SADHU VASWANI (AUTONOMOUS)COLLEGE
SANT HIRDARAM NAGAR, BHOPAL

S.NO	COURSE INDEX
1	M.A (Hindi)
2	M.Com
3	M.Sc (Biotechnology)
4	M.Sc (Computer Application)
5	M.Sc (Chemistry)
6	M.Sc (Mathematics)
7	M.Sc (Physics)

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Class	:	M.A
Subject	:	हिन्दी साहित्य
Semester	:	I
Paper	:	I
Title of Paper	:	प्राचीन एवं मध्यकालीन काव्य तथा उसका इतिहास
Max. Marks	:	85 मुख्य परीक्षा, 15 आंतरिक परीक्षा
Course Code	:	HIN-2001

पाठ्यक्रम के परिणाम

CO1- भारत के प्राचीन एवं मध्यकालीन काव्य की समृध्द साहित्यिक पंरम्परा का ज्ञान करवाना।

CO2- विभिन्न काव्य धाराओं एवं कवियों का अध्ययन।

CO3- सामाजिक उत्थान में मध्यकालीन काव्य की भूमिका का ज्ञान

CO4- हिन्दी की विभिन्न बोलियों जैसे सधुक्कड़ी, अवधी, ब्रज आदि का अध्ययन

CO5- सहज सरल भाषा में अध्यात्म, दर्शन, नीति, सामाजिक व्यवहार एवं मानवीय प्रवृत्तीयों के अक्षय भण्डार का विंहगम अध्ययन।

Unit-1	व्याख्यांश 1. विद्यापति – 20 पद (विद्यापति, जयभारती प्रकाशन, इलाहाबाद) पद कमांक –1,4,5,7,8,11,12,14,15,16,20,22,23,26,27,28,31,35,36,39 2. कबीर – कबीर ग्रंथावली – डॉ0 श्यामसुंदर दास गुरूदेव को अंग (साखी कमांक 1 से 10), सुमिरण को अंग (साखी कमांक 1 से 10), विरह को अंग (साखी कमांक 1 से 10), ज्ञान – विरह को अंग (साखी कमांक 1 से 10), परचा को अंग (साखी कमांक 1 से 10) 3. जायसी– पदमावत, संपादक – आचार्य रामचंद्र शुक्ल पद कमांक :– 1,11,16,21,24,50,60,65,69,70, (दस पद) (मानसरोदक खण्ड एवं नागमती वियोग खण्ड)
Unit-2	विद्यापति, कबीर और जायासी से संबंधित आलोचनात्मक प्रश्न ।
Unit-3	प्राचीनकाल एवं मध्यकालीन काव्य (निर्गुणधारा) का इतिहास प्रमुख प्रवृत्तियॉ एवं रचनाकारों से संबंधित प्रश्न ।
Unit-4	द्रुतपाठ के कवि – चन्दबरदाई, अमीर खुसरो, रैदास, नामदेव से संबंधित लघुउत्तरीय प्रश्न ।
Unit-5	वस्तुनिष्ठ प्रश्न (संपूर्ण पाठ्यक्रम से)

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Class	:	M.A
Subject	:	हिन्दी साहित्य
Semester	:	I
Paper	:	II
Title of Paper	:	आधुनिक हिन्दी गद्य और उसका इतिहास
Max. Marks	:	85 मुख्य परीक्षा, 15 आंतरिक परीक्षा
Course Code	:	HIN-2002

पाठ्यक्रम के परिणाम

CO1- गद्य की विभिन्न विधाओं का अध्ययन

CO2- सृजनात्मक भाषा, विचारात्मक एवं भावात्मक अभिव्यक्ति क्षमता का विकास

CO3- स्कंद गुप्त एवं आषाढ़ का एक दिन नाटकों के अध्ययन के आधार से नाटक के तत्वों व रंगमंच के इतिहास का परिचय

CO4- प्रेमचंद की कालजयी रचना गोदान के अध्ययन के माध्यम से उपन्यास के तत्वों एवं ग्रामीण जीवन का परिचय।

CO5- द्रुतपाठ द्वारा विभिन्न गद्यकारों के व्यक्तित्व एवं कृतिव का परचिय।

व्याख्यांश :

