी के पाठ्यक्रम का विश्लेषण और प्रस्तुतीकरण (समूह कार्य) ● अपनी मनपसंद कहानियों का संकलन तथा उनसे संबंधित लेख ● किन्ही दो राज्यों द्वारा विकसित किसी भी एक (6 से 12) कक्षा की हिंदी की पाठ्यपुस्तक का तुलनात्मक अध्ययन 	<p>8</p>
<p>Unit IX: सहायक शिक्षण सामग्री</p>	<p>सहायक शिक्षण सामग्री</p> <p>प्रिंट मीडिया तथा अन्य पाठ्य सामग्री जैसे बच्चे द्वारा चुनी गई सामग्री, पत्रिकाएँ, अखबार, कक्षा-पुस्तकालय आदि, आई.सी.टी.-दृश्य-श्रव्य सामग्री, रेडियो, टेलीविज़न फिल्में, भाषा प्रयोगशाला, सहसंज्ञानात्मक गतिविधियों की रूपरेखा (चर्चा, वादविवाद, खेल, कार्यशालाएँ, गोष्ठी आदि)</p> <p>गतिविधि/पोर्टफोलियो पशिक्षण के दौरान</p> <ul style="list-style-type: none"> ● दसवीं और बारहवी कक्षा के किसी भी बोर्ड की परीक्षाओं के हिंदी के प्रश्नपत्रों (पिछले तीन वर्षों) की समीक्षा करें ● एक ही सवाल पर बच्चों द्वारा अलग-अलग आए जवाबों पर समूह में चर्चा करें ● कक्षा 6 से 12 तक की हिंदी की पाठ्यपुस्तकों में से ऐसे दस प्रश्न छांटे जिनमें भाषा मूल्यांकन का सृजनात्मक रवैया परिलक्षित होता है (समूह कार्य) 	<p>6</p>

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	<p>कक्षा शिक्षण के दौरान</p> <ul style="list-style-type: none"> • चुनौतीपूर्ण बच्चों को ध्यान में रखते हुए दो सहायक शिक्षण सामग्री तैयार करना • विद्यालयी अनुभव कार्यक्रम के दौरान विद्यार्थियों से हस्तलिखित पत्रिका का विकास या हस्तलिखित पत्रिका की रूपरेखा तैयार करवाना • विद्यालयी अनुभव कार्यक्रम के दौरान विद्यार्थियों द्वारा हस्तलिखित समाचार-पत्र का विकास करवाना 	
<p>UNIT: X आकलन की भूमिका और महत्व</p>	<p>(मूल्यांकन की भूमिका बच्चों की मौलिकता और भाषा प्रयोग में उनकी सृजनात्मकता को पैना बनाना है।)</p> <p>2. भाषा विकास की प्रगति का आकलन— सतत् और समग्र मूल्यांकन, स्वमूल्यांकन, आपसी मूल्यांकन, समूह मूल्यांकन, पोर्टफोलियो</p> <p>3. प्रश्नों का स्वरूप, प्रश्नों के आधार बिंदु, – समस्या समाधान संबंधी प्रश्न, सृजनात्मक चिंतन वाले प्रश्न, समालोचनात्मक चिंतन वाले प्रश्न, कल्पनाशीलता को जीवित करने वाले प्रश्न, परिवेशीय सजगता वाले प्रश्न, गतिविधि और टास्क (खुले प्रश्न, बहुविकल्पी प्रश्न)</p> <p>4. फीडबैक (विद्यार्थी, अभिभावक और अध्यापक और रिपोर्ट)</p> <p>गतिविधि / पोर्टफोलियो</p> <p>पशिक्षण के दौरान</p> <ul style="list-style-type: none"> • दसवीं और बारहवीं कक्षा के किसी भी बोर्ड की परीक्षाओं के हिंदी के प्रश्नपत्रों (पिछले तीन वर्षों) की समीक्षा करें • एक ही सवाल पर बच्चों द्वारा अलग-अलग आए जवाबों पर समूह में चर्चा करें • कक्षा 6 से 12 तक की हिंदी की पाठ्यपुस्तकों में से ऐसे दस प्रश्न छांटे जिनमें भाषा मूल्यांकन का सृजनात्मक रवैया परिलक्षित होता है (समूह कार्य) <p>कक्षा शिक्षण के दौरान</p> <p>(क) कक्षा छह के किसी बच्चे की प्रथम त्रैमासिक आकलन रिपोर्ट में दिए गए सुझावों का अध्ययन करना</p> <p>(ख) इन सुझावों का बच्चे के भाषायी विकास में इस्तेमाल करने के लिए युक्तियों सुझाना</p> <p>परियोजना कार्य</p> <ul style="list-style-type: none"> • उच्च प्राथमिक स्तर पर आकलन एवं मूल्यांकन की मौजूदा प्रक्रिया पर रिपोर्ट तैयार करें • एन सी ई आर टी द्वारा प्रकाशित आकलन स्रोत पुस्तिका भाषा हिंदी पढ़ें तथा इसमें आए आकलन संबंधी क्रियाकलापों को कक्षा 6 से 12 के अनुरूप विकसित करते हुए एक संक्षिप्त लेख लिखें <p>"सीखने सिखाने की प्रक्रिया में अध्यापकों की भूमिका एक सहायक और मित्र की होगी। अध्यापकों के सामने यह चुनौती होगी कि वह हरेक विद्यार्थी से एक तरह की सृजनात्मक क्षमता (उनर भी) की अपेक्षा न करें।"</p>	<p>8</p>

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	<p>नोट:</p> <p>परियोजना कार्य, विद्यार्थी और अध्यापक के पोर्टफोलियो, गतिविधियाँ, चर्चा-परिचर्चा, प्रस्तुतियाँ, कार्यशाला, टूर (नमूने के तौर पर कुछ गतिविधियाँ इत्यादि प्रत्येक इकाई के साथ दी गई हैं। ऐसी अन्य गतिविधियाँ स्वयं भी तैयार कर सकते हैं। प्रत्येक विद्यार्थी को अपना पोर्टफोलियो तैयार करना है तथा प्रत्येक वर्ष चारपरियोजना कार्य करने अनिवार्य हैं।</p>
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PART C: LEARNING RESOURCES (BOOKS RECOMMENDED)

AUTHOR	TITLE	PUBLISHER
भाई योगेन्द्रजीत	:हिन्दी भाषा शिक्षण,	विनोद पुस्तक मंदिर आगरा.
.क्षत्रिय के	: मातृभाषा शिक्षण,	विनोद पुस्तक मंदिर आगरा
लाल रमन बिहारी	: हिन्दी शिक्षण,	रस्तोगी पब्लिकेशन,मेरठ
शर्मा,डॉ. लक्ष्मीनारायण	: भाषा 1,2 की शिक्षण विधियाँ और पाठ नियोजन,	,विनोद पुस्तक मंदिर आगरा
शर्मा,राजकुमारी	: हिन्दी शिक्षण,	राधा प्रकाशन मंदिर आगरा
सिंह सावित्री	: हिन्दी	स्थल बुक डिपो मेरठ

SUGGESTED DIGITAL PLATFORM

	N List National library & Information Service (subscribe) (Shodh Sindhu)
	NDL National Digital Library Central Govt. Ministry of Education (Devlop by Khadgpur.)

B. AS. Nisha. Sumanjot

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PART-A INTRODUCTION			
PROGRAM: B.ED. SYLLABUS	CLASS: (SEMESTER III)	YEAR: 2022	SESSION: 2022-24
SUBJECT		PEDAGOGY OF LANGUAGE (ENGLISH)	
1.	PROGRAM CODE	0801	
2.	COURSE CODE	BED. 301 B	
3.	COURSE TITLE	B.Ed. SEMESTER III	
4.	COURSE LEARNING OUTCOME	<ul style="list-style-type: none"> • Understand the different roles of language; • Understand the relation between literature and language; • Develop creativity among learners; • Understand the role and importance of translation; • Examine authentic literary and non-literary texts and develop insight and appreciation; • Understand the use of language in context, such as grammar and vocabulary; • Develop activities and tasks for learners; • Understand the importance of home language and school language and the role of mother tongue in education; • Understand about the teaching of poetry, prose and drama; • Identify methods, approaches and materials for teaching English at various levels in the Indian context; 	
5.	CREDIT VALUE	4	
6.	TOTAL MARKS	MAXIMUM MARKS: 100	INTERNAL :20
			EXTERNAL:80
PART B- CONTENT OF COURSE			
UNIT	TOPICS		NUMBER OF LECTURES
UNIT VI LANGUAGE LITERATURE AND AESTHETICS-I	: Different Creative forms of English Language: Understanding different forms of literature; Literature in the school curriculum: Needs, objectives and relevance; Role and relevance of media in school curriculum; Translation: Importance and need, Translation as a creative activity; through examples of translated texts into English from different Indian languages. Activities <ul style="list-style-type: none"> • Take three editorial pieces on the same topic from different newspapers. 		8

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	<p>Have a discussion on their language and presentation</p> <ul style="list-style-type: none"> • Take two translations of any piece of creative writing. Read these pieces and then translate the piece yourself • Take any creative writing related to history, e.g. Discovery of India and prepare a flow chart on the main events • Review any story and have a discussion in groups • Take any piece on Geography and prepare a teaching strategy for teaching any Geographical phenomena, e.g. climate change, water. <p>Teaching Practice</p> <p>Take any topic of your choice and write about it in any form of creative writing.</p>	
<p>UNIT VII: LANGUAGE, LITERATURE AND AESTHETICS-II</p>	<p>Teaching of Different Forms of English Literature: Poetry, Prose, Drama: The relative importance of Indian, classical, popular, and children's literature in English; Developing tasks and materials for study skills in English literary forms; The study of contemporary Indian, Asian, European and African literature; Lessons planning in prose, poetry and drama at various school levels.</p> <p>Activities</p> <ul style="list-style-type: none"> • Review any two stories of your choice • Interview any local artist/poet/writer • Collect Indian folktales in English (translated) for your portfolio • Prepare a newsletter on the basis of your school experience programme (hand written). <p>Teaching Practice</p> <p>Take any creative writing, e.g. a poem or a story and develop teaching strategies to teach:</p> <p>(a) Same pieces for different stages; (b) Understanding any creative piece at different levels; and (c) Teaching the same piece to children with special needs.</p> <p>Action Research</p> <ul style="list-style-type: none"> • Identify and list language (English) related errors common among students. • Prepare a list of idioms, proverb in English • Teaching any creative piece in the classroom on the basis of (a) Level of the students (b) Perspective • Prepare an outline for action research on the basis of your experience of the difficulties faced during school experience programme. 	<p>8</p>

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<p>UNIT VIII: DEVELOPMENT AND ANALYSIS OF SYLLABUS</p>	<p>DEVELOPMENT AND ANALYSIS OF SYLLABUS AND TEXTUAL MATERIALS</p> <p>Understanding the relationship between curriculum, syllabus and textbook; Selection of materials; Development of activities and tasks; Connecting learning to the world outside; Moving away from rote-learning to constructivism; Teacher as a researcher. (Develop meaningful strategies keeping in view the needs of the learners.)</p> <p>Activities</p> <ul style="list-style-type: none"> ➤ Do a comparative study of one textbook of English from any class (VI to VII) developed by any two states ➤ Prepare an outline for the development of the textbook for the same class for your state. Project ➤ Prepare a collection of poems and stories of your choice. 	<p>6</p>
<p>UNIT XI: TEACHING- LEARNING MATERIALS AND AIDS</p>	<p>TEACHING-LEARNING MATERIALS AND AIDS</p> <p>Print media; Other reading materials. such as learner chosen texts, Magazines, News papers, Class libraries, etc., ICT- audio-visual aids including CALL programmes; Radio, T.V., Films; Planning co-curricular activities (discussion, debates, workshops, seminar etc.); Language labs, etc.</p> <p>Activities</p> <ul style="list-style-type: none"> • Prepare a list of audio-visual aids related to teaching of English and use them wherever necessary • Identify and prepare different types of teaching aids for children with special needs (speech impaired) Organise a workshop/seminar/conference on the topic 'Language of Children' or any other related topic. <p>Project</p> <p>Prepare an outline for a school magazine development</p> <ul style="list-style-type: none"> • The material for the school magazine based on your experiences during school experience practice (Handwritten) • Review contemporary children's literature • Review any two magazines for women. 	<p>6</p>

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<p>UNIT X: ASSESSMENT-ITS ROLE AND IMPORTANCE</p>	<p>ASSESSMENT-ITS ROLE AND IMPORTANCE</p> <ul style="list-style-type: none"> ➤ Progress and assessment of development of language; Continuous and comprehensive evaluation; Techniques of evaluation—oral, written, portfolio; Cloze test, Self evaluation; Peer evaluation; Group evaluation. ➤ Typology of questions; Activities and tasks (open-ended questions, MCQ, true and false etc.) reflecting—Problem solving, creative and critical thinking, Enhancing imagination and environmental awareness. ➤ Feedback to students, parents and teachers. <p>Activities</p> <ul style="list-style-type: none"> • Write a report on current practices of assessment and evaluation at the Upper Primary Stage • Analyse the question papers of English language (Previous-3 Years)—Classes X and XII (any board) in the light of new approach of assessment • Develop a question paper for upper primary and secondary stage to assess all the aspects of language learning • Analyse answers given by the learners for one particular question • Select any ten questions from the Class VI English textbook which lend scope to the creativity of the learners • Study the key points of the Ist Term assessment of any student of Class VI • Devise a strategy to incorporate the suggestions given in the Ist CCE report for the progress of the learner. <p>Note</p> <ul style="list-style-type: none"> • Project Work, Students-Teacher's Portfolio, Activities, Presentations, Workshops and Educational tours to be carried out during both the years. (Some activities have been given in each Unit as examples. Such other activities may be developed as per the need. Every student has to prepare his/her own portfolio and four projects are compulsory for each year.) • Activities <ul style="list-style-type: none"> • Collect ten examples of Grammar in context from English Textbooks of Classes VI to VIII and have a group discussion. • Teaching Practice • Prepare activities for listening, speaking, reading and writing. (5 Each) • Prepare three activities to develop the reading skills of Class VI students. • Project <ul style="list-style-type: none"> • Keeping in view the needs of the children with special needs prepare two activities for English teachers. 	<p>8</p>
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PART C: LEARNING RESOURCES (BOOKS RECOMMENDED)		
AUTHOR	TITLE	PUBLISHER
Bond, L. Getal (1980):	Reading Difficulties – Their Diagnosis and Correction,	New York, Appleton Century Crafts.
Valdmen., (1987)	"Trends in Language Teaching,	New York, London Mac Graw Hill.
Johnson, K (1983):	Communicative Syllabus Design and Methodology,	Oxford, Pergamon Press.
Widdowson, HG (1979):	Teaching language as Communication,	London, OUP.
David, E (1977):	Classroom Techniques - Foreign Languages and English as a Second Language	New York, Harcourt Brace. 30
Parrot, M (1993):	Tasks for the Classroom Teacher,	London, Pergamon.
Grillett, M (1983):	Developing Reading Comprehension,	London, CUP.
.Byrne, D (1975):	Teaching Writing, London,	London, Longman.
:Morgan & Rinvoluri (1991):	New Ways of Dictation,	London, Longman.
Mukalel, J.C. (1998):	Approaches to English Language Teaching,	Sterling Publishing House, New Delhi.
Halbe Malati, (2005):	Methodology of English Teaching,	Himalaya Publish House, Mumbai
Sharma, K.L.:	Methods of 'Teaching English in India.	
Choudhary, N.R. (2002)	English Language Teaching,	Himalaya Publish House. Mumbai
Sachdeva, M.L.:	A New Approach to Teaching of English in India	
SUGGESTED DIGITAL PLATFORM		
	N List National library & Information Service (subscribe) (Shodh Sindhu)	
	NDL National Digital Library Central Govt. Ministry of Education (Devlop by Khadgpur.)	

PART-A INTRODUCTION			
PROGRAM: B.ED. SYLLABUS	CLASS: (SEMESTER III)	YEAR: 2022	SESSION: 2022-24
SUBJECT		PEDAGOGY OF SOCIAL SCIENCES	
1.	PROGRAM CODE	0801	
2.	COURSE CODE	BED. 103 C	
3.	COURSE TITLE	B.Ed. SEMESTER III	
4.	COURSE LEARNING OUTCOME	<p>;</p> <ul style="list-style-type: none"> To acquire a conceptual understanding of the processes of teaching and learning Social Sciences To enable student teachers examine the prevailing pedagogical practices in classrooms critically and to reflect on the desired changes; To acquire basic knowledge and skills to analyse and transact the Social Sciences curriculum effectively following wide-ranging teaching-learning strategies in order to make it enjoyable and relevant for life; 	
5.	CREDIT VALUE	4	
6.	TOTAL MARKS	MAXIMUM MARKS: 100	INTERNAL :20
			EXTERNAL:80
PART B- CONTENT OF COURSE			
UNIT	TOPICS		NUMBER OF LECTURES
UNIT VI: TEACHING-LEARNING OF HISTORY	<p>Continuity and Change over Time and Historical Construction</p> <p>This Unit seeks to introduce student-teachers to some of the seminal issues and concepts of social change in Indian and World History. It also aims to explain how historians do History and how it ought to be done in schools. It, therefore, focuses on constructivist pedagogy in History and the general competencies that children are likely to develop through the study of History. Historical Methods</p> <p>Evidence, facts, arguments, categories and perspective; Distinctions between fact and opinion and between opinion, bias and perspective; Evidence-based History teaching; Primary sources and the construction of History Thinking in terms of problems for analysis in History. Social Formations in History</p> <p>Different social formations in History and the periodisation of World History; The periodisation of Indian History: Ancient, medieval, modern and contemporary societies State-formation and different</p>		8

	<p>types of states in History Capitalism, Select Issues of Social Change in Indian History Culture, social stratification and social change in India; Caste and class in Indian society Shared religious cultures and conflicts between religious communities in India</p> <p>Gender differentials and how these cut across caste and class structures as well as religious communities. (Case Study: India)</p> <p>The above content may be used to understand the teaching, learning strategies and skill development in History. Interactive, constructivist and critical pedagogies in History</p> <p>Going beyond the textbook; Getting children to craft little nuggets of History from primary sources Encouraging children to think from first principle in History.</p> <p>The Lateral Development of Different Skills</p> <p>Observation of skills relating to primary and secondary data; Observing coins, inscriptions (if available), the material remains of the past and visuals; Helping children to read passages from primary sources; Thinking about what all these sources might or might not reveal Learning to analyse critically and to argue; Observing how arguments have been made in the standard secondary sources and how these muster facts and evidences Helping children to develop oral and written expression.</p>	
<p>UNIT VII: TEACHING-LEARNING OF POLITICAL SCIENCE</p>	<p>TEACHING-LEARNING OF POLITICAL SCIENCE DEMOCRACY, DEVELOPMENT, AND DIVERSITY</p> <p>The Unit on Political Science deals with the broad themes of democracy, development, and diversity. These three interrelated themes are concerned with political, economic, and social aspects of our everyday life. The contents in this unit contain key political concepts and issues. While explaining them, teachers are expected to refer to both historical and current events, processes and personalities from India and different parts of the world. They are also expected to make references to key concepts in the disciplines of Sociology, Economics, and Geography, so as to highlight the interrelationship between Political Science and these disciplines.</p> <p>*What is Politics?</p> <ul style="list-style-type: none"> ❖ Political Science: Nature and scope, key concepts, current trends Elements of State: Population, Territory, Government, and Sovereignty ❖ Forms of Government: Democratic (Liberal and Social), non-democratic, Rule of Law, Authority, Power, Legitimacy, Civil Society, Citizenship, Rights, separation of Powers, Organs of Government: Legislature, Executive, and Judiciary. ❖ Constitutional Vision for a Democratic India .The making of the 	<p>10</p>

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	<p>Constitution of India</p> <ul style="list-style-type: none"> ❖ Justice (with special reference to Social Justice and Empowerment) Liberty, Equality, Dignity, Socialism, Secularism (Relationship between State and Religion): Western and Indian Versions ❖ Fundamental Rights (Prohibition of discrimination; Rights of Dalits, Tribes, minorities [Religious/Linguistic], Women and Children, the Disabled) ❖ Directive Principles of State Policy (with special reference to welfare of the people) Fundamental Duties. <p>*The Working of the Government</p> <ul style="list-style-type: none"> ❖ Structures and Functions of the Government at different levels Union, State/UT, District and Local Bodies (Panchayats and Municipalities) ❖ Relationship among the three organs of the Government, Relationship between the three levels of the Government, Democratic decentralisation, citizen participation. ❖ Society and Political Processes, Elections, political parties, pressure groups ❖ Social movements: Dalit movement, Tribal movement, Women's movement, environmental movement; Role of media, Role of NGOs, RTI <ul style="list-style-type: none"> • *The above content may be used to understand the teaching-learning strategies and skill development in Political Science. <p>Teaching-learning Strategies</p> <p>The teaching-learning process needs to take into account the lived experiences of student- teachers. The issues in this Unit can be introduced by referring to the relevant items from daily newspapers (e.g. instances of violation and protection of human rights). The contents are to be transacted through participatory methods involving all participants. 'Learning by discussing' is to be followed as a regular practice in the classroom.</p> <p>Social inquiry approaches can be used in teaching, learning of Political Science. The student-teachers may be encouraged to observe actual functioning of the institutions of different local Government bodies in own district and prepare reports as group projects. They may also be encouraged to undertake field research, conduct in-depth interviews, and interpret field data and critically understand political concepts.</p> <p>Teaching-learning Materials: Constitution of India, atlas, political maps (World, Asia, India, States, Districts), globe, two daily newspapers, news magazines.</p>	
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<p>UNIT VIII: ASSESSMENT FOR LEARNING IN SOCIAL SCIENCES</p>	<p style="text-align: center;">ASSESSMENT FOR LEARNING IN SOCIAL SCIENCES</p> <p>Characteristics of Assessment in Social Sciences: Types of questions best suited for examining/assessing/understanding the different aspect of Social Sciences; Questions for testing quantitative skills, Questions for testing qualitative analysis; Open-ended questions .Open-book tests: Strengths and limitations, Evaluating answers: What to look for? Assessing projects: What to look for? Continuous and Comprehensive Evaluation (CCE) in Social Sciences.</p>	<p style="text-align: center;">8</p>
<p>UNIT XI: ANALYSIS OF SOCIAL SCIENCES</p>	<p style="text-align: center;">ANALYSIS OF SOCIAL SCIENCES TEXT BOOKS AND QUESTION PAPERS</p> <p>Analysing textbooks in Social Sciences in the light of the syllabus and from the perspective of the child (Textbooks of the same class may be taken up for all subjects in Social Sciences)</p> <p>Analysing question papers of any State Board/CBSE and NCERT's textbooks in the light of the subject specific requirements in terms of understanding and skills.</p> <p>•</p>	<p style="text-align: center;">8</p>
<p>UNIT X: INTER-DISCIPLINARITY THROUGH PROJECTS AND FIELD VISITS</p>	<p style="text-align: center;">INTER-DISCIPLINARITY THROUGH PROJECTS AND FIELD VISITS</p> <ul style="list-style-type: none"> ➤ Projects in Social Sciences should be selected keeping in view the interconnections between the various disciplines that constitute Social Sciences. The interrelationship among various aspect of Social Sciences may be visualised as follows: ➤ Geography and Economics: Transport and communication in a region – assessing current position with reference to development needs ➤ History and Political Science: Socio-political systems; Women's rights in society Economics and History: Agrarian change in India; Industrialisation in India ➤ History and Geography: Migration of people in a particular region— nature of migration, past and present trends Political Science and Geography: Sharing resources between regions/states and nations (e.g. water) ➤ Economics and Political Science: Family budget and impact of change in prices of essential commodities. ➤ These projects are just a few examples. Similar projects may be designed by student- teachers for better understanding of various issues. 	<p style="text-align: center;">8</p>

PART C: LEARNING RESOURCES (BOOKS RECOMMENDED)		
AUTHOR	TITLE	PUBLISHER
Bining & Bining	: Teaching of Social studies in the Secondary School,	McGraw Hill Book Co. New York..
James Fleming	The Teaching of Social studies in Secondary school,	Longman, Green & Co. London,
Sharde B.P. & Sharma, J.C.:	: Teaching of Geography.	Oxford, Pergamon Press.
Hall David :	Geography and Geography Teacher	London, OUP.
NCERT :	Teaching of History	New Delhi
Pandey, K.P. :	Artha Shastra Shikshan.	
Tiwari, G.S	..Artha Shastra Shikshan.	.
Awasthi, P.P.	Nagrik Shastra Shikshan Vidhi.	.
Desia, D.M. and	. : : Evaluation in Social studies, DEPSE, Ministry of Education	New Delhi.
Mehta, T.S	: G ovt. of India	.New Delhi.
Malayya, M	.Social Sciences,	Asia Publishing House, Bombay
Taneja, V.R.	Fundamentals of Teaching Social Studies,	Mohndra
	..:	
	:	
SUGGESTED DIGITAL PLATFORM		
	N List National library & Information Service (subscribe) (Shodh Sindhu)	
	NDL National Digital Library Central Govt. Ministry of Education (Devlop by Khadgpur.)	