निम्नलिखित रचनाओं से व्याख्यांश पूछे जाऐंगें ।

स्कंदगुप्त – जयशंकर प्रसाद, आधे–अधूरे – मोहन राकेश, गोदान प्रेमचन्द्र

Unit – 1	हिन्दी नाटक की विकास यात्रा एवं उसकी विविध प्रवृत्तियॉ
Unit – 2	स्कंद गुप्त एवं आधे–अधूरे से समीक्षात्मक प्रश्न
Unit – 3	हिन्दी उपन्यास की विकास यात्रा एवं उपन्यास की विविध प्रवृत्तियॉ
Unit – 4	गोदान से समीक्षात्मक प्रश्न
Unit – 5	लधुउत्तरीय प्रश्न – द्रुत पाठ में निर्धारित गद्यकारों से सम्बध्य दो लधुउत्तरीय प्रश्न होंगे । (1) नाटककार – भारतेन्दु हरीशचन्द्र, डॉ0 रामकुमार वर्मा, जगदीशचन्द्र माथुर, धर्मवीर भारती, लक्ष्मीनारायण लाल (2) उपन्यासकार – जैनेन्द्र, अमृतलाल नागर, निर्मल वर्मा, भीष्म शाहनी मुन्नू भण्डारी ।

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Subject	:	हिन्दी साहित्य
Semester	:	I
Paper	:	III
Title of Paper	:	भारतीय एवं पाश्चात्य काव्यशास्त्र
Max. Marks	:	85 मुख्य परीक्षा, 15 आंतरिक परीक्षा
Course Code	:	HIN-2003

पाठ्यक्रम के परिणाम

CO1- संस्कृत से हिन्दी तक निरंत प्रवाहमान भाररीय काव्य शास्त्र की पंरपरा से विद्यार्थियों को अवगत कराना।

CO2- काव्य रचना से रस अलंकार, रीति वक्रोक्ति, ध्वनि, औचित्य, सिध्दांतों के महत्व से परिचित करवाना।

CO3- ध्वनि सिद्धांत की पंरपरा से विद्यार्थियों को अवगत कराना।

CO4- हिन्दी कवि – आचार्यो का काव्य शास्त्रीय चिंतन से विद्यार्थियों को अवगत कराना।

CO5- आलोचनात्मक प्रवृत्ति का विकास जिसमें विद्यार्थियों में किसी भी रचना के सर्वागींण अध्ययन की क्षमता विकसित हो सकें।

Unit-1	संस्कृत काव्य शास्त्र : काव्य – लक्ष्मण, काव्य – हेतु काव्य – प्रयोजन काव्य के प्रकार । रस – सिद्धांत : रस का स्वरूप, रस–निष्पत्ति, रस के अंग, साधारणीकरण, सहृदय की अवधारणा। अंलकार सिद्धांत : मूल स्थापनाएं, अलंकारों का वर्गीकरण।
Unit-2	रीति–सिद्धांत : रीति की अवधारण, काव्य–गुण, रीति एवं शैली, रीति सिद्धांत की प्रमुख थापनाऍं। वक्रोक्ति सिद्धांत : वक्रोक्ति की अवधारणा, वक्रोक्ति के भेद, वक्रोक्ति एवं अभिव्यंजनावाद।
Unit-3	ध्वनि सिद्धांत : ध्वनि का स्वरूप, ध्वनि–सिद्धांत की प्रमुख स्थापनाऍं, ध्वनि काव्य के प्रमुख भेद, गुणीभूत–व्यंग्य, चित्रकाव्य। औचित्य सिद्धांत : प्रमुख स्थापनाएं, औचित्य के भेद।
Unit-4	हिन्दी कवि – आचार्यो का काव्य शास्त्रीय चिंतन : लक्षण–काव्य परंपरा एवं कवि–शिक्षा
Unit-5	हिन्दी आलोचना की प्रमुख प्रवृत्तियॉं : शास्त्रीय व्यक्तिवादी/सौष्ठव वादी, ऐतिहासिक, तुलनात्मक, मनोविश्लेषणवादी, सौंदर्यशास्त्रीय शैलीवैज्ञानिक और समाजशास्त्रीय

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Class : M.A
Subject : हिन्दी साहित्य
Semester : I
Paper : IV
Title of Paper : प्रयोजनमूलक हिन्दी
Max. Marks : 85 मुख्य परीक्षा, 15 आंतरिक परीक्षा
Course Code : HIN-2004

पाठ्यक्रम के परिणाम

CO1- कामकाजी हिन्दी के विभिन्न रूपों का ज्ञान

CO2- कार्यालयीन हिन्दी के प्रकार्यो का अभ्यास

CO3- परिभाषिक शब्दावली के महत्व एवं प्रयोग का ज्ञान

CO4- हिन्दी कम्प्यूटिंग का अध्ययन एवं अभ्यास

CO5- हिन्दी पत्रकारिता के विभिन्न स्वरूपों का अध्ययन एवं अभ्यास।

Unit1-	कामकाजी हिन्दी – 1 हिन्दी के विभिन्न रूप– सर्जनात्मक भाषा, संचार भाषा, राष्ट्र भाषा, राजभाषा, माध्यम भाषा, मातृ भाषा । 2 कार्यालयीन हिन्दी, राज भाषा के प्रमुख प्रकार्य । प्रारूपण, पत्र–लेखन संक्षेपण, पल्लवन, टिप्पणी
Unit2-	पारिभाषिक शब्दावली – स्वरूप एवं महत्व, पारिभाषिक शब्दावली के उदहरण एवं उनका व्यावहारिक प्रयोग ।
Unit3-	हिन्दी कम्प्यूटिंग – 1. कम्प्यूटर :परिचय, रूपरेखा, उपयोग तथा वेब पब्लिशिंग का परिचय । 2. इंटरनेट, संपर्क उपकरणों का परिचय, प्राथमिक रख–रखाव एवं इंटरनेट समय मितव्ययिता के सूत्र । 3. वेब पब्लिकेशन । 4. इंटरनेट एक्सप्लोरर अथवा नेट स्केप । 5. लिंक, ब्राउजिंग पोर्टल, ई0 मेल भेजना / प्राप्त करना, हिन्दी के प्रमुख इंटरनेट प्वाइंट, डाउनलोडिंग एवं अपलोडिंग के साफ्टवेयर, पैकेज ।
Unit4-	पत्रकारिता अवधारणा, स्वरूप एवं विभिन्न प्रकार । 2. हिन्दी पत्रकारिता का संक्षिप्त इतिहास । 3. समाचार लेखन–कला । 4. संपादन के आधार भूत तत्व । 5. व्यावहारिक प्रूफ शोधन ।
Unit5-	पत्रकारिता : शीर्षक की संरचना, लीड, इण्ट्रो का शीर्षक संपादन 2. संपादकीय लेखन 3. पृष्ठ सज्जा 4. साक्षात्कार पत्रकार वार्ता एवं प्रेस प्रबंधन 5. प्रमुख प्रेस कानून एवं आचार – संहिता

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Subject	:	हिन्दी साहित्य
Semester	:	II
Paper	:	I
Title of Paper	:	प्राचीन एवं मध्यकालीन काव्य तथा उसका इतिहास
Max. Marks	:	85 मुख्य परीक्षा, 15 आंतरिक परीक्षा
Course Code	:	HIN-2005

पाठ्यक्रम के परिणाम

CO1- प्राचीन एवं मध्यकालीन हिन्दी कविता में ब्रज तथा अवधी भाषा के प्रमुख कवियों की कविताओं का आस्वादन।

CO2- कविता के भावात्मक एवं कलात्मक सौन्दर्य का ज्ञान।

CO3- भक्ति काल एवं रीतिकालीन युग के विभिन्न काव्य प्रवृत्तियों का ज्ञान।

CO4- मुख्य उपबोलियों में रचित हिन्दी कविता के भावात्मक एवं कलात्मक सौन्दर्य का ज्ञान विद्यार्थियों को कराना।

CO5- हिन्दी भाषा के विकास क्रम के प्रति विद्यार्थियों को सजग तथा सचेत करना।

इकाई–1	व्याख्यांश : सूरदास : भ्रमरगीत सार – संपादक रामचंद्र शुक्ल, पद कमांक 51 से 100। तुलसीदास : रामचरितमानस – अयोध्या काण्ड, दोहा, कमांक 51 से 100। बिहारी : बिहारी रत्नाकर – संपादक जगन्नाथ दास रत्नाकर, दोहा कमांक 1 से 50।
इकाई–2	भक्तिकाल की संत काव्य परम्परा से प्रश्न।
इकाई–3	सूरदास, तुलसीदास से संबंधित निबंधात्मक प्रश्न।
इकाई–4	रीतिकाल का इतिहास, प्रवृत्तियां, विशेषताएं एवं बिहारी पर निबंधात्मक प्रश्न।
इकाई –5	दुतपाठ से कवि – नन्ददास, मीराबाई, घनानंद पाद्माकर और केशव से संबंधित लघुउत्तरीय प्रश्न।

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Semester	:	II
Paper	:	II
Title of Paper	:	आधुनिक हिन्दी गद्य और उसका इतिहास
Max. Marks	:	85 मुख्य परीक्षा, 15 आंतरिक परीक्षा
Course Code	:	HIN-2006

पाठ्यक्रम के परिणाम

CO1- गद्य की विभिन्न विधाओं का अध्ययन

CO2- सृजनात्मक भाषा, विचारात्मक एवं भावात्मक अभिव्यक्ति क्षमता का विकास

CO3- स्कंद गुप्त एवं आषाढ़ का एक दिन नाटकों के अध्ययन के आधार से नाटक के तत्वों व रंगमंच के इतिहास का परिचय

CO-4 प्रेमचंद की कालजयी रचना गोदान के अध्ययन के माध्यम से उपन्यास के तत्वों एवं ग्रामीण जीवन का परिचय।