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PART-A INTRODUCTION			
PROGRAM: B.ED. SYLLABUS	CLASS: (SEMESTER III)	YEAR: 2022	SESSION: 2022-24
SUBJECT	PEDAGOGY OF MATHEMATICS		
1.	PROGRAM CODE	0801	
2.	COURSE CODE	BED. 301 D	
3.	COURSE TITLE	B.Ed. SEMESTER III	
4.	COURSE LEARNING OUTCOME	<ul style="list-style-type: none"> • Develop insight into the meaning, nature, scope and objective of mathematics education; • Appreciate mathematics as a tool to engage the mind of every student; • Channelize, evaluate, explain and reconstruct their thinking; • See mathematics as something to talk about, to communicate through, to discuss among themselves, to work together on; • Pose and solve meaningful problems; • Construct appropriate assessment tools for evaluating mathematics learning; • Develop ability to use the concepts for life skills; • Stimulate curiosity, creativity and inventiveness in mathematics; • Develop competencies for teaching-learning mathematics through various measures • Examine the language of mathematics, engaging with research on children's learning in specific areas. 	
5.	CREDIT VALUE	4	
6.	TOTAL MARKS	MAXIMUM MARKS: 100	INTERNAL :20
			EXTERNAL:80

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PART B- CONTENT OF COURSE		
UNIT	TOPICS	NUMBER OF LECTURES
UNIT VI : PLANNING FOR TEACHING-LEARNING MATHEMATICS	<p>PLANNING FOR TEACHING-LEARNING MATHEMATICS Organisation of concepts for teaching-learning of mathematics. Stating instructional objectives, identifying learning experiences, appropriate strategies, teaching aids (Using low-cost material – preparation of various activities, such as verification of algebraic identities, surface areas and volumes of cube, cuboids, cylinder, cone, sphere, conic sections, etc.); ICT applications; Evaluation tools and learners participation in developing instructional materials, etc.</p>	6
UNIT VII: LEARNING RESOURCES IN MATHEMATICS	<p>LEARNING RESOURCES IN MATHEMATICS Textbooks audio-visual multimedia–Selection and designing; Using community resources for mathematics learning, pooling of learning resources in school complex/block/district level, handling hurdles in utilising resources.</p>	6
UNIT VIII: ASSESSMENT AND EVALUATION	<p>ASSESSMENT AND EVALUATION Informal Creative Evaluation: Encouraging learner to examine a variety of methods of assessment in mathematics so as to assess creativity, problem-solving and experimentation/activity performance; Appreciating evaluation through overall performance of the child; Self and peer evaluation. Formal Ways of Evaluation: Variety of assessment techniques and practices Assessing Product Vs Process, Knowing Vs Doing In practice of midterm/terminal examination, practising continuous and comprehensive evaluation to test regular programmes/achievements of learner. Assessment Framework: Identifying and organising components for developing framework of question paper at different stages of learning; Framing questions based on concepts and sub concepts so as to encourage critical thinking, promote logical reasoning and to discourage mechanical manipulation and rote learning; Framing of open-ended questions providing the scope to learners to give responses in their own words; Framing of conceptual questions from simple questions.</p>	8

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UNIT IX: MATHEMATICS FOR ALL	MATHEMATICS FOR ALL Identifying learners strength and weaknesses; Activities enriching mathematics learning – assisting learning, supplementary text material, summer programmes, correspondence course, mathematics club, contests and fairs, designing mathematics laboratory and its effective use, recreational activities—games, puzzles and riddles in mathematics, cooperative learning ensuring equal partnership of learners with special needs, stimulating creativity and inventiveness in mathematics.	8
UNIT X: PROFESSIONAL DEVELOPMENT OF MATHEMATICS TEACHERS	PROFESSIONAL DEVELOPMENT OF MATHEMATICS TEACHERS Types of in-service programme for mathematics teachers; Role of mathematics teacher's association; Journals and other resource materials in mathematics education; Professional growth— participation in conferences/seminars/workshops.	6

PART C: LEARNING RESOURCES (BOOKS RECOMMENDED)

AUTHOR	TITLE	PUBLISHER
S.K.Arora Bhimani	Howtoteachmathematics	ShantiPublisher's1998
Capeland	Howchildrenlearn mathematics	(NewYork):M.C.Millan Pub.1979,
W.R.Fuch	Mathematicsformodernmind	(NewYork):M.C.MillanPub.1967.
J.N.Kapoor	VidyalayaGanit keliye sauprayog-	(NewDelhi):AryabookDepot1968
W.B.Saunders	Howtoteachmathematicsin secondaryschool-	(Company)1967
J.N.Kapoor	Thespiritof mathematics	(NewDelhi):AryabookDepot1964
Ashok Jhunjhunwala	IndianMathematics-	(NewDelhi)WileyEastern Ltd.1993
R.C.Sexena	Curriculumandteachingofmathematicsinsecondary school	NCERT1970.
N.K.Ayengar	Theteaching of mathematics in the nNw Education -	
S.K.Arora	How to teach mathematics-	(Bhimani):ShantiPublisher's1998
Dr.S.K.Mangal	Teaching of mathematics (Hindi/English)	Agra publication
Dr.A.B.Bhatnagar	Teaching of mathematics (Hindi/English)	Agra publication

SUGGESTED DIGITAL PLATFORM

N List National library & Information Service (subscribe) (Shodh Sindhu)

NDL National Digital Library Central Govt. Ministry of Education (Devlop by Khadgpur.)

PART-A INTRODUCTION			
PROGRAM: B.ED. SYLLABUS	CLASS: (SEMESTER III)	YEAR: 2022	SESSION: 2022-24
SUBJECT		PEDAGOGY OF BIOLOGICAL SCIENCE	
1.	PROGRAM CODE	0801	
2.	COURSE CODE	BED. 301E	
3.	COURSE TITLE	B.Ed. SEMESTER III	
4.	COURSE LEARNING OUTCOME	<ul style="list-style-type: none"> • It develop insight on the meaning and nature of biological science for determining aims and strategies of teaching-learning; • Explore the process skill in science and role of laboratory in teaching-learning; • Integrate the biological science knowledge with other school subjects; • Analyse the contents of biological science with respect to its branches, process skills, knowledge organization and other critical issues; • Explore different ways of creating learning situations for different concepts of biological science; • Construct appropriate assessment tools for evaluating learning of biological science; 	
5.	CREDIT VALUE	4	
6.	TOTAL MARKS	MAXIMUM MARKS: 100	INTERNAL :20
			EXTERNAL:80

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PART B- CONTENT OF COURSE		
UNIT	TOPICS	NUMBER OF LECTURES
UNIT VI: PLANNING FOR TEACHING-LEARNING OF BIOLOGICAL SCIENCE	PLANNING FOR TEACHING-LEARNING OF BIOLOGICAL SCIENCE Identification and organisation of concepts for teaching-learning of biology; Determining acceptable evidences that show learners, understanding; Instructional materials required for planning teaching-learning of biological science and learners' participation in developing them; Identifying and designing teaching-learning experiences; Planning field visits, Zoo, Sea shore life, Botanical garden, etc.;; Organising activities, laboratory experiences, making groups, planning ICT applications in learning biology.	6
UNIT VII: LEARNING RESOURCES IN BIOLOGICAL SCIENCE	LEARNING RESOURCES IN BIOLOGICAL SCIENCE Identification and use of learning resources in biological science from immediate environmental, exploring alternative sources; Developing science kit and biological science laboratory; Designing biology laboratory; Planning and organising field observation; Collection of materials, etc.; Textbooks, audio-visual materials, multimedia-selection and designing; Use of ICT experiences in learning biological science; Using community resources for biology learning; Pooling of learning resources in school complex/block/district level; Handling hurdles in utilisation of resources.	6
UNIT VIII: TOOLS AND TECHNIQUES OF ASSESSMENT	TOOLS AND TECHNIQUES OF ASSESSMENT FOR LEARNING BIOLOGICAL SCIENCE Performance-based assessment; Developing indicators for performance assessment in biological sciences; Learners record of observations; Field diary, herbarium and collection of materials; Oral presentation of learners work in biological science, Portfolio; Assessment of project work in biology (both in the laboratory and in the field), Assessment of participation in collaborative learning; Construction of test items (open-ended and structured) in biological science and administration of tests; Developing assessment framework in biological science; Assessment of experimental work in biological science; Exploring content areas in biological science not assessed in formal examination system and their evaluation through various curricular channels; Encouraging teacher-learners to	8

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	examine a variety of methods of assessments in biological science; Continuous and comprehensive evaluation.	
UNIT IX: BIOLOGICAL SCIENCE – LIFELONG LEARNING	<p>BIOLOGICAL SCIENCE – LIFELONG LEARNING</p> <p>Nurturing natural curiosity of observation and drawing conclusion; Facilitating learning progress of learners with various needs in biology; Ensuring equal partnership of learners with special needs; Stimulating creativity and inventiveness in biology; Organising various curricular activities, such as debate, discussion, drama, poster making on issues related to science/biology; Organising events on specific day, such as Earth Day, Environment Day, etc.;</p> <p>Planning and organising field experiences, Science club, Science exhibition; Nurturing creative talent at local level and exploring linkage with district/state/central agencies.</p>	8
UNIT X: PROFESSIONAL DEVELOPMENT	<p>PROFESSIONAL DEVELOPMENT OF BIOLOGY TEACHER</p> <p>Professional development programmes for science/biology teachers; Participation in seminar, conferences, online sharing membership of professional organisation; Teachers as a community of learners; Collaboration of school with colleges, universities and other institutions; Journals and other resource materials in biology education; Role of reflective practices in professional development of biology teachers; Field visits, visit to botanical garden, science park, science centre, zoo, National Laboratories etc.; Teacher as a researcher: Learning to understand how children learn science– action research in biological science.</p>	8

A collection of handwritten signatures and initials in blue ink, including names like Nisha, Meera, and Sumanjyoti, along with various scribbles and initials.

PART C: LEARNING RESOURCES (BOOKS RECOMMENDED)		
AUTHOR	TITLE	PUBLISHER
Sarup	Modern Methods of Teaching Biology. Teaching Series	Sarup & Sons, New Delhi.
Bhaskara Rao, D(2000):	Teaching of Biology,	(Nagarjuna Publishers, G4.
Moha, Radha(2004):	Innovative Science Teaching,	(Prentice Hall of India, New Delhi
Unesco Source	New Unesco Source Book for Science Teaching	(1978), Oxford & IBH, New Delhi.
Sharma, R.C. & Shukla C.S.(2002):	Modern Science Teaching,.	Dhanpat Rai, Publishing Company, New Delhi
Sood, K.J. (1989):	New Directions in Science Teaching,	Kohli Publishers, Chandigarh
Vaidya, N(1996):	Science Teaching for the 21st Century	Deep & Deep Publications, New Delhi.
Gupta S.K.(1983):	Technology of Science Education,	Vikas Publishing House Pvt Ltd, Delhi
Chikara, M.S. and S.Sarma(1985)	www.wikipedia.com: Teaching of Biology,	Prakash Brothers, Ludhiana unter
S.K. Mangal:	Teaching of Biological Science.	
Dr. Shoti Shivendra Chandra	Contemporary Science Teaching.	
SUGGESTED DIGITAL PLATFORM		
	N List National library & Information Service (subscribe) (Shodh Sindhu)	
	NDL National Digital Library Central Govt. Ministry of Education (Devlop by Khadgpur.)	

PART-A INTRODUCTION			
PROGRAM: B.ED. SYLLABUS	CLASS: (SEMESTER III)	YEAR: 2022	SESSION: 2022-24
SUBJECT		PEDAGOGY OF PHYSICAL SCIENCE	
1.	PROGRAM CODE	0801	
2.	COURSE CODE	BED. 301 F	
3.	COURSE TITLE	B.Ed. SEMESTER III	
4.	COURSE LEARNING OUTCOME	<ul style="list-style-type: none"> • Understand the process of science and role of laboratory in teaching-learning situations; • Use effectively different activities /demonstrations/ laboratory experiences for teaching-learning of physical science; • Integrate in physical science knowledge with other school subjects; • Analyse the contents of physical science with respect to its branches, process skills, knowledge organization and other critical issues; • Develop process-oriented objectives based on the content themes/ units; • Examine different pedagogical issues in learning physical science; and • Construct appropriate assessment tools for evaluating learning of physical science. 	
5.	CREDIT VALUE	4	
6.	TOTAL MARKS	MAXIMUM MARKS: 100	INTERNAL :20
			EXTERNAL:80
PART B- CONTENT OF COURSE			
UNIT	TOPICS		NUMBER OF LECTURES
UNIT VI: LEARNING RESOURCES IN PHYSICAL SCIENCE	<p>LEARNING RESOURCES IN PHYSICAL SCIENCE</p> <p>Identification and use of learning resources in physical science from immediate environment (e.g. Natural pH Indicators, Soaps and Detergents, Baking Soda, Washing Soda, Common Salts, Fruits, Fibre, Pulleys, Projectiles, Lenses and Mirrors, Interconversion of one Form of Energy to other, Propagation of waves in Solid, Liquid and Gas etc.),</p> <p>exploring alternative sources; Improvisation of apparatus developing science kit and laboratory in science (secondary stage), physics and chemistry (higher secondary stage);</p> <p>Designing laboratories, textbooks, audio-visual materials; Multimedia-</p>		6

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	<p>selection and designing;</p> <p>Use of ICT experiences in learning science/physics and chemistry; Using community resources for learning science/physics and chemistry;</p> <p>Pooling of learning resources in school complex/block/district level, handling hurdles in utilisation of resources.</p>	
<p>UNIT VII: TOOLS AND TECHNIQUES OF ASSESSMENT</p>	<p>TOOLS AND TECHNIQUES OF ASSESSMENT FOR LEARNING PHYSICAL SCIENCE</p> <p>Performance-based assessment, developing indicators for performance-based assessment in science/physical science, learners' records of observations, field diary; Oral presentation of learners work, Portfolio; Assessment of project work in science/physical science; Assessment of participation in collaborative learning; Construction of test items in science/physical science and administration of tests; Developing assessment framework in science/physics and chemistry; Assessment of experimental work in science/physics and chemistry; Exploring content areas in physical science not assessed in formal examination system and their evaluation through various curricular channels; Encouraging teacher- learners to examine variety of methods of assessments in science/ physical science; Continuous and comprehensive evaluation–appreciating evaluation as ongoing teaching- learning process and through overall performance of child.</p>	8
<p>UNIT VIII: PLANNING FOR TEACHING-LEARNING</p>	<p>PLANNING FOR TEACHING-LEARNING OF PHYSICAL SCIENCE</p> <p>Identification and organisation of concepts for teaching-learning of science/ physics and chemistry (on different topics, such as Motion, Work and Energy, Matter and their Measurements, Carbon and its Compounds, Periodic Properties of Elements, Atomic Structure, Dual Nature of Matter and Radiation, etc.) developing them; Identifying and designing teaching-learning experiences; Organising activities, laboratory experiences, making groups; Planning ICT applications in learning science/physics and chemistry</p>	6
<p>UNIT IX: PHYSICAL SCIENCE- LIFELONG LEARNING</p>	<p>PHYSICAL SCIENCE–LIFELONG LEARNING</p> <p>Every child has natural curiosity of observation and drawing conclusion; Identification and application of physical and chemical phenomenon in day-to-day life and human welfare, facilitating learning progress of learners with various needs in science/physics and chemistry; Ensuring equal partnership of learners with special needs; Stimulating creativity and inventiveness in science; Organising various curricular activities, such as debate, discussion, drama, poster</p>	6

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	making on issues related to science/ physics and chemistry; Organising events on specific day, such as Science Day, Environment Day, etc.; Planning and organising field experiences , Science club, Science exhibition, nurturing creative talent at local level and exploring linkage with district/state/central agencies.	
UNIT X: PROFESSIONAL DEVELOPMENT	<p>PROFESSIONAL DEVELOPMENT OF SCIENCE/ PHYSICS/ CHEMISTRY TEACHERS</p> <p>Professional development programmes for science/physics and chemistry teachers; Participation in seminar, conferences, online sharing, membership of professional organisations; Teachers as a community of learners, collaboration of schools with universities; Journals and other resource materials in science/physical science education; Role of reflective practices in professional development of physics and chemistry teachers; Field visit to industries, mines, refineries; National Laboratories, power stations, science centres; etc.; Teacher as a researcher: Learning to understand how children learn science— action research in physical science.</p>	6

PART C: LEARNING RESOURCES (BOOKS RECOMMENDED)

AUTHOR	TITLE	PUBLISHER
UNESCO	New UNESCO Source Book for Science Teaching	(1978), Oxford & IBH, New Delhi..
Sharma, R.C. & Shukla C.S.(2002):	Modern Science Teaching, i.	Dhanpat Rai, Publishing Company, New Delh
Sood, K.J. (1989):	New Directions in Science Teaching,	Kohli Publishers, Chandigarh
Vaidya, N (1996):	Science Teaching for the 21st Century	Deep & Deep Publications, New Delhi.
Gupta S.K. (1983):	Technology of Science Education,	Vikas Publishing House Pvt Ltd, Delhi
Chikara, M.S. and S. Sarma (1985):	www.wikipedia.com Teaching of Biology,	Prakash Brothers, Ludhiana unter
Dr. Shoti Shivendra Chandra	: Contemporary Science Teaching.	, New Delhi.
R.A. Yadav, Siidiqui:	Teaching of Science.	Delhi
NCERT	All NCERT Science Text Books from class IX to XII.	New Delhi
UNESCO	New UNESCO Source Book for Science Teaching.	(1978), Oxford & IBH, New Delhi
Sharma, R.C. & Shukla C.S. (2002)	Modern Science Teaching,	Dhanpat Rai, Publishing Company, New Delhi.