CO5- द्रुतपाठ द्वारा विभिन्न गद्‌यकारों के व्यक्तित्व एवं कृतिव का परचिय।

Unit-1	व्याख्यांश 1–बाणभट्‌ट की आत्मकथा–हजारीप्रसाद द्विवेदी 2–निबंध– 1. देश सेवा का महत्व–बालकृष्ण भट्‌ट 2.म्युनिसीपलेटी के कारनामे–महावीर प्रसाद द्विवेदी 3.काब्य में लोकमंगल की साधानावस्था–आचार्य रामचन्द्र शुक्ल 4.अशोक के फूल–हजारीप्रसाद द्विवेदी 5.मेरे राम का मुकुट भीम रहा है–विद्यानिवास मिश्र 6.प्रिया नीलकंठी–कुबेरनाथ राय 7.पगडण्डियों का जमाना– हरिशंकर परसाई 3– निर्धारित कहानियाँ – 1. उसने कहा था (चन्द्रधर शर्मा गुलेरी) 2. पूस की रात (प्रेमचंद) 3. गुण्डा (जयशंकरप्रसाद) 4. अपना अपना भाग्य (जैनेंद्र कुमार) 5. लंदन की एक रात (निर्मल वर्मा) 6. राजा निरबंसिया (कमलेश्वर) 7. सिक्का बदल गया (कृष्णा सोबती) 4– पथ के साथी – महादेवी वर्मा
Unit-2	बाणभट्‌ट की आत्मकथा, निर्धारित निबंध, कहानी एवं पथ के साथी से समीक्षात्मक प्रश्न।
Unit-3	हिन्दी, कहानी, निबन्ध एवं अन्य गद्य विधओं (रेखाचित्र, संस्मरण, आत्मकथा, जीवनी यात्रावृत्तांत, व्यंग्य आदि) के इतिहास प्रवृत्तियाँ और प्रमुख रचनाकारों से सम्बद्ध निबन्धात्मक प्रश्न।
Unit-4	हिन्दी, कहानी , निबंध एवं अन्य गद्य विधाओं (रेखचित्र, संस्मरण, आत्मकथा, जीवनी, यात्रावृत्तांत, व्यंग आदि) के इतिहास प्रवृत्तियां और प्रमुख रचनाकारों से सम्बध्द निबन्धात्मक प्रश्न
Unit-5	लघुउत्तरीय प्रश्न द्रुतपाठ हेतू निर्धारित निम्नलिखित गद्यकारों पर केंद्रित दो लघुउत्तरीय प्रश्न पूछे जाऐंगे। निबन्धकार – भारतेंदु हरिश्चंद्र, प्रताप नारायण मिश्र, बालमुकुन्द गुप्त, सरदार पूर्ण सिंह। कहानीकार– अज्ञेय, यशपाल, फणीश्वरनाथ रेणु, भीष्म साहनी, अमरकांत स्फुट ग्रंथ – 1. अमृतराय (कलम का सिपाही) 2. शिवप्रसादसिंह उत्तर योगी 3. हरिवंशराय बच्चन, (क्या भूलूं क्या याद करू), 4. राहुल सांकृत्यायन (घुमक्कड़ शास्त्र), 5. माखनलाल चतुर्वेदी, साहित्य देवता)

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Semester	:	II
Paper	:	III
Title of Paper	:	भारतीय एवं पाश्चात्य काव्य शास्त्र
Max. Marks	:	85 मुख्य परीक्षा, 15 आंतरिक परीक्षा
Course Code	:	HIN-2007

पाठ्यक्रम के परिणाम

CO-1 संस्कृत से हिन्दी तक निरंत प्रवाहमान भाररीय काव्य शास्त्र की पंरपरा से विद्यार्थियों को अवगत कराना।

CO-2 काव्य रचना से रस अलंकार, रीति वक्रोक्ति, ध्वनि, औचित्य, सिध्दांतों के महत्व से परिचित करवाना।

CO-3 आलोचनात्मक प्रवृत्ति का विकास जिसमें विद्यार्थियों में किसी भी रचना के सर्वागींण अध्ययन की क्षमता विकसित हो सकें।

CO-4 सहज सरल भाषा में नीति, सामाजिक व्यवहार एवं मानवीय प्रवृत्तीयों का अध्ययन।

CO-5 आधुनिक समीक्षा की विशिष्ट प्रवृत्तिया का अध्ययन।

Unit-1	प्लेटो : काव्य – सिद्धांत अरस्तू : अनुकरण – सिद्धांत, त्रासदी– विवेचन, विरेचन, विरेचन सिद्धांत लोंजाइनस : उदात्त की अवधारणा
Unit-2	ड्राइडन के काव्य सिद्धांत वड्र्सवर्थ : काव्य – भाषा का सिद्धांत कालरिज : कल्पना – सिद्धांत और ललित – कल्पना
Unit-3	मैथ्यू आर्नल्ड : आलोचना का स्वरूप और प्रकार्य टी.एस.इलियट : परंपरा की परिकल्पना और वैयक्तिक प्रज्ञा, निवैर्यक्तिकता का सिद्धांत, वस्तुनिष्ठ समीकरण, संवेदनशीलता का असाहचर्य। आई.ए.रिच्र्डस : रागात्मक अर्थ। संवेगों का संतुलन, व्यावहारिक आलोचना।
Unit-4	मार्क्सवाद, मनोविश्लेषण तथा अस्तित्ववाद।
Unit-5	आधुनिक समीक्षा की विशिष्ट प्रवृत्तियाँ : संरचनावाद, शैलीविज्ञान, विखंडनवाद, उत्तर अधुनिकतावाद।

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Semester	:	II
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Title of Paper	:	प्रयोजनमूलक हिन्दी
Max. Marks	:	85 मुख्य परीक्षा, 15 आंतरिक परीक्षा
Course Code	:	HIN-2008

पाठ्यक्रम के परिणाम

CO-1 **कामकाजी हिन्दी के विभिन्न रूपों का ज्ञान**
CO-2 **कार्यालयीन हिन्दी के प्रकार्यो का अभ्यास**
CO-3 **परिभाषिक शब्दावली के महत्व एवं प्रयोग का ज्ञान**
CO-4 **हिन्दी कम्प्यूटिंग का अध्ययन एवं अभ्यास**
CO-5 **हिन्दी पत्रकारिता के विभिन्न स्वरूपों का अध्ययन एवं अभ्यास**

विवरण

इकाई 1	मीडिया लेखन 1. जनसंचार – प्रौद्योगिकी एवं चुनौतियाँ 2. विभिन्न जनसंचार माध्यामों का स्वरू – मुद्रण, श्रव्य, दृश्य–श्रव्य, इंटरनेट। 3. श्रृव्य माध्यम – रोडियो, 4. मैखिक भाषा की प्रकृति, समाचार लेखन एवं वाचन, रोडियो नाटक, उद्घोषणा लेखन, विज्ञापन लेखन, फीचर तथा रिपोर्ताज
इकाई 2	1. दृश्य–श्रव्य माध्यम (फिल्म, टेलीविजन, विडियों,) दृश्य माध्यमों में भाषा की प्रकृति, दृश्य एवं श्रव्य साम्रगी का सामंजस्य पार्श्व वाचन, (वायस ओवर) पटकथ लेखन, टेलीड्रामा, डॉक्यू ड्रामा, संवाद–लेखन, साहित्य की विधाओं का दृश्य–माध्यमों का रूपान्तंरण, विज्ञापन की भाषा। 2. इंटरनेट साम्रगी सृजन – (Content creation)
इकाई 3	1. आनुवाद का स्वरूप, क्षेत्र, प्रक्रिया एवं प्रविधि। 2. हिन्दी की प्रयोजनीयता में अनुवाद की भूमिका। 3. कार्यलयीन हिन्दी और अनुवाद। 4. जनसंचार माध्यमों का अनुवाद। 5. विज्ञापन में अनुवाद। 6. वैचारिक साहित्य का अनुवाद।
इकाई 4	1. वाणिज्यिक अनुवाद। 2. वैज्ञानिक, तकनीकी तथा प्रौद्योमिकी क्षेत्र में अनुवाद। 3. विधि– साहित्य की हिन्दी और अनुवाद। 4. व्यावहारिका अनुवाद अभ्यास। 5. कार्यलयीन अनुवाद :– कार्यालयीन एवं प्रशासनिक शब्दावली, प्रशासनिक, प्रयुन्तियॉ, पदनाम, विभाग, आदि। 6. पत्रों के अनुवाद। 7. पदनामों, अनुभागों, दस्तावेजों, प्रतिवेदनो के अनुवाद
इकाई 5	1. बैंक साहित्य के अनुवाद का अभ्यास 2. विधि साहत्य के अनुवाद का अभ्यास 3. साहित्यि अनुवाद के सिद्धांत एवं व्यवहार : कविता, कहानी, नाटक 4. सारानुवाद 5. दुभाषिया प्रविधि 6. अनुवाद पुनरीक्षण एवं मूल्यांक

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Semester	:	III
Paper	:	I
Title of Paper	:	आधुनिक हिन्दी काव्य ओर उसका इतिहास
Max. Marks	:	85 मुख्य परीक्षा, 15 आंतरिक परीक्षा
Course Code	:	HIN-2009