SUGGESTED DIGITAL PLATFORM

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PART-A INTRODUCTION			
PROGRAM: B.ED. SYLLABUS	CLASS: (SEMESTER III)	YEAR: 2022	SESSION: 2022-24
SUBJECT		NAI TALIM: Skill Based Learning	
1.	PROGRAM CODE	0801	
2.	COURSE CODE	BED. 302	
3.	COURSE TITLE	B.Ed. SEMESTER III	
4.	COURSE LEARNING OUTCOME	<ul style="list-style-type: none"> • Know the school education programs and policies which have local community engagement aspects. • Learn the process of connecting the text with the Child/learner within the local Context • Distinguish traditional from constructivist approaches of local community engagement • Train in usage of dialogic method of community engagement • Train in usage of organic intellectual approach for local community engagement • Experiential learning of best practices in community engagement • Participate effectively in the local community service • Develop insights and field realities on indignity and indigenous models. • Understand and practice models of Tagore, Gandhi, Shyama Prasad Mukkherji for rural reconstruction • Explore models of art, craft for entrepreneurship for self-reliance. 	
5.	CREDIT VALUE	4	
6.	TOTAL MARKS	MAXIMUM MARKS: 100	INTERNAL :20
			EXTERNAL:80
PART B- CONTENT OF COURSE			
UNIT	TOPICS		NUMBER OF LECTURES
Unit I Teacher Autonomy and Accountability	Meaning of Autonomy <ul style="list-style-type: none"> • Freedom vs. Autonomy Teacher Autonomy <ul style="list-style-type: none"> • Characteristics of Teacher Autonomy • Domains of Teacher Autonomy • Arguments for Teacher Autonomy • Factors Affecting Teacher Autonomy • Ways to Develop Teacher Autonomy • How Does Teacher Autonomy Help in Enriching Learning Situations Meaning of Accountability <ul style="list-style-type: none"> • Meaning of Accountability • Types and Functions of Accountability Do Autonomy and Accountability Go Together?		8

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Unit II Process and Modes of Education	<ul style="list-style-type: none"> • Education as an Activity or Process • Process of Education • Modes of Education: Informal, Formal, Non-formal, Face to Face and Distance Education • Inclusiveness of School Education • Need of School for all Children 	8
Unit III Nai Talim and Personality Development	<ul style="list-style-type: none"> • Humanistic Approach to Education- Education for Citizenship, Character building Values and Ethics • Work, Play, Act, Craft, Theater, Music in School Curriculum and the Basis of creativity and social harmony. Its implication to development of Head, Heart and Hands • Context, Concern and Issues- Child work Vs Child Labor Education and alienation 	8
Unit IV Reflection in Curriculum and Pedagogical Practices	<ul style="list-style-type: none"> • Relevance of curriculum content to the lives of Children. • Sensitization of student on global issues i.e., resource and technology availability, Inequity, Poverty, Climate Change, Global Warming, Value Crisis, Food and Energy Crisis. • Education in nonviolent school/classroom environment, Implication of above Issues on curriculum and pedagogy. 	6
Unit V Nai Talim and Field Engagement	<ul style="list-style-type: none"> • Community Service and its implication • National Integration through Nai Talim • Nai Talim & Value Education • Disaster Management <p>Practicum</p> <ul style="list-style-type: none"> • Field Trip 	6

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PART C: LEARNING RESOURCES (BOOKS RECOMMENDED)		
AUTHOR	TITLE	PUBLISHER
. Ministry of Education, GOI. 1949	<i>Report of the University Education Commission</i>	(1948-49), New Delhi.
	, <i>Report of the Secondary Education Commission</i>	(1952-53), New Delhi.
	, <i>Report of the Secondary Education Commission</i>	(1964-66), New Delhi
	: <i>Report of the Secondary Education Commission</i>	(1983-84), New Delhi
MHRD, GOI	<i>National Policy on Education,</i>	(1986)New Delhi.
NCERT. 2005.	<i>National Curriculum Framework-Report of the Focus Group on Aims of Education,</i>	New Delhi
Dewey, John. 2010.	<i>Essays in Experimental Logic,</i> Aakar Books,	NewDelhi.
Russell, Bertrand. 2003.	: <i>Human Knowledge.</i> Routledge,	London
: Swami Satprakashananda. 1995	<i>Methods of Knowledge according to Advaita</i>	
<i>Vedanta. Advaita</i>	Ashrama(Publication Department),	Calcutta.
NCERT	National Council of Educational Research and Training	, New Delhi.
Locke, John. 1690.	<i>An Essay Concerning Human Understanding.</i>	
Lewis, C.L. 1929.	<i>Mind and the World-order.</i> Dover Publications Inc.,	New York.
. Ministry of Education, GOI. 1949	<i>Report of the University Education Commission</i>	(1948-49), New Delhi.
SUGGESTED DIGITAL PLATFORM		
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PART-A INTRODUCTION			
PROGRAM: B.ED. SYLLABUS	CLASS: (SEMESTER III)	YEAR: 2022	SESSION: 2022-24
SUBJECT		PRACTICAL	
1.	PROGRAM CODE	0801	
2.	COURSE CODE	BED. 303 A & B	
3.	COURSE TITLE	B.Ed. SEMESTER III	
4.	COURSE LEARNING OUTCOME	<ul style="list-style-type: none"> • Student should be able to understand, how to use the different skill. • Teaching Materials & Teaching Aids their combination with skills in actual condition. • Types of teaching skills and their practical aspects in school condition. • Practice of using Teaching skills in actual different teaching condition. • How to select effective Teaching skills. • School experiences and their uses in actual condition. 	
5.	CREDIT VALUE	16	
6.	TOTAL MARKS	MAXIMUM MARKS: (A) 100. (B) 50	INTERNAL : (A) 100. (B) 50
			EXTERNAL: Nil
PART B- CONTENT OF COURSE			
Work	TOPICS		NUMBER OF LECTURES
Internship(16 weeks) school experience 303 A (12 credit)	*Internship(16weeks) Student teacher practices in their selective pedagogy. (During Annual Teaching Viva voce Practical Exam it is compulsory to produce all teaching related work from Semester I to III.) *15 Lesson plan (5 each from Middle and High School) including 05 lesson plan is compulsory from the Nai Talim format). (10 Lesson Plan+5 Nai Talim=15) Note: Format has been given at the end of the syllabus.		

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Reflective diary and supervisors assessment 303 B (4credit)	Reflective diary and supervisor's assessment.		
AUTHOR	TITLE	PUBLISHER	
NCERT	All NCERT Science Text Books from class IXtoXII.	New Delhi	
NCERT	All NCERT Maths Text Books from class IXtoXII.	New Delhi	
NCERT	All NCERT Hindi Text Books from class IXtoXII.	New Delhi	
NCERT	All NCERT English Text Books from class IXtoXII.	New Delhi	
NCERT	All NCERT Social Science Text Books from class IXtoXII.	New Delhi	
CG Board	All text book of class of X	CG	
CG Board	All text book of class of IX	CG	
CG Board	All text book of class of VIII	CG	
CG Board	All text book of class of VII	CG	
CG Board	All text book of class of VI	CG	
SUGGESTED DIGITAL PLATFORM			
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	NDL National Digital Library Central Govt. Ministry of Education (Devlop by Khadgpur.)		

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
Second year	PHY-3T	Thermal Physics and Statistical Mechanics	Theory	4	50	17
	PHY-4T	Waves and Optics	Theory	4	50	17
	PHY-2P	LAB 2: Thermal Physics, Statistical Mechanics, Waves and Optics	Practical	2	50	17
Third year	PHY-5T	Digital and Analog Circuits and Instruments	Theory	4	50	17
	PHY-6T	Elements of Modern Physics	Theory	4	50	17
	PHY-3P	LAB 3: Digital and Analog Circuits and Instruments, Modern Physics	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: Degree Course		Class: B.Sc.	Year: Third Year
		Session: 2024-25	
1	Course Code	PHY- 5T	
2	Course Title	Digital, Analogue Circuits and Instrumentation	
3	Course Type	Theory	
4	Pre-requisite (if any)	Passed B.Sc. II	
5	Course Learning Outcomes (CLO)	<p>At the end of this course, the students will be able to:</p> <ul style="list-style-type: none"> • Understand the basic principles and industrial applications of semiconductor diode, Zener diode and transistor • Understand the construction working and applications of transistor • Gain the knowledge of analogue and digital circuits • Understand the construction and working principles of various instruments that are used in the physics laboratory • Develop interest in electronic components 	
6	Credit Value	Theory :4	
7	Total Marks	Max. Marks: 50	Min. Passing Marks: 17

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Part B: Content of the Course		
Total No. of Lectures: 60		
Unit	Topics	No. of Lectures
1	Semiconductor Devices and Amplifiers: Semiconductor Diodes: p and n type semiconductors. Barrier Formation in PN Junction Diode. Qualitative Idea of Current Flow Mechanism in Forward and Reverse Biased Diode, PN junction and its characteristics, Principle and structure of (1) LEDs (2) Photodiode (3) Solar Cell.	12
2	Power Supply: Half-wave Rectifier, Central-tapped and Bridge Full-wave Rectifiers, Calculation of Ripple Factor and Rectification Efficiency, Basic idea about capacitor filter, L-section filter and π -section filter, Zener diode as voltage regulator. Bipolar Junction transistors: n-p-n and p-n-p Transistors. Characteristics of CB, CE and CC Configurations. Active, Cutoff, and Saturation Regions. Current gains α , β and γ . Relations between α , β and γ . Load Line analysis of Transistors. DC Load line and Q-point. Classification of Amplifiers: Class A, B, and C	12
3	Voltage Divider Bias Circuit for CE Amplifier. h-parameter Equivalent Circuit. Analysis of a single-stage CE amplifier using Hybrid Model. Input and Output impedance. Current, Voltage and Power Gains. Operational Amplifiers (Black Box approach): Characteristics of an Ideal and Practical Op-Amp (IC 741), Open-loop & Closed-loop Gain. CMRR, concept of Virtual ground. Applications of Op-Amps: (1) Inverting and Non-inverting Amplifiers (2) Adder (3) Subtractor (4) Differentiator (5) Integrator, (6) Zero Crossing Detector.	12
4	Sinusoidal Oscillator: Barkhausen's criterion for Self-sustained oscillations, Determination frequency of RC oscillator. Wein Bridge Oscillator, Hartley oscillator and Phase shift oscillator Introduction to CRO: Block diagram, construction and working of CRO, Applications of CRO in (i) study of waveform (ii) measurement of voltage, current, frequency and phase difference,	12
5	Digital Circuits Difference between Analog and Digital Circuits. Binary Numbers. Decimal to Binary and Binary to Decimal Conversion, AND, OR and NOT Gates (Realization using Diodes and Transistor). NAND and NOR Gates as Universal Gates. XOR and XNOR Gates. De Morgan's Theorems. Boolean Laws. Simplification of Logic Circuit using Boolean Algebra. Fundamental Products. Minterms and Maxterms. Conversion of a Truth Table into an Equivalent Logic Circuit by (1) Sum of Products Method and (2) Karnaugh Map. Binary Addition. Binary Subtraction using 2's Complement Method). Half Adders and Full Adders and Subtractors, 4-bit binary Adder-Subtractor.	12

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Part C: Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

- Integrated Electronics, J. Millman and C.C. Halkias, 1991, Tata Mc-Graw Hill.
- Electronic devices and circuits, S. Salivahanan and N. Suresh Kumar, 2012, Tata Mc-Graw Hill.
- Microelectronic Circuits, M.H. Rashid, 2nd Edn.,2011, Cengage Learning.
- Modern Electronic Instrumentation & Measurement Tech., Helfrick&Cooper,1990, PHI Learning
- Digital Principles & Applications, A.P. Malvino, D.P. Leach & Saha, 7th Ed.,2011, Tata McGraw Hill
- Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, 2014, 6th Edn., Oxford University Press.
- Fundamentals of Digital Circuits, A. Anand Kumar, 2nd Edition, 2009, PHI Learning Pvt. Ltd.
- OP-AMP and Linear Digital Circuits, R.A. Gayakwad, 2000, PHI Learning Pvt. Ltd.
- **e-resources:**
 1. <https://www.quora.com>
 2. <https://www.allaboutcircuit.com>
 3. <https://www.wileyindia.com>
 4. <https://www.instrumentationtools.com>
 5. <https://www.ibiblio.com>
 6. <https://www.easyengineering.net>
 7. <https://www.elsevier.com>

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Method:

Maximum Marks: 50

Continuous Comprehensive Evaluation(CCE): Not Applicable

University Exam. (UE): 50 Marks

Internal Assessment: Max. Marks: 10

Class Test/Assignment/Presentation (Proposed)

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

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- 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

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- Member

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- 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

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- Member

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- Member

17/ Dr. Vikas Gulhare, Govt. G.N.A. P.G. College, Bhatapara

- Member

8.6.22
S.K.R.

Part A :Introduction			
Program: Degree Course		Class: B.Sc. III year	Year: 2024 <i>Third Year</i>
1	Course Code	PHY- 6T	
2	Course Title	ELEMENTS OF MODERN PHYSICS	
3	Course Type	Theory	
4	Pre-requisite (if any)	B.Sc. II	
5	Course Learning Outcomes (CLO)	<p>At the end of this course, the students will be able to:</p> <ul style="list-style-type: none"> • Gain of advanced theoretical and experimental method including the use of numerical method • Understand the basic postulates of quantum mechanics • Gain knowledge about physical quantities as operators • Understand the Schrodinger equation and its applications • Gain knowledge about structure of nucleus, nuclear fission and fusion and be familiar of nuclear energy 	
6	Credit Value	Theory :4	
7	Total Marks	Max. Marks: 50	Min. Passing Marks: 17

Signature

Part B: Content of the Course		
Total No. of Lectures: 60		
Unit	Topics	No. of Lectures
1	Planck's quantum theory, Planck's constant and light as a collection of photons; Photo-electric effect and Compton scattering. De Broglie wavelength and matter waves; Davisson Germer experiment. Problems with Rutherford model- instability of atoms and observation of discrete atomic spectra; Bohr's quantization rule and atomic stability; calculation of energy levels for hydrogen like atoms and their spectra.	12
2	Position measurement- gamma ray microscope thought experiment; Wave-particle duality, Heisenberg uncertainty principle- impossibility of a particle following a trajectory; Estimating minimum energy of a confined particle using uncertainty principle; Energy-time uncertainty principle, Two slit interference experiment with photons, atoms and particles; linear superposition principle as a consequence	12
3	Matter waves and wave function; probabilistic interpretation of wave function, Probability and probability current densities in one dimension. Normalization of wave function, Expectation value of dynamical variables, Operators: Position, Momentum and Energy operators; stationary states; probabilities and normalization; Schrodinger equation for non-relativistic particles;	12
4	One dimensional infinitely rigid box- energy eigenvalues and eigen function, Quantum dot; Quantum mechanical scattering and tunneling in one dimension - across a step potential and across a rectangular potential barrier. Schrodinger equation in spherical polar co-ordinates, spherical symmetric potential, energy states of hydrogen using Schrodinger equation	12
5	Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an electron being in the nucleus as a consequence of the uncertainty principle. Nature of nuclear force, NZ graph, semi-empirical mass formula and binding energy. Radioactivity: stability of nucleus; Law of radioactive decay; Mean life & half-life; α - decay; β -decay, energy released, spectrum and Pauli's prediction of neutrino; γ -ray emission. Fission and fusion - mass deficit, relativity and generation of energy; Fission - nature of fragments and emission of neutrons. Nuclear reactor: slow neutrons interacting with Uranium 235; Fusion and thermonuclear reactions.	12

Part C: Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

- Concepts of Modern Physics, Arthur Beiser, 2009, McGraw-Hill
- Modern Physics, John R. Taylor, Chris D. Zafiratos, Michael A. Dubson, 2009, PHI Learning
- Six Ideas that Shaped Physics: Particle Behave like Waves, Thomas A. Moore, 2003, McGraw Hill
- Quantum Physics, Berkeley Physics Course Vol.4. E.H. Wichman, 2008, Tata McGraw-Hill Co.
- Modern Physics, R.A. Serway, C.J. Moses, and C.A. Moyer, 2005, Cengage Learning
- Modern Physics, G. Kaur and G.R. Pickrell, 2014, McGraw Hill
- e-Resources:
 1. <https://link.springer.com>
 2. <https://web.pdx.edu>
 3. <https://yooktal.in>
 4. <https://www.bookfobia.com.av>
 5. <https://www.nhbs.com>

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Method:

Maximum Marks: 50

Continuous Comprehensive Evaluation(CCE): Not Applicable

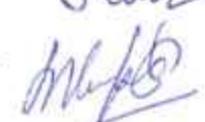
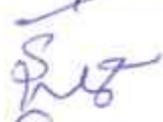
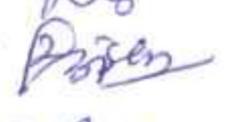
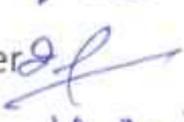
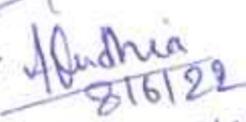
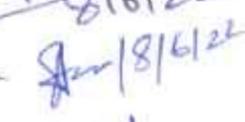
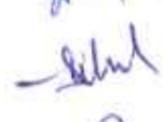
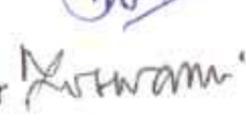
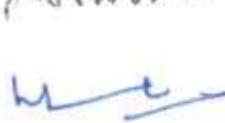
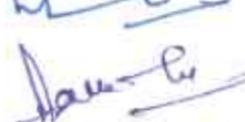
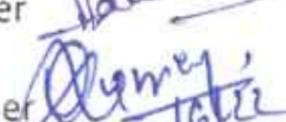
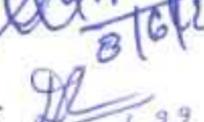
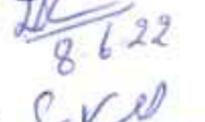
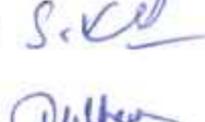
University Exam. (UE): 50 Marks

Internal Assessment: Max. Marks: 10

Class Test/Assignment/Presentation (Proposed)

DECLARATION

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

Part A :Introduction			
Program: Degree Course		Class: B.Sc. III year	Year: 2024 <i>Third Year</i>
1	Course Code	PHY- 3 P	
2	Course Title	LAB 3	
3	Course Type	Practical	
4	Pre-requisite (if any)	NO	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: <ul style="list-style-type: none"> • Understand the working of semiconductor diode, LED, transistor, and their characteristics • Understand the working of rectifier, filter, regulator etc. • Understand the function of Zener diode as voltage regulator • Gain knowledge about amplifier and logic gates, 	
6	Credit Value	Practical : 2	
7	Total Marks	Max. Marks: 50	Min. Passing Marks: 17



Part B: Content of the Course

Total No. of Lectures: 60

Experiments

At least 12 experiments from the following or other experiments of equal standards

1. To study IV characteristics of p n junction diode, Zener diode and LED
2. To study the characteristics of p n p and n p n transistor in CE configuration
3. To study the characteristics of p n p and n p n transistor in CB configuration
4. To study regulated power supply and determination of ripple factor and voltage regulation factor
5. To draw and study the frequency response curve of two stage RC coupled amplifier
6. To design and study the CE amplifier of a given gain using voltage divider biasing circuit
7. To measure voltage and frequency of a periodic waveform using a CRO
8. To design and study Wein Bridge Oscillator
9. To design and verify the truth table of AND, OR, NOT AND XOR gates
10. To determine Boltzmann constant using I-V characteristics of p n diode
11. To determine function of material of filament of directly heated vacuum diode valve
12. To determine Planck's constant using LEDs of at least four different colors
13. To determine ionization potential of mercury
14. To measure the susceptibility of paramagnetic solution (Quinke's method)
15. To draw the B-H curve of iron using a solenoid and determine the energy loss from hysteresis
16. To measure the resistivity of semiconductor (Ge) crystal with temperature by four probe method and to determine its band gap
17. To determine the Hall coefficient of a semiconductor sample
18. To study the photo electric effect by drawing photo current versus intensity curve and to determine the wavelength of light
19. To study the diffraction pattern of a single and double slit using laser source
20. To study Half adder, Full adder and 4-bit binary adder
21. Study of adder, subtractor using full adder IC
22. To minimize a given logic circuit

Part C: Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

- Basic Electronics- A Text Lab Manual, P.B. Zbar, A.P. Malvino, M. A. Miller, 1994, Tata Mc Graw Hill
- Electronics: Fundamentals and Applications, J. D. Ryder, 2004, Prentice Hall of India
- Electronic Principles, A.P. Malvino, 2008, Tata Mc Graw Hill
- Integrated Electronics, J. Millman and C.C. Halkias, 1991, Tata Mc-Graw Hill.
- Electronic devices and circuits, S. Salivahanan and N. Suresh Kumar, 2012, Tata Mc-Graw Hill.
- Microelectronic Circuits, M.H. Rashid, 2ndEdn., 2011, Cengage Learning.
- Modern Electronic Instrumentation & Measurement Tech., Helfrick&Cooper, 1990, PHI Learning
- Digital Principles & Applications, A.P. Malvino, D.P. Leach & Saha, 7th Ed., 2011, Tata McGraw Hill
- Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, 2014, 6th Edn., Oxford University Press.
- Fundamentals of Digital Circuits, A. Anand Kumar, 2nd Edition, 2009, PHI Learning Pvt. Ltd.
- OP-AMP and Linear Digital Circuits, R.A. Gayakwad, 2000, PHI Learning Pvt. Ltd.
- e-Resources:
<https://link.springer.com>
<https://web.pdx.edu>
<https://yooktal.in>
<https://www.bookfobia.com.av>
<https://www.nhbs.com>

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Method:

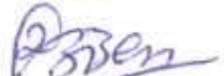
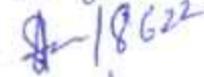
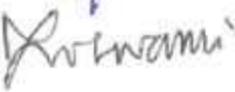
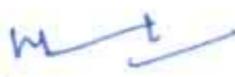
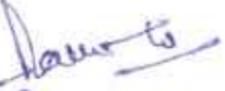
Maximum Marks: 50

Continuous Comprehensive Evaluation(CCE): Not Applicable

University Exam. (UE): 50 Marks

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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
Second year	CHEM-3T	Inorganic and Physical Chemistry	Theory	4	50	17
	CHEM-4T	Organic and Physical Chemistry	Theory	4	50	17
	CHEM-2P	LAB 2 : General Chemistry-2	Practical	2	50	17
Third year	CHEM-5T	Inorganic and Physical Chemistry	Theory	4	50	17
	CHEM-6T	Organic and Physical Chemistry	Theory	4	50	17
	CHEM-3P	LAB 3 : General Chemistry-3	Practical	2	50	17

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

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Part A: Introduction			
Program: Degree Course		Class: B.Sc. III Year	Year: 2024
		Session: 2024-2025	
1.	Course Code	CHEM-5T	
2.	Course Title	Inorganic & Physical Chemistry	
3.	Course Type	Core Course	
4.	Pre-requisite (if any)	To Study this course our students must have had the diploma in chemistry or equivalent	
5.	Course Learning Outcomes (CLO)	<p>At the end of this course, the students will be able to learn the following aspects of Chemistry :</p> <ul style="list-style-type: none"> • Metal-ligand bonding and stability of the metal complexes. • Spectroscopic and magnetic properties of transition metal complexes. • Fundamentals and catalytic and industrial applications of organometallic compounds. • Applications of bioinorganic chemistry, acid-base principles and inorganic polymers. • Fundamentals and applications of electromagnetic spectrum, microwave, infrared, Raman and electronic spectroscopy' • Basic concepts and theories of photochemistry and learn about the various aspects of its applications. • Problems and principles/concepts in electric, magnetic and optical properties of molecules. 	
6.	Credit Value	Theory: 4	
7.	Total Marks	Max. Marks: 50	Min Passing Marks: 17

Part B: Content of the Course		
Total No. of Lecturer (in hours per week):		Total Lecturer: 90
Unit	Topics	No. of Lectures
I	<p>Metal- Ligand Bonding in Transition Metal Complexes-Limitation of Crystal Field Theory, Tetragonal distortions from octahedral geometry, Jahn-Teller distortion, square planar geometry. Qualitative aspect of Ligand field and MO Theory, MO diagrams of representative coordination complexes of octahedral geometry.</p> <p>Thermodynamic and kinetic aspects of metal complexes. A brief outline of thermodynamic stability of metal complexes and factors affecting the stability. Substitution reactions of square planar complexes. Trans-effect, theories of trans-effect. Mechanism of substitution reactions of Square planar complexes.</p>	15
II	<p>Magnetic Properties of Transition Metal Complexes: Types of magnetic behavior, method of determining magnetic susceptibility by Gouy method, spin only formula, L-S coupling, correlation of μ_s (spin only) and μ_{eff}. Values, Orbital contribution to magnetic moments, Application of magnetic moment data for 3d metal complexes.</p> <p>Electronic spectra of Transition Metal Complexes: Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states, spectro-chemical series. Orgel-energy level diagram for d^1 and d^2 states,</p>	15

Acad

	Discussion of the Electronic spectrum of $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ complex ion.	
III	<p>Organometallic chemistry: Definition and classification of organometallic compounds based on nature of metal-carbon bond. Concept of hapticity of organic ligands. Structures of mononuclear and binuclear carbonyls of Cr, Mn, Fe, Co and Ni using VBT. π-acceptor behavior of CO (MO diagram of CO to be discussed), Zeise's salt: Preparation and structure of Metal carbonyls : 18 electron rule , Electron count of mononuclear, polynuclear and substituted metal carbonyls of 3d series. General methods of preparation (direct combination, reductive carbonylation, thermal and photochemical decomposition) of mono and binuclear carbonyls of 3d series.</p> <p>Catalysis by Organometallic Compounds—Study of the following industrial processes and their mechanism: Alkene hydrogenation (Wilkinson's Catalyst), Polymerization of ethane (Ziegler–Natta Catalyst)</p>	15
IV	<p>Bioinorganic chemistry: Classification of elements according to their action in biological system. Essential and trace elements in biological processes, carbonic anhydrase and carboxypeptidase. Excess and deficiency of some trace metals, Metal ions present in biological systems, Toxicity of some metal ions (Hg, Pb, Cd and As), metalloporphyrins with special reference to hemoglobin and myoglobin and their structure and biological functions. Biological role of alkaline earth metals with special reference to Ca^{2+} and Mg^{2+}, nitrogen fixation.</p> <p>Inorganic polymers: Types of inorganic polymers, comparison with organic polymers, synthesis, structural aspects and applications of silicones and siloxanes. Silicates, phosphazenes and polyphosphate</p>	15
V	<p>Spectroscopy-I Introduction: Characterization of Electromagnetic radiation, regions of the spectrum, interaction of radiation with matter, types of spectrums, types of spectroscopy studied in different regions of electromagnetic radiation. Born-Oppenheimer Approximation. Basic idea of instrumentation of simple photometer, atomic absorption and emission spectrophotometers.</p> <p>Photochemistry: Difference between thermal and photochemical processes. Laws of photochemistry: Grothus-Draper law, Lambert-Beer's law, Stark- Einstein law, quantum yield, examples of low and high quantum yields, Photochemical equilibrium and the differential rate of photochemical reactions, Quenching, Role of photochemical reaction in biochemical process. Jablonski diagram depicting various process occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing), photosensitized reactions, energy transfer processes (simple examples), photostationary states, Chemiluminescence.</p> <p>Electronic Spectroscopy: Basic principles, Electronic Spectra of diatomic molecule, Franck- Condon principle, types of electronic transition, application of electronic spectra.</p>	15
VI	<p>Spectroscopy-II Rotational Spectroscopy: Rotational Spectrum of Diatomic molecules. Energy levels of a rigid rotor, selection rules, determination of bond length, qualitative description of non-rigid rotator, isotopic effect.</p> <p>Vibrational Spectroscopy: Theory of IR Spectroscopy, vibrating diatomic molecule, energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, rotational-vibrational Spectra, determination of force constant, anharmonic oscillator</p> <p>Raman Spectroscopy: Instrumentation of Raman spectrophotometer, Concept of polarizability, quantum theory of Raman spectra, stokes and</p>	15

Acad

antistokes lines, pure rotational and pure vibrational Raman spectra.
selection rule, Applications of Raman Spectra.