पाठ्यक्रम के परिणाम

CO-1 साहित्य कृतियों के माध्यम से साहित्य के शिल्प और सौंदर्य से परिचित
CO-2 समिक्षण क्षमता का विकास
CO-3 छायावाद की प्रमुख प्रवृत्तियों से परिचय
CO-4 विभिन्न रचनाकारों की रचनाओं आकलन एवं आस्वादन
CO-5 द्रुतपाठ द्वारा विभिन्न गद्यकारों के व्यक्तित्व एवं कृतिव का परचिय।

इकाई –1	व्याख्यांश : (1) मैथिलीशरण गुप्त – साकेत का नवम् सर्ग, (2) जयशंकर प्रसाद – कामायनी चिंता, श्रद्धा, इडा सर्ग
इकाई –2	मैथिलीशरण गुप्त से संबंधित समीक्षात्मक प्रश्न
इकाई –3	जयशंकर प्रसाद से संबंधित समीक्षात्मक प्रश्न
इकाई –4	आधुनिक हिन्दी काव्य (छायावाद तक) की प्रमुख प्रवृत्तियां
इकाई –5	द्रुत पाठ के निर्धारित कवि जगन्नाथ दास रत्नाकार, अयोध्या सिंह उपाध्याय, हरिऔध, महादेवी वर्मा ओर बालकृष्ण शर्मा नवीन

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Subject	:	हिन्दी साहित्य
Semester	:	III
Paper	:	III
Title of Paper	:	हिन्दी साहित्य का इतिहास
Max. Marks	:	85 मुख्य परीक्षा, 15 आंतरिक परीक्षा
Course Code	:	HIN-2011

पाठ्यक्रम के परिणाम

CO-1 हिन्दी साहित्य के इतिहास के लेखन परंपरा नामकरण एवं युगीन पृष्ठभूमि से परिचय।
CO-2 हिन्दी साहित्य के आदिकाल की पृष्ठ भूमि साहित्य प्रवृत्तियाँ एवं काव्य धारा से परिचय।
CO-3 पूर्व मध्यकाल भक्तिकाल के ऐतिहासिक पृष्ठभूमि सांस्कृतिक चेतना एवं विभिन्न काव्य धाराएँ उनके कवियों के काव्य सौन्दर्य का परिचय।
CO-4 राम और कृष्ण काव्य के प्रमुख कवियों की कृतियों का आस्वादन एवं ररचनागत वैशिष्ट् से परिचय।
CO-5 उत्तर मध्यकाल के ऐतिहासिक पृष्णभूमि से परिचय।

इकाई –1	हिन्दी साहित्य के इतिहास लेखन की परम्परा और साहित्येतिहास के पुनर्लेखन की समस्याएं
इकाई –2	हिन्दी साहित्य के आदिकाल की पृष्ठभूमि, साहित्यिक प्रवृत्तियां, काव्यधाराएं, गद्य साहित्य, प्रतिनिधि रचनाकार और इनकी रचनाएं
इकाई –3	पूर्व मध्यकाल, भक्तिकाल की ऐतिहासिक पृष्ठीभूमि, सांस्कृतिक चेतना एवं भक्ति आन्दोलन, विभिन्न काव्य धाराएं तथा उनका विश्लेषण, प्रमुख निर्गुण सन्त कवि और प्रमुख सूफी कवियों का अवदान।
इकाई –4	राम और कृष्ण काव्य : प्रमुख कवि और उनका रचनागत वैशिष्ट्य
इकाई –5	उत्तर मध्यकाल रीतिकाल की ऐतिहासिक पृष्ठभूमि , काल सीमा और नामकरण, विविध धाराएं रितिबद्ध, रीति सिद्ध, रीतिमुक्त प्रवृत्तियां और विशेषताएं

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Semester	:	III
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Title of Paper	:	कथाकार प्रेमचन्द
Max. Marks	:	85 मुख्य परीक्षा, 15 आंतरिक परीक्षा
Course Code	:	HIN-2012

पाठ्यक्रम के परिणाम

CO-1 मुंशी प्रेमचन्द का साहित्य यथार्थ परक और जीवंत है।
CO-2 प्रेमचन्द का साहित्य हमारे जीवन को स्वाभाविक और स्वाधीन बनाता है। जिससे मन का संस्कार बनता है। यही साहित्य का उददे्श्य है ।
CO-3 प्रेमचंद ने साहित्य संबंधी मूल समस्या को इंगित किया एवं नए और पुराने जमाने की चेतना के फर्क को समझाया।
CO-4 पुरानी और नई चेतना में फर्क बताना आधुनिकयुग के साहित्य की प्रवृत्तियों से परिचय।
CO-5 भाषा साधन है साध्य नही, जिस कारण हिन्दुस्तानी भाषा का निर्माण किया ।

इकाई –1	गोदान, उपन्यास कहानी बुढ़ी काकी, बडे भाई साहब, शंतरज के खिलाड़ी
इकाई –2	प्रेमचन्द्र युगीन परिवेश
इकाई –3	हिन्दी उपन्यास परम्परा और प्रेमचन्द
इकाई –4	हिन्दी कहानी उद्‌भव, विकास और प्रेमचंद
इकाई –5	द्रुतपाठ– विश्वम्मभर नाथ शर्मा कौशिक वेचन शर्मा उग्र, भगवती प्रसाद बाजपेयी, वृंदावनलाला वर्मा

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Class	:	M.A
Subject	:	हिन्दी साहित्य
Semester	:	III
Paper	:	II
Title of Paper	:	भाषा विज्ञान एवं हिन्दी भाषा
Max. Marks	:	85 मुख्य परीक्षा, 15 आंतरिक परीक्षा
Course Code	:	HIN-2010

पाठ्‌यक्रम के परिणाम

CO-1 भाषा और भाषा विज्ञान से परिचय

CO-2 स्वन प्रक्रिया स्वरूप और शाखाओं से परिचय
CO-3 भाषा में व्याकरण के महत्व का परिचय
CO-4 साहित्य के अध्ययन में भाषा विज्ञान के अंगो की उपयोगिता से परिचय।
CO-5 भाषा और भाषा विज्ञान की शाखाओं से परिचय

इकाई –1	भाषा और भाषा विज्ञान – भाषा की परिभाषा और अभिलक्षण, भाषा व्यवस्था और भाषा व्यवहार, भाषा संरचना और भाषिक प्रकार्य, भाषा विज्ञान स्वरूप
इकाई –2	स्वन प्रक्रिया – स्वरूप और शाखाएं, वागयंत्र और उनके कार्य स्वनिम की अवधारणा – स्वनों का वर्गीकरण, स्वन गुण स्वनिक–परिवर्तन
इकाई –3	व्याकरण – रूप विज्ञान का स्वरूप, रूपिम की अवधारण। वाक्य की अवधारणा – वाक्य के भेद – वाक्य विश्लेषण – निकटस्थ अव्यय विश्लेषण गहन संरचना और बाह्‌य संरचना
इकाई –4	अर्थ विज्ञान – अर्थ की अवधारण। शब्द और अर्थ का संबंध। अर्थ प्राप्ति के साधन और अर्थ परिवर्तन
इकाई –5	साहित्य और भाषा विज्ञान – साहित्य में अध्ययन में भाषा विज्ञान के अंगो की उपयोगिता।

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Class	:	M.A
Subject	:	हिन्दी साहित्य
Semester	:	IV
Paper	:	I
Title of Paper	:	आधुनिक हिन्दी काव्य और उसका इतिहास
Max. Marks	:	85 मुख्य परीक्षा, 15 आंतरिक परीक्षा
Course Code	:	HIN-2013

पाठ्यक्रम के परिणाम

CO-1 साहित्य कृतियों के माध्यम से साहित्य के शिल्प और सौंदर्य से परिचित

CO-2 समिक्षण क्षमता का विकास

CO-3 छायावाद की प्रमुख प्रवृत्तियों से परिचय

CO-4 सहज सरल भाषा में अध्यात्म, दर्शन, नीति, सामाजिक व्यवहार एवं मानवीय प्रवृत्तीयों के अक्षय भण्डार का विंहगम अध्ययन।

CO-5 विभिन्न रचनाकारों की रचनाओं आकलन एवं आस्वादन

इकाई–1	पाठ्य विषयः 1. सुमित्रानंदन पन्त – परविर्तन, नौका विहार, एकतारा 2. सूर्यकांत त्रिपाठी निराला – राम की शक्ति पूजा, कुकुरमुत्ता 3. संच्चिदानंद हीरानंद – वात्स्यायन अज्ञेय –नदी के द्वीप, सरस्वती पुत्र असाध्यवीणा 4. गजानन माधव मुक्तिबोध – ब्रह्म राक्षस, भूल गलती सुमित्रानंदन पन्त, सूर्यकांत त्रिपाठी निराला, अज्ञेय एवं मुक्तिबोध की गविताओं से व्याख्यांश
इकाई –2	आधुनिक हिन्दी काव्य (छायावाद तक) की प्रमुख प्रवृत्तियॉं, इतिहास एवं प्रमुख कवि
इकाई–3	छायावादोत्तर काव्य की प्रमुख प्रवृत्तियां, इतिहास और प्रमुख कवि
इकाई–4	निर्धारित कवियों पर समीक्षात्मक प्रश्न
इकाई–5	द्रुत पाठ – रामधारी सिंह दिनकर, हरिवंशराय बच्चन, त्रिलोचन, भवानी प्रसाद मिश्र, नरेश मेहता से लघुउत्तरीय प्रश्न