Keywords: Crystal field theory, transition metal complexes, magnetic properties, electronic spectra, organometallic compounds, carbonylation, inorganic polymers, electromagnetic radiations, photochemistry, rotational and vibrational spectroscopy, raman spectroscopy

Part C: Learning Resource

Text Books, Reference Books, Other Resources

Suggested Reading :

1. Lippard, S.J. & Berg, J.M. Principles of Bioinorganic Chemistry Panima Publishing Company 1994.
2. Cotton, F.A. & Wilkinson, G, Advanced Inorganic Chemistry Wiley-VCH, 1999.
3. Malik W.U. & et Al., Selected Topics in Inorganic Chemistry, S Chand Publication (2010).
Puri, B.R. , Sharma, L.R., KaliaK.C. , Principles of Inorganic Chemistry, Vishal Publishing Co. (2021).
4. Gurtu, J.N., Gurtu, A., Advanced Physical Chemistry, Pragati Prakashan, Meerut, Edition IV, 2017
5. Dogra, S.K., Physical Chemistry through problems, Wiley Eastern.
6. Khera, H.C., Gurtu, J.N., Singh, J., Chemistry for B.Sc. Ist Year, Pragati Prakashan
7. Ball, D.W., Physical Chemistry, Thomson Press, India, 2007
8. Castellan, G.W., Physical Chemistry, 4th Edition, Narosa, 2004
9. Bariyar, A. & Goyal, S., B.Sc. Chemistry Combined (in Hindi), Krishna Educational Publishers Year 2019
10. Levine, I.N., Physical Chemistry, 6th Edition, Tata McGraw-Hill, 2010
11. Metz, C.R., 2000 Solved Problems in Chemistry, Sahaun Series, 2006
12. Puri, B.R., Pathania, M.S., Sharama, L.R., Principles of Physical Chemistry, Vishal Publishing Company 2020
13. Negi, A.S. & Anand, S.C., A Text Book of Physical Chemistry, 3rd Edition, New Age International Publication
14. Bajpai, D.N., Advanced Physical Chemistry, S. Chand, 2019
15. Bahal & Tuli, Essential of Physical Chemsitry, 2020
16. Greenwood, N.N. & Earnshaw A. Chemistry of the Elements, Butterworth-Heinemann, 1997.
17. Purcell, K.F & Kotz, J.C. Inorganic Chemistry W.B. Saunders Co, 1977.
18. Huheey, J.E., Inorganic Chemistry, Prentice Hall, 1993.
19. Lee, J.D. Concise Inorganic Chemistry, ELBS, 1991
20. Atkins, P. W and Shriver D. N. Atkins' Inorganic Chemistry 5th Ed. Oxford University Press (2010).
21. Engel, T. and Reid, P., Physical Chemistry, 3rd Edition, Prentice Hall, 2012
22. Mortimer, R.G., Physical Chemistry, 3rd Edition, Elsevier, Noida, UP, 2009
23. Atkins' Physical Chemistry, 10th Edition, Oxford University Press, 2014
24. Barrow, G.M., Physical Chemistry Tata McGraw-Hill, 2007
25. Physical Chemistry, A Modern Introduction, 2nd Edition, William M. Davis, CRC Press, 2018.
26. Chemical Kinetics, Stochastic Processes and irreversible Thermodynamics, Santillan Moises, Springer, 2014.
27. Physical Chemistry, Madan R.L., McGraw Hill, 2021.
28. Physical Chemistry, 3rd Edition, Robert G. Mortimer, Elsevier, 2021.

E-learning resources:

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

ALB

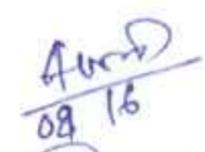
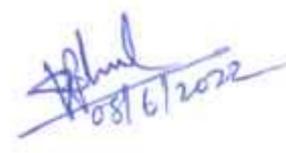
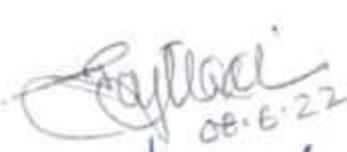
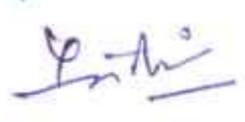
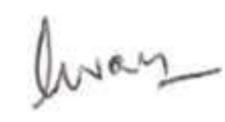
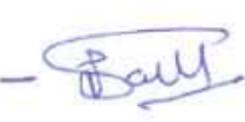
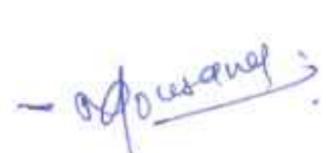
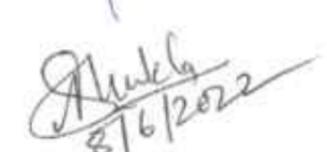
Fundamental Chemistry related topics on SWAYAM platform and E-pathshala

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 | 
08/6 |
| 2. Smt. Priyanka Tiwari,
Assistant Professor,
Govt. J.P. Verma P.G. College, Bilaspur (C.G.) | - Member |  |
| 3. Mr. Vijay Kumar Lahare,
Assistant Professor,
Govt. Lahiri P.G. College Chirimiri(C.G.) | - Member | 
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| 4. Dr. Rajmani Patel,
Assistant Professor,
Hemchand Yadav University, Durg (C.G.) | - Member | 
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| 5. Dr. A.K. Singh,
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| 6. Dr. P.K. Singh,
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8/6/22 |

- Assistant Professor, Govt. R.R.M. P.G. College Surajpur
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- Member *Ashish Tiwari*
8/6/22

- Member *Laxmi Chand Manwani*
8/6/22

- Member *Indira*
8-6-22

Part A: Introduction				
Program: Degree Course		Class: B.Sc. III Year	Year: 2024	Session: 2024-2025
1.	Course Code	CHEM-6T		
2.	Course Title	Organic & Physical Chemistry		
3.	Course Type	Core Course		
4.	Pre-requisite (if any)	To Study this course our students must have had the diploma in chemistry or equivalent		
5.	Course Learning Outcomes (CLO)	<p>At the end of this course, the students will be able to learn the following aspects of Chemistry</p> <ul style="list-style-type: none"> • Fundamental theoretical knowledge about the heterocyclic chemistry. • Common organometallic reactions and draw reasonable reaction mechanisms. • Various synthetic dyes and their structures. • Chemical structure of proteins, amino acids and nucleic acids. 5: To acquire knowledge about different mechanisms involved in polymerization, useful polymers and their structures. • Basic principles of UV-Visible, IR and NMR spectra and their applications. • Fundamentals/concepts/principles/postulates of quantum mechanics and need for development of quantum mechanics. • Applications of quantum mechanics in the study of black body radiation, photoelectric effect, simple quantum mechanical models, bonding in molecules and molecular spectroscopy. 		
6.	Credit Value	Theory: 4		
7.	Total Marks	Max. Marks: 50	Min Passing Marks: 17	

Part B: Content of the Course		
Total No. of Lecturer (in hours per week): 4		Total Lecturer: 90
Unit	Topics	No. of Lectures
I	Heterocyclic Compounds : Classification and Nomenclature of Hetrocyclic Compounds, Five Membered Hetrocyclic Compounds, Furan or Furfuran C ₄ H ₄ O, Pyrrole (C ₄ H ₅ N), Thiophene (C ₄ H ₄ S), 1,4 dicarbonyl compound, Six membered Hetrocyclic Compounds Pyridine (C ₅ H ₅ N), Orientation in Pyridine and Substitution Reactions, Comparison of Basicity of Pyridine, Piperidine and Pyrrol, Condensed Five and Six Membered Hetrocyclic, Indole (2,3 Benzopyrrole) C ₈ H ₇ N, Quinoline or α , β - Benzopyridine; (C ₉ H ₇ N), Isoquinoline (C ₉ H ₇ N).	15
II	Carbohydrates : Classification of Carbohydrates, Biological Importance of Carbohydrates, Monosaccharides, Relative and Absolute Configuration of Glucose and Fructose, Epimers and Anomers, Mutarotation, Determination of Ring size of Glucose and Fructose, Haworth Projections and Conformational Structure, Mutual Transformations or Inter Conversion among Monosaccharides, Disaccharides, Polysaccharides.	15

Azad

	Biomolecules: Amino acids, Proteins and Nucleic acids: Amino Acids, Isoelectric Point, Proteins, Difference between Globular Proteins and Fibrous Proteins, Peptide and Peptide Bond, Nucleic acid, structure and functions of RNA and DNA.	
III	Infra-red and Ultraviolet –Visible Spectroscopy: Infra-red Spectroscopy: Basics of Infra-red Spectroscopy, Fundamental vibrations and their symmetry, Instrumentation, Measurement of IR Spectra, Regions and Interpretation of IR Spectra of organic molecules and its applications. Ultra-violet and Visible Spectroscopy: Absorption Laws and Molar Absorptivity, Presentation of UV- Spectra of conjugated enes, UV Spectra of conjugated enones, applications of Ultra-violet spectroscopy. Effect of conjugation on λ_{max} .	15
IV	NMR and Mass Spectroscopy: NMR Spectroscopy: Principle of NMR Spectroscopy, Instrumentation of NMR Spectroscopy, Nuclear Shielding and Deshielding, The Chemical Shift, Signal Splitting : Spin-Spin Coupling, Interpretation of PMR, Spectra, Structural Elucidation using UV, IR and NMR, Anisotropy and Anisotropic Effect, Coupling constant and signal resolution, ^{13}C -NMR Spectroscopy. Mass Spectroscopy: Principle of mass Spectroscopy, Instrumentation of mass Spectroscopy, fragmentation process. The m/z value of the molecular ion to calculate the molecular formula. Isotope Effect.	15
V	Quantum Mechanics-I : Historical background of quantum mechanics, Black-body radiation, Planck's radiation law, photoelectric effect, Compton effect. Operator: Hamiltonian operator, angular momentum operator, Laplacian operator, postulate of quantum mechanics, eigen values, eigen function, Schrodinger time independent wave equation, physical significance of ψ & ψ^2 , application of Schrodinger wave equation to particle in a one-dimensional box, hydrogen atom (separation into three equations) radial and angular wave functions.	15
VI	Quantum Mechanics-II : Quantum Mechanical approach of Molecular orbital theory, basic ideas-criteria for forming M.O. from A.O., LCAO approximation, formation of H_2^+ ion, calculation of energy levels from wave functions, bonding and antibonding wave functions, Concept of σ , σ^* , π , π^* orbitals and their characteristics, Hybrid orbitals-sp, sp^2 , sp^3 Calculation of coefficients of A.O.'s used in these hybrid orbitals. Introduction to valence bond model of H_2 , comparison of M.O. and V.B. models.	15

Part C: Learning Resource

Suggested Readings :

- Morrison, R. N. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd.(Pearson Education).
- Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Finar, I. L. Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Products), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Puri, B.R., Pathania, M.S., Sharama, L.R., Principles of Physical Chemistry, Vishal Publishing Company 2020
- Gurtu, J.N., Gurtu, A., Advanced Physical Chemistry, Pragati Prakashan, Meerut, Edition IV, 2017
- Dogra, S.K., Physical Chemistry through problems, Wiley Eastern.

Ans

7. Khera, H.C., Gurtu, J.N., Singh, J., Chemistry for B.Sc. Ist Year, Pragati Prakashan
8. Ball, D.W., Physical Chemistry, Thomson Press, India, 2007
9. Castellan, G.W., Physical Chemistry, 4th Edition, Narosa, 2004
10. Bariyar, A. & Goyal, S., B.Sc. Chemistry Combined (in Hindi), Krishna Educational Publishers Year 2019
11. Levine, I.N., Physical Chemistry, 6th Edition, Tata McGraw-Hill, 2010
12. Metz, C.R., 2000 Solved Problems in Chemistry, Sahaun Series, 2006
13. Bahal & Tuli, Essential of Physical Chemsitry, 2020
14. Negi, A.S. & Anand, S.C., A Text Book of Physical Chemistry, 3rd Edition, New Age International Publication
15. Bajpai, D.N., Advanced Physical Chemistry, S. Chand, 2019
16. Engel, T. and Reid, P., Physical Chemistry, 3rd Edition, Prentice Hall, 2012
17. Eliel, E. L. & Wilen, S. H. Stereochemistry of Organic Compounds, Wiley: London, 1994
18. Kalsi, P. S. Organic spectroscopy, New Age International, 2005.
19. Dyer, J.R., Introduction to spectroscopy, PHI
20. McMurry, J.E. Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning India Edition, 2013.
21. Mortimer, R.G., Physical Chemistry, 3rd Edition, Elsevier, Noida, UP, 2009
22. Atkins' Physical Chemistry, 10th Edition, Oxford University Press, 2014
23. Barrow, G.M., Physical Chemistry Tata McGraw-Hill, 2007

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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/#>
7. <https://nptel.ac.in/courses>

Fundamental Chemistry related topics on SWAYAM platform and E-pathshala

Part D: Assessment and Evaluation

Maximum Marks: 50

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- Chairman

Alka
8/6.

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- Member

Priyanka

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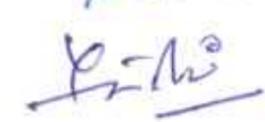
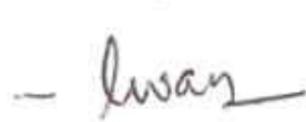
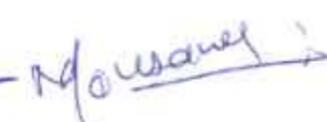
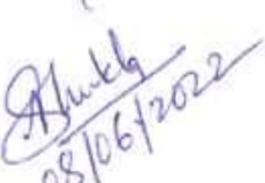
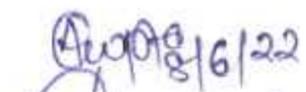
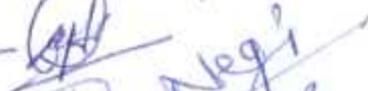
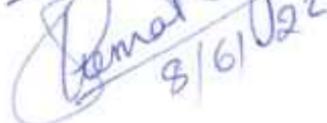
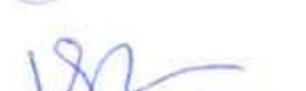
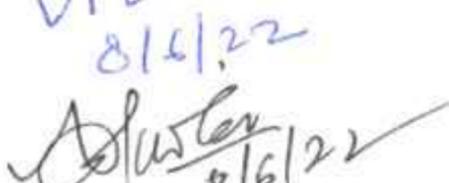
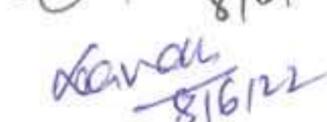
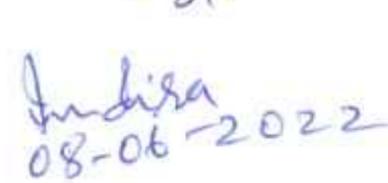
- Member

Vijay
08/06/2022

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

- Member

Rajmani
08.6.22

- | | | | |
|-----|---|----------|---|
| 5. | Dr. A.K. Singh,
Professor,
Govt. V.Y.T. P.G. College Durg (C.G.) | - Member | 
8/6/22 |
| 6. | Dr. P.K. Singh,
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| 18. | Dr. K. Indira
Professor,
Government K. PG College Jagadapur (C.G.) | - Member | 
08-06-2022 |

Part A: Introduction			
Program: Degree Course		Class: B.Sc. III Year	Year: 2024 Session: 2024-25
1	Course Code	CHEM-3P	
2	Course Title	LAB. 3: GENERAL CHEMISTRY 3	
3	Course Type	Chemistry Practical	
4	Pre-requisite (if any)	To study this course our students must have had the diploma in chemistry or equivalent	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will learn the following aspects of laboratory exercises : <ul style="list-style-type: none"> • Preparation of inorganic complexes • Preparation of organic compounds • Explain /define different terms in conductometry • Explain/define different terms in colorimetry • Understand the theoretical principles with the help of practicals 	
6	Credit Value	Practical : 02	
7	Total Marks	Max. Marks: 50	Min. Passing Marks: 17

Part B: Content of the Course		
Total No. of Lectures: 30		
LABORATORY COURSE		No. of Lectures
Tentative list of practical	Inorganic Chemistry Gravimetric analysis: Estimation of nickel (II) using dimethylglyoxime (DMG), estimation of copper as CuSCN, estimation of iron as Fe ₂ O ₃ by precipitating iron as Fe(OH) ₃ , estimation of Al (III) by precipitating with oxine and weighing as Al(oxine) ₃ (aluminium oxinate), estimation of Barium as BaSO ₄ . Inorganic Preparations: • Tetraamminecopper (II) sulphate, [Cu(NH ₃) ₄]SO ₄ .H ₂ O • Cis and trans K[Cr(C ₂ O ₄) ₂ . (H ₂ O) ₂] Potassium dioxalatodiaquachromate(III) • Tetraamminecarbonatocobalt (III) ion • Potassium tris(oxalate)ferrate(III)/ Sodium tris(oxalate)ferrate(III) • Cu(I) thiourea complex, bis (2,4-pentanedionate) zinc hydrate; Double salts (Chrome alum/ Mohr's salt)	10
	Organic chemistry 1. Preparation of organic Compounds: Synthesis of oxalic acid from cane sugar. Acetylation of one of the following compounds: amines (aniline, o-, m-, p- toluidines and o-,m-, p-anisidine) and phenols (β-naphthol, vanillin, salicylic acid) Benzoylation of one of the following amines (aniline, o-, m-, p-toluidines and o-, m-, panisidine) and one of the following phenols (β-naphthol, resorcinol, p cresol) by Schotten-Baumann reaction. Bromination of any one of the following: a. Acetanilide by conventional methods b. Acetanilide using green approach (Bromate-bromide method)	10

Ans

	<ul style="list-style-type: none"> • Nitration of any one of the following: <ul style="list-style-type: none"> a. Acetanilide/nitrobenzene by conventional method b. Salicylic acid by green approach (using ceric ammonium nitrate). <ul style="list-style-type: none"> • Reduction of p-nitrobenzaldehyde by sodium borohydride. • Hydrolysis of amides and esters. • Semicarbazone of any one of the following compounds: acetone, ethyl methyl ketone, cyclohexanone, benzaldehyde. • Benzylisothiuronium salt of one each of water soluble and water insoluble acids (benzoic acid ,oxalic acid ,phenyl acetic acid and phthalic acid) • Aldol condensation using either conventional or green method. • Benzil-Benzilic acid rearrangement. • Preparation of sodium polyacrylate. • Preparation of urea formaldehyde. • Preparation of methyl orange. <p>The above derivatives should be prepared using 0.5-1g of the organic compound. The solid samples must be collected and may be used for recrystallization, melting point and TLC.</p> <ol style="list-style-type: none"> 1. Qualitative Analysis: Qualitative analysis of an organic mixture containing two solid components using water, NaHCO₃, NaOH for separation and preparation of suitable derivatives. 2. Extraction of caffeine from tea leaves. 3. Analysis of Carbohydrate: aldoses and ketoses, reducing and non-reducing sugars. 4. Identification of simple organic compounds by IR spectroscopy and NMR spectroscopy. (Spectra to be provided). 5. Estimation of glycine by Sorenson's formalin method. 6. Study of the titration curve of glycine. 7. Estimation of proteins by Lowry's method. 8. Study of the action of salivary amylase on starch at optimum conditions 9. Effect of temperature on the action of salivary amylase. 	
	<p>Physical chemistry</p> <p>Conductometry</p> <ul style="list-style-type: none"> • Determination of cell constant • Determination of equivalent conductance, degree of dissociation and dissociation constant of a weak acid. • Perform the following conductometric titrations: <ol style="list-style-type: none"> i.Strong acid vs. strong base ii.Weak acid vs. strong base iii.Mixture of strong acid and weak acid vs. strong base iv.Strong acid vs. weak base <ul style="list-style-type: none"> • To determine the strength of the given acid conductometrically using standard alkali solution. • To determine the solubility and solubility product of a sparingly soluble electrolyte conductometrically • To study the saponification of ethyl acetate conductometrically. <p>Potentiometry/pH metry:</p> <ul style="list-style-type: none"> • Perform the following potentio/pH metric titrations: <ol style="list-style-type: none"> i. Strong acid vs. strong base ii. Weak acid vs. strong base 	10

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	<p>iii. Dibasic acid vs. strong base iv. Potassium dichromate vs. Mohr's salt v. Determination of pKa of monobasic acid</p> <p>UV/ Visible spectroscopy:</p> <ul style="list-style-type: none"> • Verify Lambert-Beer's law and determine the concentration of CuSO₄/KMnO₄/K₂Cr₂O₇ in a solution of unknown concentration • Determine the concentrations of KMnO₄ and K₂Cr₂O₇ in a mixture. • Study the kinetics of iodination of propanone in acidic medium. • Determine the amount of iron present in a sample using 1,10-phenanthroline. • Determine the dissociation constant of an indicator (phenolphthalein). • Study the kinetics of interaction of crystal violet/ phenolphthalein with sodium hydroxide. • Study of pH-dependence of the UV-Vis spectrum (200-500 nm) of potassium dichromate. • Spectral characteristics study (UV) of given compounds (acetone, acetaldehyde, acetic acid, etc.) in water. • Absorption spectra of KMnO₄ and K₂Cr₂O₇ (in 0.1 M H₂SO₄) and determine λ_{max} values. <p>Note: Experiments may be added/deleted subject to availability of time and facilities</p>	
<p>Keywords: Gravimetric analysis, Inorganic complex preparation, Organic compounds, Conductometry, Potentiometric, pH metry, Spectroscopy.</p>		
<p>Part C : LEARNING RESOURCES</p>		
<p>Suggested Readings:</p> <ol style="list-style-type: none"> 1. Vogel, A.I. Quantitative Organic Analysis, Part 3, Pearson (2012).31 2. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education (2009) 3. Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. Practical Organic Chemistry, 5th Ed., Pearson (2012) 4. Ahluwalia, V.K. & Aggarwal, R. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, University Press (2000). 5. Ahluwalia, V.K. & Dhingra, S. Comprehensive Practical Organic Chemistry: Qualitative Analysis, University Press (2000), 7. Manual of Biochemistry Workshop, 2012, Department of Chemistry, University of Delhi 8. Green Chemistry, ,Theory and Practice,P.T.AnastasandJ.C.Warner 9. Green Chemistry ,Environmental friendly alternatives ,R.S.Sanghli and M.M. Srivastava, Narosa Publications. 10. Gupta, A., Unified Chemistry Practical, Navbodh Publications. <p>E-Learning Resources:</p> <ol style="list-style-type: none"> 1. http://vlab.amrita.edu/index.php 2. http://www.chemguide.co.uk/ 		
<p>Fundamental Chemistry related topics on SWAYAM platform and E-pathshala</p>		

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Part D: Assessment and Evaluation

Maximum Marks: 50

Experiments	08 hours / M.M. 50
Five Experiments to be performed	
Inorganic chemistry – Two experiments to be performed . a) Gravimetric Estimation compulsory. b) Anyone experiment from synthesis and analysis.	08 marks 04 marks
Organic chemistry – Two experiments to be performed. a) Qualitative analysis of organic mixture containing two solid components. b) One experiment from synthesis of organic compound	08 marks (03 marks for each compound and 02 marks for separation) 04 marks
Physical chemistry – one experiment from physical chemistry	12 marks
Sessional	04 marks
Viva	10 marks
[Note ; In case of Ex-student , one mark each will be added to gravimetric analysis and qualitative analysis of organic mixture and two marks in experiment in physical chemistry].	

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,
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2. Smt. Priyanka Tiwari,
Assistant Professor,
Govt. J.P. Verma P.G. College, Bilaspur
3. Mr. Vijay Kumar Lahare,
Assistant Professor,
Govt. Lahiri P.G. College Chirimiri(C.G.)

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Alka
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- Member

Priyanka

- Member

Vijay
08/06/2022

4. Dr. Rajmani Patel,
Assistant Professor,
Hemchand Yadav University, Durg
5. Dr. A.K. Singh,
Professor,
Govt. V.Y.T. P.G. College Durg
6. Dr. P.K. Singh,
Assistant Professor,
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10. Mrs. Mousami Lahare,
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Government Vivekand PG College Manedragarh(C.G.)
18. Dr. K. Indira
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Government K. P. G. College Jagadalpur (C.G.)

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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	
Second year	MATH-3T	Differential Equations	Theory	4	50	33	
	MATH-4T	Real Analysis	Theory	4	50		
	MATH-2P (Any One)	Lab 2 : Differential Equations and Real Analysis	Practical	2	50	17	
		Project 2 : History of Mathematicians	Project	2	50	17	
Third year	MATH-5T Optional I (Any One)	Mechanics	Theory	4	50	33	
		Numerical Methods	Theory	4	50		
		Linear Algebra	Theory	4	50		
		Integral Transforms and Fourier Analysis	Theory	4	50		
	MATH-6T Optional II (Any One)	Discrete Mathematics	Theory	4	50		
		Tensors and Differential Geometry	Theory	4	50		
		Number Theory	Theory	4	50		
		Probability and Statistics	Theory	4	50		
	MATH-3P (Any One)	Lab 3 : Mathematics Paper 1 and Paper 2	Practical	2	50		17
		Project 3 : 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: Degree Course		Class: B. A. / B.Sc. Part III	Year: 2022 Session:2024-2025
1	Course Code	Paper – MATH – 5T(I)	
2	Course Title	Mechanics	
3	Course Type	Theory	
4	Pre-requisite (if any)	No	
5	Course Learning Outcome (CLO)	<p>This Course will enable the students to:</p> <ul style="list-style-type: none"> • Familiarize with subject matter, which has been the single centre, to which were drawn mathematicians, physicists, astronomers and engineers together. • Understand necessary conditions for the equilibrium of particles acted upon by various forces and learn the principle of virtual work for a system of coplanar forces acting on a particle. • Determine the centre of gravity of materialistic systems and discuss the equilibrium of a uniform cable hanging freely under its own weight. • Deal with the kinematics and kinetics of the rectilinear and planar motions of a particle including the constrained oscillatory motions of particle. • Learn that a particle moving under a central force describes a plane curve and know the Kepler's laws of the planetary motions, which were deduced by him long before the mathematical theory given by Newton. 	
6	Credit Value	4	
7	Total Marks	Maximum Marks : 50	Minimum Passing Marks : 17

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Part B: Content of the Course		
Total Periods: 60		
Unit	Topics	No. of Periods
I	Statics: Coplanar forces, Couples, Moment of force and a couple about a point and a line, Equilibrium of a particle and of a system of particles; Work and potential energy, Principle of virtual work for a system of coplanar forces acting on a particle, Forces which can be omitted in forming the equations of virtual work.	12
II	Centre of Gravity and Common Catenary: Concepts of Centre of mass and Centre of gravity, Centre of gravity of an uniform arc, plane area and solids of revolution; Common catenary, Approximations of a catenary.	12
III	Rectilinear Motion: Simple harmonic motion and its geometrical representation, Motion under inverse square law, Motion in resisting media, Concept of terminal velocity, Motion of varying mass.	12
IV	Motion in a Plane: Kinematics and kinetics of motion, Expressions for velocity and acceleration in cartesian, polar and intrinsic coordinates; Motion in a vertical circle, projectile and cycloidal motion.	12
V	Central Orbits: Equation of motion under a central force, Differential equation of an orbit, (p, r) equation of an orbit, Apses and apsidal distances, Areal velocity, Characteristics of central orbits, Kepler's laws of planetary motion.	12

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Part C - Learning Resource

Text Books, Reference Books:

1. R. S. Varma (1962). *A Text Book of Statics*. Pothishala Pvt. Ltd.
2. P.L. Srivastava (1964). *Elementary Dynamics*. Ram Narain Lal, Beni Prasad Publishers Allahabad.
3. J. L. Synge & B. A. Griffith (1949). *Principles of Mechanics*. McGraw-Hill.
4. S.L. Loney (2006). *An Elementary Treatise on the Dynamics of a Particle and of Rigid Bodies*. Read Books.
5. A. S. Ramsey (2009). *Statics*. Cambridge University Press.
6. A. S. Ramsey (2009). *Dynamics*. Cambridge University Press.

E-Resources

1. Suggested Equivalent **online courses**: Web link NPTEL/ SWAYAM/ MOOCs
2. <https://www.youtube.com/playlist?list=PLwdnzlV3ogoXUbQmP-T2gPhYXeEcxP6U8>

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

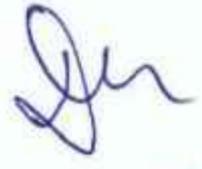
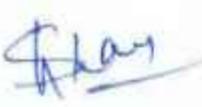
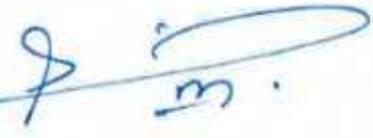
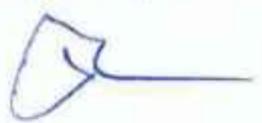
Maximum Marks:

50 Marks

TSM

Declaration

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Govt. MMR PG College, Champa | - | Member |  |
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Govt. MLS College, Seepat | - | Member |  |

Part A: Introduction			
Program: Degree Course		Class: B. A. / B.Sc. Part III	Year: 2022 Session:2024-2025
1	Course Code	Paper – MATH – 5T(II)	
2	Course Title	Numerical Methods	
3	Course Type	Theory	
4	Pre-requisite (if any)	No	
5	Course Learning Outcome (CLO)	<p>This Course will enable the students to:</p> <ul style="list-style-type: none"> • Obtain numerical solutions of algebraic and transcendental equations. • Find numerical solutions of system of linear equations and to check the accuracy of the solutions. • Learn about various interpolating and extrapolating methods to find numerical solutions. • Solve initial and boundary value problems in differential equations using numerical methods. • Apply various numerical methods in real life problems. 	
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	Numerical methods for solving algebraic and transcendental equations: Round-off error and computer arithmetic, Local and global truncation errors, Algorithms and convergence; Bisection method, false position method, fixed point iteration method, Newton's method and secant method for solving equations.	12
II	Numerical Methods for Solving Linear Systems: Partial and scaled partial pivoting, LU decomposition and its applications, Thomas method for tridiagonal systems; Gauss-Jacobi, Gauss-Seidel and successive over-relaxation (SOR) methods.	12
III	Interpolation: Lagrange and Newton interpolations, Piecewise linear interpolation, Cubic spline interpolation, Finite difference	12

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	operators, Gregory-Newton forward and backward difference interpolations.	
IV	Numerical Differentiation and Integration: First order and higher order approximation for first derivative, Approximation for second derivative; Numerical integration: Trapezoidal rule, Simpson's rule and its error analysis, Bulirsch-Stoer extrapolation methods, Richardson extrapolation.	12
V	Initial and Boundary Value Problems of Differential Equations: Euler's method, Runge-Kuttamethods, Higher order one step method, Multi-step methods; Finite difference method, Shooting method, Real life examples: Google search engine, 1D and 2D simulations, Weather forecasting.	12

Part C - Learning Resource

Text Books and Reference Books:

1. Brian Bradie , *A Friendly Introduction to Numerical Analysis*. Pearson. 2006
2. C. F. Gerald & P. O. Wheatley. *Applied Numerical Analysis* (7th edition), Pearson Education, India. 2008
3. M.K. Jain, S. R. K. Iyengar & R. K. Jain. *Numerical Methods for Scientific and Engineering Computation* (6th edition). New Age International Publishers. 2012
4. Robert J. Schilling & Sandra L. Harris. *Applied Numerical Methods for Engineers Using MATLAB and C*. Thomson-Brooks/Cole. 1999

E- Resources:

1. Suggested Equivalent **online courses:** Web link NPTEL/ SWAYAM/ MOOCs
2. <https://www.youtube.com/watch?v=pOtnzAXIXvI&list=PL3pGy4HtqwD0CWdFuygdF-gk0ORk5EFZg>

Part D: Assessment and Evaluation

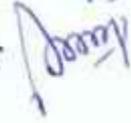
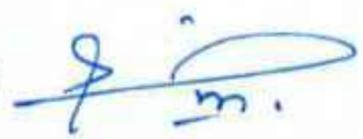
Suggested Continuous Evaluation Methods:

Maximum Marks:

50 Marks

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Part A: Introduction			
Program: Degree Course		Class: B. A. / B.Sc. Part III	Year: 2022 Session:2024-2025
1	Course Code	Paper – MATH – 5T(III)	
2	Course Title	Linear Algebra	
3	Course Type	Theory	
4	Pre-requisite (if any)	No	
5	Course Learning Outcome (CLO)	<p>This Course will enable the students to:</p> <ul style="list-style-type: none"> • Learn about properties of linear transformation and isomorphism theorems. • Understand the concept of polynomials and their prime factorization. • Find canonical form of linear transformations. • Obtain various variants of diagonalisation of linear transformations. • Apply Cauchy-Schwarz inequality for deriving metric on inner product spaces and obtain orthonormal basis using Gram-Schmidt orthogonalisation. 	
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	Properties of Linear Transformation: Vector spaces, Linearly independent and dependent sets, Bases and dimension, Linear transformation, Linear functional, Dual spaces and second dual space, Transpose of linear transformation, Algebra of linear transformations, Isomorphism theorems.	12

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II	Polynomials: Algebras, The algebra of polynomials, Lagrange interpolation, Vandermonde matrix, Polynomial ideals, Taylor's formula, The prime factorization of a polynomial, Algebraically closed fields.	12
III	Elementary Canonical Forms: Determinant functions, Characteristic values of a linear transformation, Cayley-Hamilton theorem for linear transformations, Annihilating polynomials, Invariant subspaces, Minimal and characteristic polynomials.	12
IV	Diagonalisation and Jordan Canonical Form: Diagonalisability of linear transformations, Direct sum decomposition, Invariant direct sums, The primary decomposition theorem, Triangular form, Jordan canonical form, trace and transpose.	12
V	Inner Product Spaces: Definition and examples of inner product space, orthogonality, Cauchy-Schwarz inequality, Gram-Schmidt orthogonalisation, Diagonalisation of symmetric matrices, Hermitian, Unitary and normal operators.	12

Part C - Learning Resource

Text Books, Reference Books,

1. I. M. Gel'fand. *Lectures on Linear Algebra*. Dover Publications. 1989
2. Kenneth Hoffman & Ray Kunze. *Linear Algebra* (2nd edition). Prentice-Hall. 2015
3. Nathan Jacobson. *Basic Algebra I* (2nd edition). Dover Publications. 2009
4. Nathan Jacobson *Basic Algebra II* (2nd edition). Dover Publications. 2009.
5. Serge Lang *Introduction to Linear Algebra* (2nd edition). Springer India. 2005.
6. Gilbert Strang. *Linear Algebra and its Applications* (2nd edition). Elsevier. 2014

E- Resources:

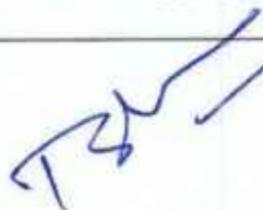
1. Suggested Equivalent **online courses:** Web link NPTEL/ SWAYAM/ MOOCs
2. https://www.youtube.com/watch?v=9h_Q-R6sXbM&list=PL7oBzLzHZ1wXQvQ938Wgl-soq09GywgOw

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

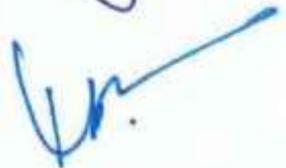
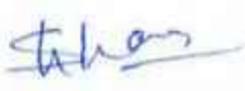
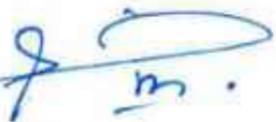
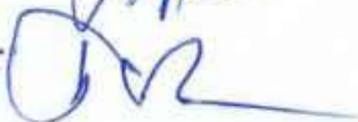
Maximum Marks:

50 Marks



Declaration

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Part A: Introduction			
Program: Degree Course		Class: B. A. / B.Sc. Part III	Year: 2022 Session:2024-2025
1	Course Code	Paper – MATH – 5T(IV)	
2	Course Title	Integral Transforms and Fourier Analysis	
3	Course Type	Theory	
4	Pre-requisite (if any)	No	
5	Course Learning Outcome (CLO)	<p>This Course will enable the students to:</p> <ul style="list-style-type: none"> • Know about piecewise continuous functions, Dirac delta function, Laplace transforms and its properties. • Solve ordinary differential equations using Laplace transforms. • Explain Parseval's identity, Plancherel's theorem and applications of Fourier transforms to boundary value problems. • Learn Fourier series, Bessel's inequality, term by term differentiation and integration of Fourier series. 	
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	Laplace Transforms: Integral transform, Kernel of an integral transform, Reduction of integral transform into Laplace transform, Linearity, Existence theorem, Laplace transforms of derivatives and integrals, Shifting theorems, Change of scale property, Laplace transforms of periodic functions, Dirac's delta function.	12
II	Further Properties of Laplace Transforms and Applications: Differentiation and integration of transforms, Convolution theorem, Integral equations, Inverse Laplace transform, Lerch's theorem, Linearity property of inverse Laplace transform, Translations theorems of inverse Laplace transform, Inverse	12

TS

	transform of derivatives, Applications of Laplace transform in obtaining solutions of ordinary differential equations and integral equations.	
III	Fourier Transforms: Fourier and inverse Fourier transforms, Fourier sine and cosine transforms, Inverse Fourier sine and cosine transforms, Linearity property, Change of scale property, Shifting property, Modulation theorem, Relation between Fourier and Laplace transforms.	12
IV	Solution of Equations by Fourier Transforms : Solution of integral equation by Fourier sine and cosine transforms, Convolution theorem for Fourier transform, Parseval's identity for Fourier transform, Plancherel's theorem, Fourier transform of derivatives, Applications of infinite Fourier transforms to boundary value problems, Finite Fourier transform, Inversion formula for finite Fourier transforms.	12
V	Fourier Series: Fourier cosine and sine series, Fourier series, Differentiation and integration of Fourier series, Absolute and uniform convergence of Fourier series, Bessel's inequality, The complex form of Fourier series.	12

Part C - Learning Resource

Text Books, Reference Books:

1. James Ward Brown & Ruel V. Churchill. *Fourier Series and Boundary Value Problems*. McGraw-Hill Education. 2011
2. Charles K. Chui. *An Introduction to Wavelets*. Academic Press 1992
3. Erwin Kreyszig. *Advanced Engineering Mathematics* (10th edition). Wiley. 2011
4. Walter Rudin. *Fourier Analysis on Groups*. Dover Publications. 2017
5. A. Zygmund. *Trigonometric Series* (3rd edition). Cambridge University Press. 2002

Other Resources:

1. Suggested Equivalent **online courses:** Web link NPTEL/ SWAYAM/ MOOCs
2. <https://www.youtube.com/watch?v=FGjMZ1uMRrs&list=PLhSp9OSVmeyJ5N-JUEZj7uS6IAT9a79nD>

Part D: Assessment and Evaluation

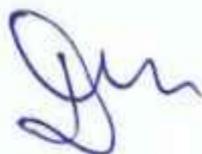
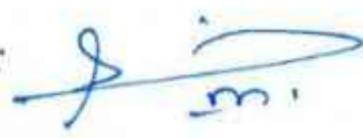
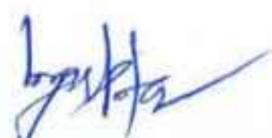
Suggested Continuous Evaluation Methods:

Maximum Marks:

50 Marks

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Part A: Introduction			
Program: Degree Course		Class: B. A. / B.Sc. Part III	Year: 2022 Session:2024-2025
1	Course Code	Paper – MATH – 6T(I)	
2	Course Title	Discrete Mathematics	
3	Course Type	Theory	
4	Pre-requisite (if any)	No	
5	Course Learning Outcome (CLO)	<ul style="list-style-type: none"> • Learn about partially ordered sets, lattices and their types. • Understand Boolean algebra and Boolean functions, logic gates, switching circuits and their applications. • Solve real-life problems using finite-state and Turing machines. • Assimilate various graph theoretic concepts and familiarize with their applications. 	
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	Partially Ordered Sets: Definitions, examples and basic properties of partially ordered sets (poset), Order isomorphism, Hasse diagrams, Dual of a poset, Duality principle, Maximal and minimal elements, Least upper bound and greatest upper bound, Building new poset, Maps between posets.	12
II	Lattices: Lattices as posets, Lattices as algebraic structures, Sublattices, Products and homomorphisms; Definitions, examples and properties of modular and distributive lattices; Complemented, relatively complemented and sectionally complemented lattices.	12
III	Boolean Algebras and Switching Circuits: Boolean algebras, De Morgan's laws, Boolean homomorphism, Representation theorem; Boolean polynomials, Boolean polynomial functions, Disjunctive	12

125

	and conjunctive normal forms, Minimal forms of Boolean polynomials, Quine-McCluskey method, Karnaugh diagrams, Switching circuits and applications.	
IV	Finite-State and Turing Machines: Finite-state machines with outputs, and with no output; Deterministic and nondeterministic finite-state automaton; Turing machines: Definition, examples, and computations.	12
V	Graphs: Definition, examples and basic properties of graphs, Königsberg bridge problem; Subgraphs, Pseudographs, Complete graphs, Bipartite graphs, Isomorphism of graphs, Paths and circuits, Eulerian circuits, Hamiltonian cycles, Adjacency matrix, Weighted graph, Travelling-salesman problem, Shortest path, Dijkstra's algorithm.	12

Part C - Learning Resource

Text Books and Reference Books:

1. B. A. Davey & H. A. Priestley . *Introduction to Lattices and Order* (2nd edition). Cambridge University Press. 2002
2. Edgar G. Goodaire & Michael M. Parmenter. *Discrete Mathematics with Graph Theory* (3rd edition). Pearson Education. 2018
3. Rudolf Lidl & Günter Pilz. *Applied Abstract Algebra* (2nd edition). Springer. 1998
4. Kenneth H. Rosen. *Discrete Mathematics and its Applications: With Combinatorics and Graph Theory* (7th edition). McGraw-Hill. 2012
5. C. L. Liu *Elements of Discrete Mathematics* (2nd edition). McGraw-Hill. 1985

E-Resources:

1. Suggested Equivalent **online courses:** Web link NPTEL/ SWAYAM/ MOOCs
2. <https://www.youtube.com/watch?v=hkIHg9oMkGA&list=PLwdnzlV3ogoVxVxCTII45pDVMlaoYoMHf>

Part D: Assessment and Evaluation

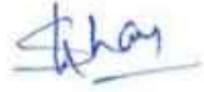
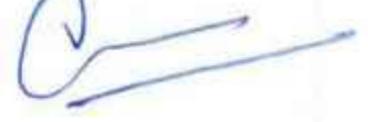
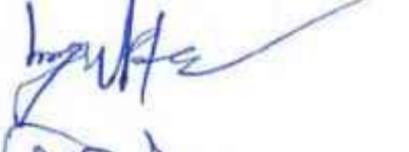
Suggested Continuous Evaluation Methods:

Maximum Marks:

50 Marks

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Part A: Introduction			
Program: Degree Course		Class: B. A. / B.Sc. Part III	Year: 2022 Session:2024-2025
1	Course Code	Paper – MATH – 6T(II)	
2	Course Title	Tensors and Differential Geometry	
3	Course Type	Theory	
4	Pre-requisite (if any)	No	
5	Course Learning Outcome (CLO)	<ul style="list-style-type: none"> • Explain the basic concepts of tensors. • Understand role of tensors in differential geometry. • Learn various properties of curves including Frenet - Serret formulae and their applications. • Know the Interpretation of the curvature tensor, Geodesic curvature, Gauss and Weingarten formulae. • Understand the role of Gauss's Theorema Egregium and its consequences. • Apply problem-solving with differential geometry to diverse situations in physics, engineering and in other mathematical contexts. 	
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	Tensors: Contravariant and covariant vectors, Transformation formulae, Tensor product of two vector spaces, Tensor of type (r, s) , Symmetric and skew-symmetric properties, Contraction of tensors, Quotient law, Inner product of vectors.	12
II	Further Properties of Tensors: Fundamental tensors, Associated covariant and contravariant vectors, Inclination of two vectors and orthogonal vectors, Christoffel symbols, Law of transformation of Christoffel symbols, Covariant derivatives of covariant and contravariant vectors, Covariant differentiation of tensors, Curvature tensor, Ricci tensor, Curvature tensor identities.	12
III	Curves in \mathbb{R}^2 and \mathbb{R}^3: Basic definitions and examples, Arc length, Curvature and the Frenet-Serret formulae, Fundamental existence and uniqueness theorem for curves, Non-unit speed curves.	12

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IV	Surfaces in \mathbb{R}^3: Basic definitions and examples, The first fundamental form, Arc length of curves on surfaces, Normal curvature, Geodesic curvature, Gauss and Weingarten formulae, Geodesics, Parallelvector fields along a curve and parallelism.	12
V	Geometry of Surfaces: The second fundamental form and the Weingarten map; Principal, Gauss and mean curvatures; Isometries of surfaces, Gauss's Theorema Egregium, The fundamental theorem of surfaces, Surfaces of constant Gauss curvature, Exponential map, Gauss lemma, Geodesic coordinates, The Gauss-Bonnet formula and theorem.	12

Part C - Learning Resource

Text Books, Reference Books:

1. Christian Bär. *Elementary Differential Geometry*. Cambridge University Press. 2010
2. Manfredo P. do Carmo. *Differential Geometry of Curves & Surfaces* (Revised and updated 2nd edition). Dover Publications. 2016
3. Alfred Gray. *Modern Differential Geometry of Curves and Surfaces with Mathematica* (4th edition). Chapman & Hall/CRC Press, Taylor & Francis. 2018
4. Richard S. Millman & George D. Parker. *Elements of Differential Geometry*. Prentice-Hall. 1977
5. R. S. Mishra. *A Course in Tensors with Applications to Riemannian Geometry*. Pothishala Pvt. Ltd. 1965
6. Sebastián Montiel & Antonio Ross. *Curves and Surfaces*. American Mathematical Society. 2009

E-Resources

1. Suggested Equivalent **online courses:** Web link NPTEL/ SWAYAM/ MOOCs
2. <https://www.youtube.com/watch?v=OyQj-RWLuV4>

Part D: Assessment and Evaluation

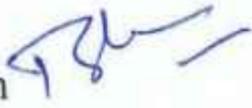
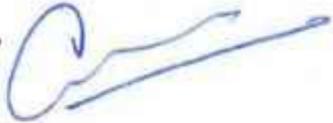
Suggested Continuous Evaluation Methods:

Maximum Marks:

50 Marks

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Part A: Introduction			
Program: Degree Course		Class: B. A. / B.Sc. Part III	Year: 2022 Session:2024-2025
1	Course Code	Paper – MATH – 6T(III)	
2	Course Title	Number Theory	
3	Course Type	Theory	
4	Pre-requisite (if any)	No	
5	Course Learning Outcome (CLO)	<ul style="list-style-type: none"> • Some of the open problems related to prime numbers, viz., Goldbach conjecture etc. • About number theoretic functions and modular arithmetic. • Public crypto systems, in particular, RSA. 	
6	Credit Value	4	
7	Total Marks	Maximum Marks : 50	Minimum Passing Marks : 17

Part B: Content of the Course		
Total Periods: 60		
Unit	Topics	No. of Periods
I	Distribution of Primes and Theory of Congruencies: Linear Diophantine equation, Prime counting function, Prime number theorem, Goldbach conjecture, Fermat and Mersenne primes, Congruence relation and its properties, Linear congruence and Chinese remainder theorem, Fermat's little theorem, Wilson's theorem.	12
II	Number Theoretic Functions: Number theoretic functions for sum and number of divisors, Multiplicative function, The Mobius inversion formula, The greatest integer function. Euler's phi-function and properties, Euler's theorem.	12
III	Primitive Roots: The order of an integer modulo n , Primitive roots for primes, Composite numbers having primitive roots; Definition of quadratic residue of an odd prime, and Euler's criterion.	12

TSM

IV	Quadratic Reciprocity Law and Public Key Encryption: The Legendre symbol and its properties, Quadratic reciprocity, Quadratic congruencies with composite moduli.	12
V	Applications: Public key encryption, RSA encryption and decryption, Some important application.	12

Part C - Learning Resource

Text Books and Reference Books

1. David M. Burton. *Elementary Number Theory* (7th edition). McGraw-Hill. 2007
2. Gareth A. Jones & J. Mary Jones. *Elementary Number Theory*. Springer. 2005
3. Neville Robbins. *Beginning Number Theory* (2nd edition). Narosa. 2007

E- Resources

1. Suggested Equivalent **online courses:** Web link NPTEL/ SWAYAM/ MOOCs
2. https://www.youtube.com/watch?v=u7cBLb0b7pk&list=PLOzRYVm0a65fuj_5fuj1BLeQNULrM4lrj

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

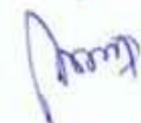
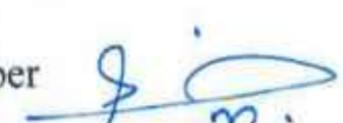
Maximum Marks:

50 Marks

TSM

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Part A: Introduction			
Program: Certificate Course		Class: B. A. / B.Sc. Part III	Year: 2022 Session:2024-2025
1	Course Code	Paper – MATH – 6T(IV)	
2	Course Title	Probability and Statistics	
3	Course Type	Theory	
4	Pre-requisite (if any)	No	
5	Course Learning Outcome (CLO)	<ul style="list-style-type: none"> • Understand the basic concepts of probability. • Appreciate the importance of probability distribution of random variables and to know the notion of central tendency. • Establish the joint distribution of two random variables in terms their correlation and regression. • Understand Correlation , Regression, Partial and Multiple correlation. • Study Attributes, Chi-square distribution and sampling. • Learn Curve Fitting , Interpolation, Extrapolation and Finite Differences 	
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	Probability and Random Variables: Axiomatic and empirical definitions of probability, Independent and dependent events, Conditional probability and Baye's theorem; Discrete and continuous random variables and their probability distributions, Cumulative distribution function, n^{th} Moments, Moment generating function, Characteristic function.	12

TAM

II	Univariate Distributions: Discrete distributions: Bernoulli trials and Bernoulli distribution, Binomial and Poisson distributions; Continuous distributions: Uniform, Geometric, Gamma, Exponential, Beta and normal distributions; Normal approximation to the binomial distribution, Central limit theorem.	12
III	Curve Fitting , Interpolation, Extrapolation and Finite Differences: Method of least squares, Normal equation, Fitting of the curve of the type $y = ab^x$ and $y = ax^b$. Methods of Interpolation , Newton's Binomial Method, Lagrange's Interpolation Formula, Gauss's forward and backward formula, Stirling formula, Bessel's formula, Everett's formula, Divided difference table, Newton's divided difference formula.	12
IV	Correlation, Regression, Partial and Multiple Correlation: Correlation, Karl Pearson's Coefficient of correlation, Correlation of ranks, Correlation coefficient, Regression, Line of regression, Equations to the line of regression, Schwarz's Inequality, Moment of Bivariate Distribution. Multiple Correlation, Partial Correlation, Distribution of two, three and more variable, Regression Coefficient , Residuals, Standard deviation of the residuals, Multiple correlation and Partial correlation coefficient.	12
V	Attributes, Chi-square distribution and sampling: Attributes, Positive and Negative Attributes, Testing, Condition for consistence in attributes, Independence , Criterion of Independence, Association, complete association, coefficient of association, degree of association, Chi-square distribution, Origin of sampling, Essentials of sampling, Random sampling, Large samples, simple sampling, comparison of large sample, sample from different populations, level of significance, testing the significance of an observed coefficient of correlation and rank of correlation coefficient, Fisher's z-test, Small samples, t-distribution, Fisher's z-distribution, Snedecore's F-distribution.	12

Part C - Learning Resource

Text Books and Reference Books:

1. David Applebaum. *Probability and Information: An Integrated Approach*. Cambridge University Press. 1996
2. Robert V. Hogg, Joseph W. McKean & Allen T. Craig *Introduction to Mathematical Statistics* (7th edition), Pearson Education. 2013
3. Irwin Miller & Marylees Miller (2014). *John E. Freund's Mathematical Statistics with Applications* (8th edition). Pearson. Dorling Kindersley Pvt. Ltd. India.
4. Jim Pitman (1993). *Probability*, Springer-Verlag.
5. Sheldon M. Ross (2014). *Introduction to Probability Models* (11th edition). Elsevier.
6. A. M. Yaglom and I. M. Yaglom (1983). *Probability and Information*. D. Reidel Publishing Company. Distributed by Hindustan Publishing Corporation (India) Delhi.

19

7. M. Ray and Sar Swarup Sharma, (1988); *Mathematical Statistics*, 8th edition Ram Prasad and Sons Agra

Other Resources:

1. Suggested Equivalent **online courses:** Web link NPTEL/ SWAYAM/ MOOCs
2. https://www.youtube.com/watch?v=COI0BUmNHT8&list=PLyqSpQzTE6M_JcleDbrVyPnE0PixKs2JE

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

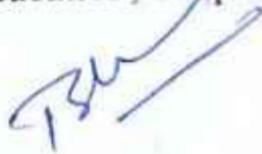
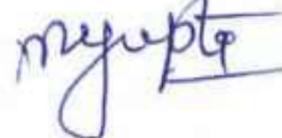
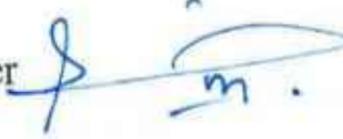
Maximum Marks:

50 Marks

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Declaration

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Part A: Introduction			
Program: Degree Course		Class: B.A. /B.Sc. III Year	Year: 2022 Session: 2024-2025
1	Course Code	MATH-3P (I)	
2	Course Title	I - Lab 03 - Mathematics Paper 1 and Paper 2	
3	Course Type	Practical	
4	Pre-requisite (if any)	No	
5	Course Learning Outcomes (CLO)	<p>This course will enable the students to</p> <ul style="list-style-type: none"> • Learn Free and Open Source Software (FOSS) tools for computer programming • Solve problem on mathematical theory studied in Mathematics Paper 1 and 2 by using FOSS software's. • Acquire knowledge of applications of Mathematics 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	<p>Mathematics practical with Free and open Source Software (FOSS) tools for computer programs, such as GeoGebra/Maxima/Scilab/ Octave /Python/R.</p> <p>List of Practical's: (At least 10 practical's from Paper 1 and Paper 2)</p> <ul style="list-style-type: none"> • Note: Additional practical may be included in the list at the college level as per choice of optional papers <p>Mechanics: Suggested book: Scilab Textbook Companion for Engineering Mechanics by A. K. Tayal</p> <ol style="list-style-type: none"> 1. Using the Principle of Virtual Work find the force to hold the system of pulleys in equilibrium. 2. Using the Principle of Virtual Work to determine vertical and horizontal components of reactions of end points of a frame made up with hinge joints. 3. Displacement time relationship for a traveling car. 4. Displacement time relationship for a stone dropped from top of a tower.

5. Distance travelled by a particle in the n th second.

Numerical Methods: Suggested book: Scilab Textbook Companion for Numerical Methods by B. Ram

1. Program to find solution of nonlinear equations using Bisection method.
2. Program to find smallest positive root of a cubic equation using Newton's method.
3. Program to find solution of linear system of equations using Triangularization Method.
4. Program to find solution of linear system of equations using Gauss Jacobi Method.
5. Program to find solution of linear system of equations using Gauss Seidel Method.
6. Program for value of a function at given point using Newton forward difference interpolation.
7. Program for value of a function at given point using Newton backward difference interpolation.
8. Program to find first and second order approximation of first derivative of a function.
9. Program to find integral approximation by Simpson three eight rule.
10. Program to solve initial value problem using Euler's method.

Linear Algebra: Suggested book: Scilab Textbook Companion for Linear Algebra by K. Hoffman and R. Kunze

1. Program to find matrix of differential operator with respect to standard basis on the vector space of polynomial functions of degree three or less.
2. Program to find GCD to two polynomials.
3. Program to find Characteristic Polynomial of a matrix of order 2.
4. Program to find Characteristic and minimal polynomial of a matrix.



5. Program to find Orthogonal projection in R^3 .

6. Program to find Unitary matrix.

Integral Transforms and Fourier analysis: Suggested book: Scilab Textbook Companion for Higher Engineering Mathematics by B. S. Grewal

1. Find Fourier sine integral.

2. Find Fourier transform of given function.

3. Find Fourier sine transform.

4. Find Fourier cosine transform.

Discrete Mathematics: Suggested book: Scilab Textbook Companion for Discrete Mathematics by S. Lipschutz, M. Lipson And V. H. Patil, Scilab Textbook Companion for Discrete Mathematics And Its Applications by K. H. Rosen

1. Use of Adjacency matrix

2. Use of Path matrix

Probability and Statistics: Suggested book: Scilab Textbook Companion for Probability And Statistics For Engineers And Scientists by S. M. Ross

1. Program for application of Baye's theorem.

2. Program to obtain probability of union of events.

3. Program for probability of equality likely events

4. Program for applications of Binomial distribution.

5. Program to obtain probability using Poisson distribution.

6. Program for probabilities of a uniform random variable.

7. Program to make scatter plot of two sets of data.

8. Program to fit a linear curve to a given set of data and to determine the sum of squares of the residuals.

Number Theory: Suggested book: Scilab Textbook Companion for Discrete Mathematics And Its Applications by K. H. Rosen

1. To find the quotient and remainder when an integer is divided by

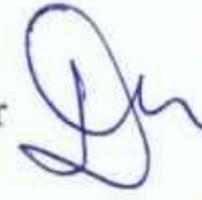
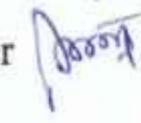
	<p>another integer.</p> <ol style="list-style-type: none"> 2. To find prime factorization of a given integer. 3. Test that a given integer is prime or not. 4. To find the greatest common divisor of two integers using recursion. 5. To find the greatest common divisor of two integers using Euclidean algorithm.
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Part C - Learning Resource		
Text Books, Reference Books, Other Resources		
<p>SUPPORT FROM THE GOVT FOR STUDENTS AND TEACHERS IN UNDERSTANDING AND LEARNING FOSS TOOLS:</p> <p>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;)</p>		
Part D: Assessment and Evaluation		
<p>Suggested Continuous Evaluation Methods: Maximum Marks: 50 Continuous Comprehensive Evaluation (CCE): Not Applicable University Exam(UE): 50 Marks</p>		
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	Not Applicable

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Part A: Introduction			
Program: Degree Course		Class: B.A./ B.Sc. III Year	Year: 2022 Session: 2024-2025
1	Course Code	MATH-3P (II)	
2	Course Title	II - Project 03 - History of Mathematician	
3	Course Type	Project	
4	Pre-requisite (if any)	No	
5	Course Learning Outcomes (CLO)	<p>Studying history of mathematicians help students:</p> <ul style="list-style-type: none"> • Develop a deeper understanding of the mathematics they have 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

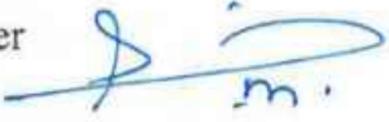
Part B: Content of the Course	
Total Periods: 30	
Project List	<p>Course Objectives:</p> <p>An elective course designed to acquire special / advance knowledge, such as supplement study / support study to a project work and a candidate study such a course on his own with an advisory support by a teacher / faculty member.</p> <p>Project:</p> <p>Contributions and biographies of Indian Mathematicians Swami Bharti Krishna Tirth and Ramanujan, Madhav and Neelkanth Somyaji and contribution involved in contents of the paper of opted by student. (Any 10 Mathematicians)</p>

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

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Scheme of B.Sc. Botany

Year	Course Code	Subject Name	Theory/ Practical	Total Credit	Total Marks	
					Max	Min
First year	BOT-1T	Microbial Diversity and Plant Pathology	Theory	4	50	17
	BOT--2T	Archegoniateae and Plant Architecture	Theory	4	50	17
	BOT--1P	LAB 1 : Microbial Techniques and Archegoniate identification	Practical	2	50	17
Second year	BOT--3T	Plant Systematics, Economic Botany and Ethnobotany	Theory	4	50	17
	BOT--4T	Plant Anatomy, Embryology and Plant Breeding	Theory	4	50	17
	BOT--2P	LAB 2 : Plant Identification and Embryology	Practical	2	50	17
Third year	BOT -5T	Plant Physiology and Ecology	Theory	4	50	17
	BOT -6T	Cytogenetics, plant tissue culture and biometry	Theory	4	50	17
	BOT -3P	LAB 3 : Experiments in Physiology, Biochemistry & Molecular biology	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: B.Sc.	Class: B.Sc. III Year	Year: 2024	Session: 2024-2025
1.	Course Code	BOT-5T	
2.	Course Title	Plant Physiology and Ecology	
3.	Course Type	Theory	
4.	Pre-requisite (if any)	NO	
5.	Course Learning Outcomes (CLO)	<p>After the completion of the course the students will be able to:</p> <ol style="list-style-type: none"> 1. Understand the role of Physiological and metabolic processes for plant growth and development. 2. Learn the symptoms of Mineral Deficiency in crops and their management. 3. Assimilate Knowledge about Biochemical constitution of plant diversity 4. acquaint the students with complex interrelationship between organisms and environment; 5. make them understand methods for studying vegetation, community patterns and processes, ecosystem functions, and principles of phytogeography. 6. This knowledge is critical in evolving strategies for sustainable natural resource management and biodiversity conservation. 	
6.	Credit Value	Theory: 4	
7.	Total Marks	Max. Marks: 50	Min Passing Marks: 17

Part B: Content of the Course		
Total Periods: 60		
Unit	Topics	No. of Period
I	<p>Plant water relation, Mineral Nutrition, Transpiration and translocation in phloem: Importance of water, water potential and its components; Osmosis, Diffusion, Diffusion Pressure Deficit, Plasmolysis, Imbibition, Mechanism of water absorption, Transpiration and its significance; Factors affecting transpiration; Root pressure and guttation. Criteria of essentiality of elements; Role of essential elements- micro and macro elements; Symptoms of mineral deficiency in major crops, Minerals absorption and their transport across the cell membrane, Ascent of sap, Phloem transport</p>	12
II	<p>Carbon metabolism: Enzymes: Structure of enzyme: holoenzyme, apoenzyme, cofactors, coenzymes and prosthetic group; mechanism of action (activation energy, lock and key hypothesis, induced- fit theory), enzyme inhibition and factors affecting enzyme activity, Allosteric enzymes & Abzymes. Photosynthesis: structure of chloroplast, Pigments, Absorption and Action spectra, Emerson's Enhancement effect, Photosystems, Electron transport system (Z-Scheme) and Photophosphorylation.; Carbon fixation- the Calvin cycle, Photorespiration, C4 and CAM cycle. Respiration-structure of mitochondria, aerobic and anaerobic respiration and fermentation, glycolysis, Krebs cycle, and electron transport system. ATP-synthase, RQ, Factors affecting respiration, Pentose phosphate pathway</p>	12

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III	<p>Nitrogen and Lipid Metabolism: Physical and biological nitrogen fixation (examples of legumes and non-legumes), Physiology and biochemistry of nitrogen fixation, Nitrate and ammonia assimilation, reductive amination and transamination, amino acid synthesis.</p> <p>Lipid Metabolism: Synthesis and breakdown of triglycerides, alfa and beta - oxidation, glyoxylate cycle, gluconeogenesis and its role in mobilization of lipids during seed germination</p> <p>Plant Development, Movements, Dormancy & Responses: Plant growth curve, developmental roles of phytohormones (auxins, gibberellins, cytokinins, ABA, ethylene), Photoperiodism (SDP, LDP, Day neutral plants); Phytochrome (discovery, structure and functions), Seed and bud Dormancy, Vernalization & Senescence, Plant movements</p>	12
IV	<p>Natural resources & Sustainable utilization; Ecology & Ecosystem: Definition of Ecology, Ecological Factors, Positive and negative interactions. Ecosystem– Concept of structure and function of an ecosystem- trophic levels, food chain, food web, Ecological pyramids</p> <p>Abiotic and biotic components, -Energy flow in an ecosystem</p> <p>Ecological Succession-Definition & types. Processes and types (autogenic, allogenic, autotrophic, heterotrophic, primary & secondary), Hydrosere and Xerosere.</p> <p>Ecological Adaptations – Hydrophytes, Xerophytes</p>	12
V	<p>Biodiversity: alfa, beta and gamma diversity, social, ethical and aesthetic values; hotspots of biodiversity, threats to biodiversity, biotic communities and populations and their characteristics and dynamics. Endemic and endangered species of plants in India. Ecological niche, ecotypes, Ecotone , ecological indicators.</p> <p>Conservation of Biodiversity: Ex-situ and in-situ conservation, Red data book, botanical gardens, National park, Sanctuaries, hot & hottest spots and Bioreserves.</p>	12
<p>Keywords: Mineral nutrition, Carbon assimilation, Nitrogen and lipid metabolism, Natural resource management, Ecological succession, biodiversity conservation</p>		

Part C - Learning Resources

Text Books, Reference Books, Other Resources

1. Plant Physiology and Biochemistry ISBN #:81-301-0035-5 Sunil D Purohit, K. Ahmed & Gotam K Kukda Edition: 2013 Pages: 368 + VIII Text Book (Hindi)
2. Hopkins, W.G. & Hiiner, N.P. Introduction to Plant Physiology (3rd ed.) 2004, John Wiley & Sons.
3. A Handbook On Mineral Nutrition And Diagnostic Techniques For Nutritional Disorders of Crops (pb) ISBN :9788177543377 Edition : 01 Year : 2011 Author : Pathmanabhan G , Vanangamudi M , Chandrasekaran CN , Sathyamoorthi K , Babu CR , Babu RC , Boopathi PN Publisher : Agrobios (India)
4. Jain, V.K. Fundamental of Plant Physiology (7th ed.) 2004. S. Chand and Company.
5. Salisbury, F.B. & Ross, C.W. Plant Physiology (4th ed.), 1992, Wadsworth Publishing Company.
6. Panday, S.N. & Sinha, B.K. Plant Physiology (4th ed.), 2006, Vikas Publishing House Pvt. Ltd.
7. Mukherjee, S. & Ghosh, A. Plant Physiology (2nd ed.), 2005, New Central Book Agency.
8. Chaudhuri, D., Kar, D.K., and Halder, S.A. Handbook of Plant Biosynthetic Pthways 2008, New Central Book. Agencies.

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9. Voet, D. and Voet, J.G., Bio-Chemistry (3rd ed.), 2005, John Wiley & Sons.
10. Mathews, C.K., Van Holder, K.E. & Ahren, K.G. Bio-Chemistry (3rd ed.), 2000, Pearson Education.
11. Lehninger Principles of Biochemistry. Sixth Edition. 2013. David L. Nelson, Michael M. Cox. Freeman, Macmillan.
12. Srivastava, HN. 2006. Pradeep's Botany Vol. V. Pradeep Publications, Jalandhar.
13. Verma, SK. Plant Physiology and Biochemistry. S. Chand & Sons, New Delhi.
14. Buchanon, Gruissen and Jones. Plant Physiology & Biochemistry: Biochemistry and Molecular Biology of plants, 2000, I.K. International.
15. Chapman and Riss. Ecology: Principles and Applications, Latest Ed., Cambridge University Press
16. Shukla, R.S. & Chandel, P.S. Plant Ecology, Latest Ed., S. Chandel and Co.
17. Kumar, H.D. Modern Concept of Ecology, Latest Ed. Vikas Publishing House
18. Begon, M., Herper, J.L. and Townsend, C.R. Ecology- Individuals, Populations and Communities (3rd ed.), Oxford Blackwell Science
19. Verma, P.S. & Agarwal, U.K. Concept of Ecology, Latest Ed., S. Chand & Company
20. Odum, F.P. Fundamentals of Ecology, Latest Ed., Saunders
21. Sharma, P.D. Elements of Ecology, Latest Ed., Rastogi Publications
22. Ambasht, R.S. & Ambasht, N.K. A Text Book of Plant Ecology, Latest Ed., CBS Publication & Distributors
23. Mani, M.S. Bio-Geography of India, Latest Ed., Springer-Verlag.
24. Mackenzie et al. Ecology, Latest Ed., Viva Books.
25. Gurevitch, J. (et al.), The Ecology of plants, 2002, Sinauer Associates
26. . Kimar, U. & Asija, M.J. Bio-diversity: Principles & Conservation, 2005, Student Edition, Agrobios (India)
27. Krishnamurthy, K.V. An Advanced Text Book on Biodiversity, 2003, Oxford & IBH Publishing Co. Ltd.
28. Mitra, D., Guha, J.K., Chowdhury, S.K. Studies in Botany, Vol. II (7th ed.) Moulik Library.
29. Primack, R.B. Essentials of Conservation Biology, 1993, Sinauer Associates.
30. Lo, C.P. & Yeung, A.K.W. Concepts and Techniques of Geographic Information Systems, 2002, Printice-Hallof India.
31. Cain, Bowman, Hacker. Ecology. 2014. 3rd Ed. Sinauer Associates
32. Vasudevan, N. (2006). Essentials of Environmental Science. Narosa Publishing House, New Delhi.
33. Singh, J. S., Singh, S.P. and Gupta, S. (2006). Ecology, Environment and Resource Conservation. Anamaya Publications, New Delhi.
34. Rogers, P.P., Jalal, K.F. and Boyd, J.A. (2008). An Introduction to Sustainable Development. Prentice Hall of India Private Limited, New Delhi.
35. Abbasi, S. A. (1998). Environmental Pollution and its Control. Cogent International, Pondicherry.
36. Abbasi, S. A. and Ramasamy, E. V. (1999). Biotechnological Methods of Pollution Control. Universities Press (India) Limited, Hyderabad.
37. Peavy, H. S., Rowe, D. R. and Tchobanoglaus, G. (1985). Environmental Engineering, Mc Graw Hill Book Company, Singapore.
38. Rand, M. C., Greenberg, A. E. and Taras, M. J. (Ed.) (1995). Standard methods for the examination of water and wastewater: 19th edition, American Public Health association (APHA), Washington, D.C.
39. Scragg, A. (1999). Environmental Biotechnology, Addison Wesley Longman, Singapore.
40. Tchobanoglaus, G. (1988). Wastewater Engineering: Treatment, Disposal, Reuse. Tata Mc Graw Hill, New Delhi.
41. Aarve, V. P., William, A. W. and Debra, R. R. (2002). Solid waste engineering. Cengage reading, USA.
42. George, T., Hilary, T. and Samuel, A. V. (1993). Integrated solid Waste Management, Engineering Principles and Management Issues, Mc Graw Hills.

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43. George, T. and Frank, K. (2002). Handbook of solid waste management: (Second edition). Mc Graw Hills.
44. Kanthi, L. S. (2000). Basics of Solids and hazardous waste management Technologies. Prentice Hall.
45. Anonymous. 1997. National Gene Bank: Indian Heritage on Plant Genetic Resources (Booklet). National Bureau of Plant Genetic Resources, New York.
46. Gillespie, A. 2006. Climate Change, Ozone Depletion and Air Pollution: Legal Commentaries with Policy and Science Considerations. Martinus Nijhoff Publishers.
47. Hardy, J.T. 2003. Climate Change: Causes, Effects and Solutions. John Wiley & Sons.
48. Harvey, D. 2000. Climate and Global Climate Change. Prentice Hall.
49. Manahan, S.E. 2010. Environmental Chemistry. CRC Press, Taylor and Francis Group.
50. Maslin, M. 2014. Climate Change: A Very Short Introduction. Oxford Publications.
51. Mathez, E.A. 2009. Climate Change: The Science of Global Warming and our Energy Future. Columbia University Press.
52. Mitra, A.P., Sharma, S., Bhattacharya, S., Garg, A., Devotta, S. & Sen, K. 2004. Climate Change and India. Universities Press, India.
53. Philander, S.G. 2012. Encyclopedia of Global Warming and Climate Change (2nd edition). Sage Publications.
54. Demers, M.N. 2005. Fundamentals of Geographic Information System. Wiley & Sons.
55. Richards, J. A. & Jia, X. 1999. Remote Sensing and Digital Image Processing. Springer.
56. Sabins, F. F. 1996. Remote Sensing: Principles and Interpretation. W. H. Freeman.
57. Gaston, K J. & Spicer, J.I. 1998. Biodiversity: An Introduction. Blackwell Science, London.
58. Singh, J. S. & Singh, S. P. 1987. Forest vegetation of the Himalaya. The Botanical Review 53:80-192.
59. Sodhi, N.S. & Ehrlich, P.R. (Eds). 2010. Conservation Biology for All. Oxford University Press.
60. Sodhi, N.S., Gibson, L. & Raven, P.H. 2013. Conservation Biology: Voices from the Tropics. Wiley-Blackwell, Oxford, UK.

Suggested equivalent online courses:

1. <https://www.classcentral.com/course/swayam-plant-physiology-and-metabolism-17732>
2. <https://www.wiziq.com/course/3249-plant-physiology-in-10-live-online-classes>
3. <https://www.easybiologyclass.com/plant-physiology-free-lecture-notes-online-tutorials-lecture-notes-ppts-mcqs/>
4. https://onlinecourses.swayam2.ac.in/cec19_bt09/preview
5. <https://community.plantae.org/tags/moocuturelearn.com/courses/teaching-biology-inspiring-students-with-plants-in-science>
6. <https://www.coursera.org/courses?query=plants>
<http://egyankosh.ac.in/handle/123456789/53530>

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50

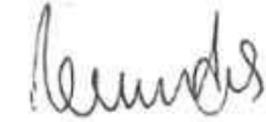
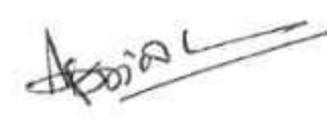
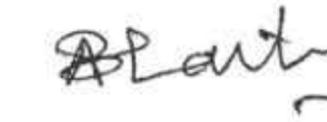
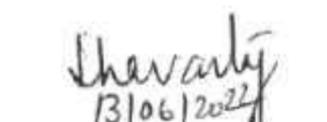
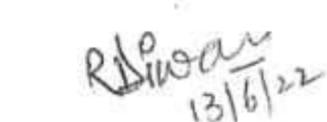
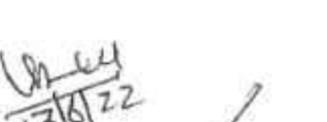
Continuous Comprehensive Evaluation (CCE): As per rule

University Exam(UE): 50 Marks

for marks
13.6.22

Declaration

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 10. ~~Manisha Gupta~~

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Part A: Introduction			
Program: B.Sc.	Class: B.Sc. III Year	Year: 2024	Session: 2024-2025
1. Course Code	BOT-6T		
2. Course Title	Cytogenetics, plant tissue culture and biometry		
3. Course Type	Theory		
4. Pre-requisite (if any)	NO		
5. Course Learning Outcomes (CLO)	After the completion of the course the students will be able to: <ul style="list-style-type: none"> • Acquire knowledge on cell ultrastructure. • Understand the structure and chemical composition of chromatin and concept of cell division. • Interpret the Mendel's principles, acquire knowledge on cytoplasmic inheritance and sex-linked inheritance • Understand the concept of 'one gene one enzyme hypothesis' along with the molecular mechanism of mutation. • students will be familiar with data handling. 		
6. Credit Value	Theory: 4		
7. Total Marks	Max. Marks: 50	Min Passing Marks: 17	

Part B: Content of the Course		
Total Periods: 60		
Unit	Topics	No. of Period
I	Cell biology: Structure and function of cell wall, plasma membrane, ribosomes, Endoplasmic reticulum, Golgi apparatus, mitochondria, chloroplast, lysosomes, peroxisomes and cell inclusions. Organization of nucleus: nuclear envelope, nucleoplasm and nucleolus. Chromosomal nomenclature- chromatids, centromere, telomere, satellite, secondary constriction. Organization of chromosomes- Nucleic acid and histones- types and classification. Lampbrush chromosomes and polytene chromosomes- Karyotype and idiogram. Cell cycle: G ₀ , G ₁ , S and G ₂ phases –mitosis: open and closed mitosis –amitosis and meiosis. Chromosomal aberrations (Structural and Numerical)	12
II	Genetics: History of Genetics and Mendelian inheritance, Chromosome theory of inheritance, crossing over and linkage; Incomplete dominance and codominance; Interaction of Genes; Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, Polygenic inheritance; Extra-nuclear Inheritance, Linkage, crossing over, Concept of sex determination and Sex chromosomes; Patterns of Sex determination in plants Sex linked inheritance.	12
III	Genetic material: Miescher to Watson and Crick- historic perspective, Griffith's and Avery's transformation experiments, Hershey-Chase, bacteriophage experiment, DNA structure, types of DNA, types of genetic material. DNA replication (Prokaryotes and eukaryotes): semi- conservative. DNA replication (Prokaryotes and eukaryotes): bidirectional replication, semi- conservative, semi discontinuous RNA priming, θ (theta) mode of replication, replication of linear, dsDNA, replicating the 5' end of linear chromosome including replication enzymes.	12

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IV	<p>Gene mutation and mutagens – substitution- transition and transversion, DNA damage and repairs, physical (ionizing and non- ionising) and chemical mutagens</p> <p>Transcription & Regulation of gene expression</p> <p>Types of structures of RNA (mRNA, tRNA, rRNA), RNA polymerase- various types; Translation, (Prokaryotes and eukaryotes), genetic code-. deciphering and properties. Regulation of gene expression in Prokaryotes: Lac operon</p> <p>Plant tissue culture: Principles, components and techniques (preparation of culture media: liquid and solid medium, basal and supplemented media) and culturing of protoplast- principle and application, regeneration of protoplasts, protoplast fusion and somatic hybridization- selection of hybrid cells, Somaclonal variation, Plant secondary metabolites production. Artificial seeds</p>	12
V	<p>Biostatistics: Definition, statistical methods, basic principles, variables- measurements, functions, limitations and uses of statistics. Biometry: Data, Sample, Population, random sampling, Frequency distribution- definition only, Central tendency–Arithmetic Mean, Mode and Median; Measurement of dispersion–Coefficient of variation, Standard Deviation, Standard error of Mean; Test of significance: chi- square test for goodness of fit. Computer application in biostatistics - MS Excel and SPSS</p>	12
<p>Keywords: Mineral nutrition, Carbon assimilation, Nitrogen and lipid metabolism, Natural resource management, Ecological succession, biodiversity conservation</p>		

Part C -Learning Resources

*for records
13.6.22*

Suggested Readings:

1. Cell Biology And Genetics (Hindi) 2/e PB...Gupta P K (Hindi) Rastogi Publications
2. PLANT BIOTECHNOLOGY (HINDI) October 2019 Publisher: Kindle DirectPublishingISBN: ISBN: 9781698665283 Authors:H. R. Dagla Jai Narain Vyas University
3. Biotechnology: Fundamentals And Application (hindi) (hb) ISBN : 9788177544732Edition :03Year : 2018Author : Dr. Purohit SS , Mathur S
4. Biotechnology (Hindi) (Hindi, Paperback, B.D.Singh) Hindi Publisher: Kalyani PubishersISBN: 9789327246070, 9327246071
5. Cytogenetics, Plant Breeding, Evolution and Biostatistics ISBN #: 978-81-301-0066-1SunilD Purohit &Gotam K Kukda, Apex Publishing House
6. Genetics and Biotechnology Sunil D Purohit, K. Ahmed &Gotam K KukdaApexPublishing House
7. PadapPrajanan (Hindi)
8. G.M. Cooper. (2015). The cell: A Molecular Approach. 7th Edition. Sinauer Associates.
9. Alberts, B., Johnson, A.D., Lewis, J., Morgan, D., Raff, M., Roberts, K., Walter, P. (2014). Molecular Biology ofCell. 6th Edition. WW. Norton & Co.
10. Campbell, M.K. (2012) Biochemistry, 7th ed., Published by Cengage Learning.
11. Campbell, P.N. and Smith, A.D. (2011). Biochemistry Illustrated, 4th ed., Published by Churchill Livingstone
12. Tymoczko, J.L., Berg, J.M. and Stryer, L. (2012). Biochemistry: A short course, 2nd ed., W.H.Freeman.
13. Berg, J.M., Tymoczko, J.L. and Stryer, L. (2011) Biochemistry, W.H.Freeman and Company
14. Nelson, D.L. and Cox, M.M. (2008). Lehninger Principles of Biochemistry, 5th Ed., W.H. Freeman and Company.
15. . Karp, G. (2010). Cell Biology, John Wiley & Sons, U.S.A. 6th edition.
16. Hardin, J., Becker, G., Skliensmith, L.J. (2012). Becker's World of the Cell. 8th edition.Pearson Education Inc.U.S.A.)
17. Gardner, E.J., Simmons, M.J., Snustad, D.P. (1991). Principles of Genetics, John Wiley & sons, India. 8th e
18. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics, John Wiley & Sons Inc., India.5th edition.
19. Klug, W.S., Cummings, M.R., Spencer, C.A. (2009). Concepts of Genetics. Benjamin Cummings, U.S.A..
20. Griffiths, A.J.F., Wessler, S.R., Carroll, S.B., Doebley, J. (2010). Introduction to Genetic Analysis. W. H. Freemanand Co., U.S.A. 10th edition.
21. M K Raxdan An Introduction to Plant Tissue Culture -; Oxfird& IBH Publishing Co.Pvt. Ltd.,New Delhi
22. Aggarwal SK (2009) Foundation Course in Biology, 2nd Edition, Ane Books Pvt. Ltd
23. Allard RW (1960) Principles of Plant Breeding. John willey and Sons. Inc. New York
24. BD Singh (2003) Plant Breeding. Kalyani Publishers
25. Cohn, N.S. (1964) Elements of Cytology. Brace and World Inc, New Delhi
26. Darnel, J.Lodish, Hand Baltimore, D. (1991) Cell and molecular biology. Lea and Fibiger, Washington.
27. De Robertis, E.D.P and Robertis, E.M.P (1991) Cell and molecular biology Scientific American books.
28. Dobzhansky, B (1961) Genetic and origin of species, Columbia university Press New Yor
29. Durbin (2007) Biological Sequence Analysis. Cambridge University Press India Pvt. Ltd
30. Gerald Karp (1985) Cell biology, Mc Graw Hill company..
31. Lewin, B, (1994) Genes, Oxford University Press, New York.
32. Lewis, W.H (1980) Polyploidy. Plenum Press, New York.
33. Nicholl T (2007) An Introduction to Genetic Engineering, Cambridge University Press India Pvt. Ltd
34. Roy S.C. and Kalayan Kumar De (1997) Cell biology. New central Books,Calcutta

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Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50

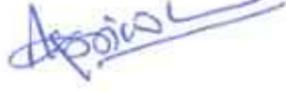
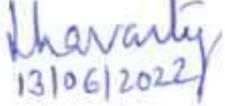
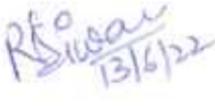
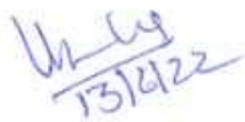
Continuous Comprehensive Evaluation (CCE): As per rule

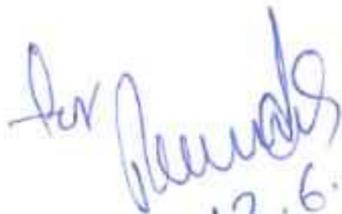
University Exam(UE): 50Marks

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Declaration

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Part A : Introduction			
Programme: Certificate		Class B.Sc.-III	Year: 2022
		Session: 2022-23	
1.	Course Code	BOT-3P	
2.	Course Title	Experiments in physiology, Biochemistry & molecular biology	
3.	Course Type	Practical	
4.	Pre-requisite (if any)	No	
5.	Course outcomes:	<ul style="list-style-type: none"> • Course outcomes: • After the completion of the course the students will be able to: • Know and authentic the physiological processes undergoing in plants along with • their metabolism • Identify Mineral deficiencies based on visual symptoms • Understand and develop skill for conducting molecular experiments for genetic • engineering 	
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	<p>Topic* *(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.))</p> <p>Plant water relation, Mineral Nutrition and translocation in phloem</p> <ol style="list-style-type: none"> 1. Determination of osmotic potential of plant cell sap by plasmolytic method using leaves of <i>Rhoeo / Tradescantia</i>. 2. Osmosis – by potato osmoscope experiment 3. Effect of temperature on absorption of water by storage tissue and determination of Q10. 4. Experiment to demonstrate the transpiration phenomenon with the bell jar method 5. Structure of stomata (dicot & monocot) 6. Experiment to measure the rate of transpiration by using Ganong's/ 		

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	<p>Farmer's potometer</p> <p>7. Study of mineral deficiency symptoms using plant material/photographs.</p> <p>Cell biology</p> <p>1. Study of plant cell structure with the help of epidermal peel mount of <i>Onion/Rhoeo/Crinum/ etc.</i></p> <p>2. Measurement of cell size by the technique of micrometry (Ocular and stage micrometer).</p> <p>3. Determination of mitotic index/ meiotic index and frequency of different mitotic / meiotic stages in pre-fixed root tips and flower buds respectively.</p>
	<p>Nitrogen Metabolism, Photosynthesis & Respiration : 1. A basic idea of chromatography: Principle, paper chromatography , column chromatography and TLC; demonstration of chromatography.</p> <p>2. Separation of photosynthetic pigments by paper chromatography.</p> <p>3. Effect of quality of light/concentration of Carbon dioxide on photosynthetic rate in aquatic plant</p> <p>4. Determination of the RQ starchy/ proteinaceous/ oily germinating seeds.</p> <p>Genetics: 1. Monohybrid cross (Dominance, codominance and incomplete dominance)</p> <p>2. Dihybrid cross (Dominance and incomplete dominance)</p> <p>3. Gene interactions (All types of gene interactions mentioned in the syllabus)</p> <p>a. Recessive epistasis 9: 3: 1.</p> <p>b. Dominant epistasis 12: 3: 1</p> <p>c. Complementary genes 9: 7</p> <p>d. Duplicate genes with cumulative effect 9: 6: 1</p> <p>e. Inhibitory genes 13: 3</p> <p>4. Observe the genetic variations among inter and intra specific plants.</p> <p>5. Demonstration of Breeding techniques-Hybridization, emasculation/ bagging/ tagging experiment.</p>
	<p>Genetic material: 1. Instruments and equipments used in molecular biology.</p> <p>2. Isolation of DNA from plants</p>
	<p>Techniques for biochemical analysis: 1. Weighing and Preparation of solutions -percentage, molar & normal solutions, dilution from stock solution etc.</p> <p>2. Separation of amino acids by paper chromatography.</p> <p>3. Detection of organic acids: citric, tartaric, oxalic and malic from laboratory samples.,</p> <p>4. Qualitative Analysis of carbohydrates,</p> <p>5. Estimation of reducing sugar by anthrone method,</p> <p>6. Qualitative Analysis of Lipids</p> <p>7. Qualitative analysis of Amino acids and Proteins</p>
	<p>Biostatistics: 1. Univariate analysis of statistical data: Statistical tables, Central</p>

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	<p>tendency - mean, mode, median, standard deviation and standard error (using seedling population /leaflet size).</p> <p>2. Calculation of correlation coefficient values and finding out the probability.</p> <p>3. Determination of goodness of fit in Mendelian and modified mono-and dihybrid ratios (3:1, 1:1, 9:3:3:1, 1:1:1:1, 9:7, 13:3, 15:1) by Chi-square analysis and comment on the nature of inheritance.</p> <p>3. Computer application in biostatistics - MS Excel and SPSS</p>
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Part C - Learning Resource	
Text Books, Reference Books, Other Resources	
Suggested Readings:	
<ol style="list-style-type: none"> 1. A Laboratory Manual Of Plant, Physiology, Biochemistry And Ecology ISBN: 9788177544589 Edition: 01 Year: 2012 Author: Akhtar Inam Publisher : Agrobios (India). 2. Wilson and Walker. Practical Biochemistry: Principles and Techniques. Cambridge University Press. U.K. 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. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley & Sons. Inc. 	
E-learning Resources:	
<ol style="list-style-type: none"> 1. https://www.edx.org/learn/molecular-biology 2. https://krishikosh.egranth.ac.in/handle/1/5810039999 3. https://www.classcentral.com/course/swayam-genetic-engineering-theory-and-application-14090 4. https://www.coursera.org/courses?query=genetics 5. https://www.coursera.org/courses?query=molecular%20biology 6. https://www.edx.org/learn/genetic-engineering 7. https://www.mooc-list.com/tags/genetic-engineering 8. https://www.classcentral.com/course/edx-molecular-biology-part-1-dna-replication-and-repair-2907 	

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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)

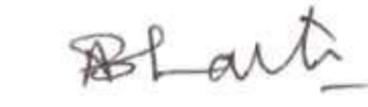
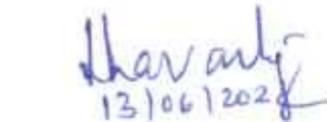
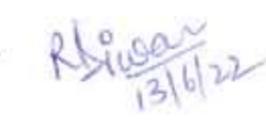
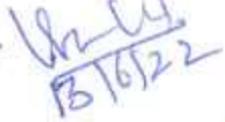
Class Test/Assignment/Presentation

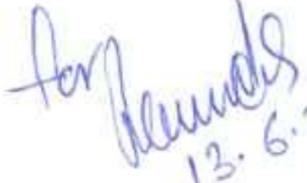
Not Applicable

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**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
Second year	ZOOL-3T	Genetics , Developmental Biology and Evolution	Theory	4	50	17
	ZOOL-4T	Biochemistry and Molecular Biology	Theory	4	50	17
	ZOOL-2P	Practical	Practical	2	50	17
Third year	ZOOL-5T	Animal Behavior , Chronobiology and Ecology	Theory	4	50	17
	ZOOL-6T	Microbiology , Parasitology , Immunology and Applied Zoology	Theory	4	50	17
	ZOOL-3P	Practical	Practical	2	50	17
Total				30	450	

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. IIIrd Year	Year: 2024
		Session 2024:2025	
1	Course code	ZOOL: 5T	
2	Course Title	Animal Behaviour, Chronobiology and Ecology	
3	Course type	Theory	
4	Pre requisite	NO	
5	Course learning Out comes (CLO)	<p>After successfully completing this course, the students will be able to:</p> <ul style="list-style-type: none"> • Learn a wide range of theoretical and practical techniques used to study animal behaviour. • Develop skills, concepts and experience to understand all aspects of animal behaviour. • Objectively understand and evaluate information about animal behaviour and ecology encountered in our daily lives. • Understand and be able to objectively evaluate the role of behaviour in the protection and conservation of animals in the wild. • Consider and evaluate behaviour of all animals, including humans, in the complex ecological world, including the urban environment. • Know the evolutionary and functional basis of animal ecology. • Understand what makes the scientific study of animal ecology a crucial and exciting endeavour. • Analyse a biological problem, derive testable hypotheses and then design experiments and put the tests into practice. • Solve the environmental problems involving interaction of humans and natural systems at local or global level. 	
6	Credit value	4	
7	Total Marks	Max. Marks: 50	Minimum. Passing Marks: 17

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Part B : Content of Course		
Total Periods: 60		
Unit	Topics	No. of Period
I	<p>Concept and pattern and control of behaviour Animal behaviour: Scope and importance of study. Concept of behaviour : Motivation, Fixed action of pattern, sign stimulus, Innate releasing mechanism, Action specific energy, Physiological Basis, Learning, Imprinting, Behavioural Genetics, and Evolution of Behaviour. Patterns of behaviour : Kinds of behaviour: foraging behaviour, Territorial behaviour. Mate selection and courtship behaviour. Parental care, Defensive behaviour. Stereotyped Behaviours : Orientation: Kinesis and taxes and Simple Reflex. Neural control And Hormonal Control of Behaviour.</p>	12
II	<p>Innate; Learning behaviour and socio:biology Innate behaviour: communication by sound (cricket vocalizations), Bird song, Echolocation in Bat. Chemical Signalling: Pheromones (types of pheromones) and bee Dance. Schooling behaviour in fish and Flocking Behaviour in Birds. Types of learning: Habituation, Imprinting and types of imprinting :filial and sexual, Classical conditioning, Instrumental learning, Latent learning and Trial and error learning, insight learning. Social behaviour : aggregation, group selection, kin selection, altruism.</p>	14
III	<p>Chronobiology : Biological clocks, biological rhythms: Circadian and circannual rhythms. Tidal, solar and lunar rhythms, entrainments. Biological oscillation. The concept of Average, amplitude, phase and period. Role of melatonin. Applications of Chronobiology: Chrono pharmacology, Chrono medicine, Chronotherapy. Migratory behaviour in birds and fishes.</p>	11
IV	<p>An overview of ecology, ecosystems and population ecology Structure and function of ecosystem: Major ecosystems of the world. Law of limiting factors. Ecological succession. Energy flow in ecosystem, food chain and food web. Recycling of nutrients: C, N, P & S cycle. Ecology of populations: Density, natality, mortality, Fertility and fecundity, survivorship curves. Unique and group attributes of population: mortality, age ratio and age pyramid, sex ratio, dispersal. Factors regulating population dispersal and growth: Exponential and logistic growth. Population regulation: Density:dependent and independent factors; r and K strategies.</p>	12

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V	<p>Biotic community, environmental degradation: Community characteristics: stratification; dominance, diversity, species richness, abundance, evenness, similarity, diversity and food:web indices. ecotone and edge effect. Types of interaction: Positive interactions: commensalism, proto:cooperation, and mutualism. Negative interactions: parasitism and allelopathy; predation and predator:prey dynamics; herbivory. Interspecific competition and coexistence. Environmental ethics; Pollution: Air, water and noise pollution and their control. Natural resources, Mineral, water and forest, their significance and conservation. Types of biodiversity, Hotspots, benefit and threat of conservation strategies.</p>	11
<p>Key words – Innate and Learning Behaviour, Sociobiology, Biological clock, Circadian rhythm, Population, Community, Succession, Pollution, Biological interaction, Biodiversity.</p>		

<p>Part : C Learning Resource</p>	
<p>Text books, Reference Books, Other Resources:</p> <ol style="list-style-type: none"> 1. McFarland, D. (1999) Animal Behaviour (3rd edition) Pitman Publishing Limited, London, UK. 2. Manning, A. and Dawkins, M. S. (2012) An Introduction to Animal Behaviour (6th edition) Ca 3. Alcock, J. (2005) Animal Behaviour (8th edition) Sinauer Associate Inc., USA. 4. Sherman, P. W. and Alcock, J. (2013) Exploring Animal Behaviour (6th edition) Sinauer Associate Inc., Massachusetts, USA. 5. Dunlap, J. C.; Loros, J.J. and DeCoursey, P. J. (2009) Chronobiology Biological Timekeeping (1st edition) Sinauer Associates, Inc. Publishers, Sunderland, MA, USA. 6. McFarland, D. (1999) Animal Behaviour (3rd edition) Pitman Publishing Limited, London, UK. 7. Manning, A. and Dawkins, M. S. (2012) An Introduction to Animal Behaviour (6th edition) Ca 8. McFarland, D. (1999) Animal Behaviour (3rd edition) Pitman Publishing Limited, London, UK. 9. Manning, A. and Dawkins, M. S. (2012) An Introduction to Animal Behaviour (6th edition) Ca 10. Alcock, J. (2005) Animal Behaviour (8th edition) Sinauer Associate Inc., USA. 11. McFarland, D. (1999) Animal Behaviour (3rd edition) Pitman Publishing Limited, London, UK. 12. Manning, A. and Dawkins, M. S. (2012) An Introduction to Animal Behaviour (6th edition) Ca 13. McFarland, D. (1999) Animal Behaviour (3rd edition) Pitman Publishing Limited, London, UK. 	

14. Manning, A. and Dawkins, M. S. (2012) An Introduction to Animal Behaviour (6th edition) Ca
15. Alcock, J. (2005) Animal Behaviour (8th edition) Sinauer Associate Inc., USA.
16. Sherman, P. W. and Alcock, J. (2013) Exploring Animal Behaviour (6th edition) Sinauer Associate Inc., Massachusetts, USA.
17. Dunlap, J. C.; Loros, J.J. and DeCoursey, P. J. (2009) Chronobiology Biological Timekeeping (1st edition) Sinauer Associates, Inc. Publishers, Sunderland, MA, USA.
18. Kumar, V. (2002). Biological Rhythms: Narosa Publishing House, Delhi/ Springer : Verlag, Germany. mbridge, University Press, UK
19. Colinvaux, P. A. (1993) Ecology (2nd edition) Wiley, John and Sons, Inc.
20. Krebs, C. J. (2001) Ecology (6th edition) Benjamin Cummings. 57
21. Odum, E.P., (2008) Fundamentals of Ecology. Indian Edition. Brooks/Cole.
22. Ricklefs, R.E. (2000) Ecology (5th edition) Chiron Press.
23. Southwood, T.R.E. and Henderson, P.A. (2000) Ecological Methods (3rd edition) Blackwell Sci.
24. Kendeigh, F C. (1984) Ecology with Special Reference to Animal and Man. Prentice Hall Inc.
25. Stiling, P. D. (2012) Ecology Companion Site: Global Insights and Investigations. McGraw Hill Education.

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
10. <https://www.sciencedirect.com/book/9781843342038/> open Access
11. <https://egyankosh.ac.in>
12. <https://Sciencedirect.com>
13. <https://Britannica.com> > science > animal :behaviour
14. <https://www.nontesonzoology.com> > animal behaviour
15. <https://www.biologyonline.com>
16. <https://www.sciencing.com> > Science > Biology > Ecology
17. <https://www2.hcmuf.edu.vn>
18. <https://www.researchgate.net>

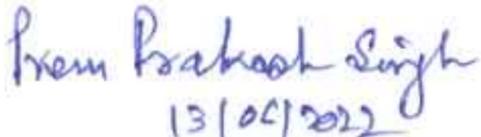
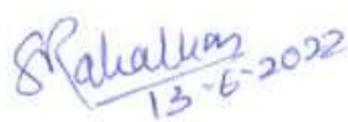
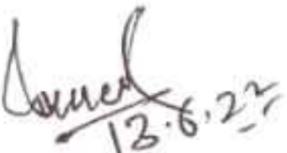
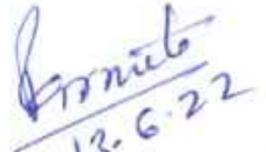
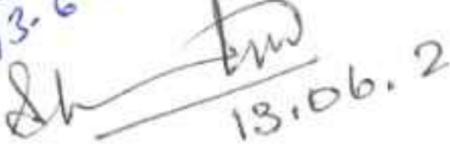
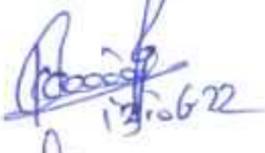
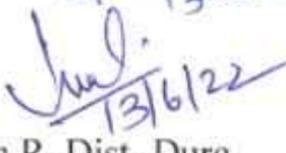
Part D: Assessment and Evaluation

University Exam(UE): Maximum Marks: 50 Marks

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DECLARATION

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13.06.22
11. Dr. Hema Kulkarni - Member -
Assistant Professor, Shahid Domeswar Sahu Govt. College, Jamgaon R. Dist -Durg 
13/6/22

Date : 13.06.2022.

Part A: Introduction			
Program: Certificate Course		Class: B.Sc. III rd Year	Year: 2024 Session: 2024-2025
1	Course Code	ZOOL – 6 T	
2	Course Title	Microbiology, Parasitology, Immunology and Applied Zoology	
3	Course Type	Theory	
4	Pre-requisite (if any)	No	
5	Course Learning Outcomes (CLO)	After completing this course, the students will be able to - <ul style="list-style-type: none"> • Understand causative agents, pathogenesis, diagnosis, prophylaxis, and chemotherapy for various bacterial, viral, protozoan, and helminthic diseases. • Understand the concept of immune mechanisms, their pathways, acquired immunity, hypersensitivity, and autoimmune disorders. • Understand the aquaculture techniques, their problems, and commercial viability. • Understand the techniques and commercial significance of apiculture, sericulture, and lac culture. • Understand the basic and technical skills related to dairy management, poultry, and vermicomposting. 	
6	Credit Value	4	
7	Total Marks	Max. Marks: 50	Min Passing Marks : 17

Part B: Content of the Course		
Total Periods: 60		
Unit	Topics	No. of Period
I	Microbiology and Parasitology : Bacterial diseases – Caused by <i>Salmonella typhi</i> , <i>Helicobacter pylori</i> and <i>Mycobacterium tuberculosis</i> with their pathogenesis, diagnosis, prophylaxis, and chemotherapy. Viral diseases – Hepatitis, influenza, AIDS, with their pathogenesis, diagnosis, prophylaxis, and chemotherapy. Protozoan diseases – Amoebiasis, Malaria, Trypanosomiasis, and Leishmaniasis with the life cycle of pathogen and possible treatments. Helminthic diseases – Schistosomiasis, Taeniasis, Ascariasis, and Filariasis with the life cycle of pathogen and possible treatment.	12
II	Immunology : Cells and organelles of the immune system. Characteristics of antigen, Antigenicity, Immunogenicity, Epitopes, Haptens, Adjuvant. Immunoglobulin : Classification, properties, and function of immunoglobulin. Antigen, and Antibody interaction. Humoral and cell-mediated immune response. The role of B and T cells in immunity. MHC complex, Hypersensitivity. Autoimmune disorders: Thyroid problem, Rheumatoid Arthritis . Monoclonal antibodies. Concept of vaccine.	12
III	Aquaculture : Prawn culture – Prawn culture in freshwater, its preservation, and processing. Pearl culture – Biology and technology followed (Fresh & Marine). Fish culture –Maintainance of fresh water fish farm and Breeding, Composite fish farming.	12
IV	Apiculture, Sericulture, Lac culture : Apiculture – types of the honey bee and culture technology. Lac culture – cultivation process with the life cycle of lac insect. Sericulture – types of silkworm and technology for mulberry silk worm culture. Economic values of Apiculture, Sericulture and Lac culture.	11
V	Dairy Management, Poultry farming, and Vermicomposting : Dairy Management : Techniques for dairy management; Cattle disease. Poultry – Types of breeds, rearing methods and diseases. Biology and rearing method of earthworm <i>Eisenia foetida/ Pharitima Posthuma</i> . The technology of Vermicompost production.	13
Keywords: Micro organism, Parasites, Immune System, Economic Zoology, Dairy Management, Poultry Management, Vermicomposting.		


 12.6.2022

Part C : Learning Resource

Text Books, Reference Books, Other Resources –

1. Jawetz, M., and Adelberg (2015) Medical Microbiology (27 th edition).
2. Chatterjee, K.D. (2015) Parasitology (13 th edition).
3. Goldsby, R.A.; Kindt, T.J. and Kuby, J. (2006) Immunology (6th edition).
4. Roitt, I.; Brostoff, J. and Male, D. (2012) Immunology (8th edition).
5. Shukla, G.S. and Upadhyaya, V.B. (1999:2000). Economic Zoology (Rastogi Publishers).
6. Mani, M.S. (2006). Insects, NBT, India.
7. Jabde, P.V. (2005) Text Book of Applied Zoology: Vermiculture, Apiculture, Sericulture, Lac culture.

E: Resources –

1. SWAYAM: [.https://swayam.gov.in/explorer?searchText](https://swayam.gov.in/explorer?searchText)
2. <https://academic.oup.com>
3. <https://medineplus.gov>
4. <https://ncin.nlm.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](https://www.sciencedirect.com/book/9781843342038/open%20Access)
10. <https://egyankosh.ac.in>

Part D: Assessment and Evaluation

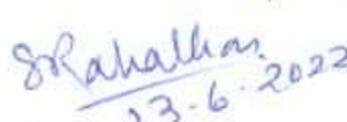
Maximum Marks, University exam. (UE) : : 50

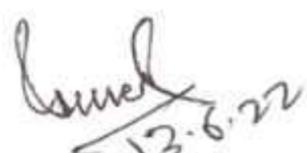
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Assistant Professor, Shahid Domeswar Sahu Govt. College, Jamgaon R. Dist -Durg 13/6/22

Date : 13.06.2022.

Part A: Introduction			
Program : Degree course	Class: B.Sc.III Year	Year -2024	Session :-2024-2025
1	Course code	ZOOL-3P	
2	Course Title	Lab course - 3	
3	Course Type	Practical	
4	Pre-Requisite(If Any)	No	
5	Course Learning Outcome (CLO)	<p>At The end of Course Students will be able to -</p> <ul style="list-style-type: none"> • Learn a wide range of practical techniques used to study animal behaviour. • Develop skills, concepts and experience to understand all aspects of animal behaviour. • Objectively understand and evaluate information about animal behaviour and ecology encountered in our daily lives. • Understand and be able to objectively evaluate the role of behaviour in the protection and conservation of animals in the wild. • Consider and evaluate behaviour of all animals, including humans, in the complex ecological world, including the urban environment. • Understand causative agents, pathogenesis, diagnosis, prophylaxis, and chemotherapy for various bacterial, viral, protozoan, and helminthic diseases. • Understand the concept of immune mechanisms, their pathways, acquired immunity, hypersensitivity, and autoimmune disorders. • Understand the aquaculture techniques, their problems, and commercial viability. • Understand the techniques and commercial significance of apiculture, sericulture, and lac culture. • Understand the basic and technical skills related to dairy management, poultry, and vermicomposting. 	
6	Credit Value	2	
7	Total marks	Maximum marks : 50 Minimum marks: 17	

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13.6.2022

Part : B Content of course

Total lecture-30

Tentative Practical List

Note :This is tentative list .The teacher concern can add per requirement

1. Orientation of an animal to light.
2. Chemical communication in ants.
3. Predatory behaviour of a carnivorous animal.
4. Nests and nesting habits of the birds and social insects
5. To study geotaxis behaviour in earthworm.
6. To study the phototaxis behaviour in insect larvae.
7. Study of circadian functions in humans (daily eating, sleep and temperature patterns).
8. Visit to Forest/ Wild life Sanctuary/Biodiversity Park/Zoological Park to study behavioural activities of
9. Making an ecosystem in a wide-mouthed bottle.
10. Constructing a food web by observing and collecting organisms from a given area.
11. Studying the impact of herbivore on plant species (planted in pots under specific conditions)
12. Estimation of the ratio of the producers and consumers.
13. Studying insect diversity in a habitat.
14. Study of permanent slides and specimens of parasitic protozoans and helminthes.
15. Pathological examination of sputum, blood, urine and stool.
16. Staining and identification of Gram positive and Gram negative bacteria.
17. RBC and WBC counting.
18. Identification of Blood group.
19. Demonstration of antigen-antibody interaction in gel.
20. Morphological characterization of common fish species.
21. Identification of two major carps – *Labeo rohita* and *Catla catla* and their life cycles.
22. Through charts/specimens- study of bees.
23. Worker honey bee with emphasis on leg modifications (through specimens/charts).
24. Life cycle of mulberry silkworm, *Bombyx mori* and tasar silkworm (model/chart/specimens).
25. External morphology and nomenclature of dairy animals.
26. Determination of the specific gravity of milk by using a mercury lactometer.
27. Test for good quality eggs (Floating test, cracking test) and for fertilized and unfertilized eggs (Light test, Cracking test).
28. External morphology of poultry birds (model).
29. Project report on visit to dairy farm and visit to Poultry farm (Poultry management).

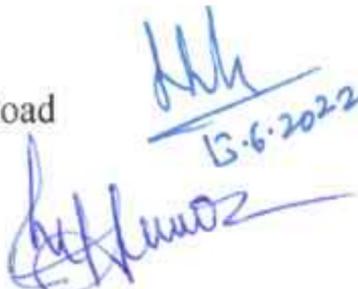
Part-C Learning Resource	
Text books, References, Books Other Resource :	
<ol style="list-style-type: none"> 1. Practical Ecology, Anmol Publications. 2. Practical Methods in Ecology and Environmental Science, <u>R. K. Trivedy, P. K. Goel, C. L. Trisal</u> Enviro Media Publications, 1987. 3. Ethology practical Vilmos Altbäcker Márta Gácsi András Kosztolányi Ákos Pogány Gabriella Lakatos Péter Pongrácz. 4. Animal Behaviour Reena Mathur Rastogi publication. 5. ANIMAL BEHAVIOUR Practical work and data response exercises for sixth form students Michael D. 6. Animal Cell Culture and Technology Michel butcher_Publisher : .Taylor & Francis 7. Our Animal Resources: Animals and Their Economic Importance Hardcover. 8. Publisher Holt, Rinehart, and Winston : 9. Practical Microbiology D.K. Maheshwari. 10. practical microbiology R.C. Dubey. 11. microbiology textbook. Dr Arora. 12. Microbiology: A Laboratory Manual - Book by James G. Cappuccino and Natalie Sherman. 13. Micro extremely Lecturio and sketchy rock's. 14. Lehninger – Biochemistry. 15. Kuby – immunology. 16. Ananthnarayan- medical Microbiology. 17. Tortora- for studying diseases caused by the normal flora and antibiotic classes. 18. Stanbury and Whittakar -fermentation Microbiology. 19. Genes by Lewis- for Genetics/ molecular biology and genetic engineering 20. Watson- Molecular biology. 21. Kooper - Cell biology. 	

Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
University exam (UE) : Maximum Marks: 50		
Internal Assessment:		
Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	Not Applicable

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