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Subject	:	हिन्दी साहित्य
Semester	:	IV
Paper	:	III
Title of Paper	:	हिन्दी साहित्य का इतिहास
Max. Marks	:	85 मुख्य परीक्षा, 15 आंतरिक परीक्षा
Course Code	:	HIN-2015

पाठ्यक्रम के परिणाम

CO-1 हिन्दी साहित्य के इतिहास के लेखन परंपरा नामकरण एवं युगीन पृष्ठभूमि से परिचय।

CO-2 हिन्दी साहित्य के आदिकाल की पृष्ठ भूमि साहित्य प्रवृत्तियाँ एवं काव्य धारा से परिचय।

CO-3 पूर्व मध्यकाल भक्तिकाल के ऐतिहासिक पृष्ठभूमि सांस्कृतिक चेतना एवं विभिन्न काव्य धाराएँ उनके कवियों के काव्य सौन्दर्य का परिचय।

CO-4 राम और कृष्ण काव्य के प्रमुख कवियों की कृतियों का आस्वादन एवं ररचनागत वैशिष्ट् से परिचय।

CO-5 उत्तर मध्यकाल के ऐतिहासिक पृष्णभूमि से परिचय।

इकाई–1	आधुनिक काल : आधुनिक काल की सामाजिक, राजनीतिक, आर्थिक एवं सांस्कृतिक पृष्ठभूमि, सन् 1857 ई. का प्रथम स्वाधीनता संग्राम और पुनर्जागरण, भारतेन्दु युग – प्रमुख साहित्यकार, रचनाएं और साहित्यिक विशेषताएं
इकाई –2	द्विवेदी युग : प्रमुख साहित्यकार, रचनाएं और साहित्यिक विशेषताएं । हिन्दी स्वच्छन्दतावादी चेतना का अक्रिम विकास, छायावादी काव्य, प्रमुख साहित्यकार, रचनाएं और साहित्यिक विशेषताएं
इकाई–3	उत्तर छायावाद की विविध प्रवृत्तियां : प्रगतिवाद, प्रयोगवाद, नयी कविता । प्रमुख साहित्यकार, रचनाएं और साहित्यिक विशेषताएं
इकाई–4	हिन्दी गद्य की प्रमुख विधाएं, कहानी, उपन्यास, नाटक निबंध
इकाई–5	संस्मरण रेखाचित्र जीवनी, आत्मकथा का विकास । हिन्दी आलोचना का उद्‌भव एवं विकास । स्त्री विमर्श और दलित विमर्श का परिचय

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Class	:	M.A
Subject	:	हिन्दी साहित्य
Semester	:	IV
Paper	:	IV
Title of Paper	:	कथाकार प्रेमचन्द
Max. Marks	:	85 मुख्य परीक्षा, 15 आंतरिक परीक्षा
Course Code	:	HIN-2016

पाठ्यक्रम के परिणाम

CO-1 मुंशी प्रेमचन्द का साहित्य यथार्थ परक और जीवंत है।

CO-2 प्रेमचन्द का साहित्य हमारे जीवन को स्वाभाविक और स्वाधीन बनाता है। जिससे मन का संस्कार बनता है। यही साहित्य का उदद्देश्य है ।

CO-3 प्रेमचंद ने साहित्य संबंधी मूल समस्या को इंगित किया एवं नए और पुराने जमाने की चेतना के फर्क को समझाया।

CO-4 पुरानी और नई चेतना में फर्क बताना आधुनिकयुग के साहित्य की प्रवृत्तियों से परिचय।

CO-5 भाषा साधन है साध्य नही, जिस कारण हिन्दुस्तानी भाषा का निर्माण किया ।

इकाई – 1	व्यांख्यांश गबन रंगभूमि कर्मभूमि कहानी – ठाकुर का कुआं – पचं परमेश्वर मंत्र, कफन, ईदगाह, पूस की रात, दो बैलो की कथा नमक का दरोगा, कजाकी, सदगति ।
इकाई – 2	प्रेमचन्द जीवन एवं रचना यात्रा : उपन्यास, कहानी, पत्रकारिता ।
इकाई – 3	प्रेमचन्द के पाठ्य उपन्यासों की समीक्षा ।
इकाई – 4	प्रेमचन्द के पाठ्य कहानियों की समीक्षा ।
इकाई – 5	द्रुतपाठ – जेनेन्दे कुमार, यशपाल, भगवतीचरण वर्मा, अमृतलाला नागर ।

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Class : M.A
Subject : हिन्दी साहित्य
Semester : IV
Paper : II
Title of Paper : भाषा विज्ञान एवं हिन्दी भाषा
Max. Marks : 85 मुख्य परीक्षा, 15 आंतरिक परीक्षा
Course Code : HIN-2014

पाठ्यक्रम के परिणाम

CO-1 भाषा और भाषा विज्ञान से परिचय
CO-2 स्वन प्रक्रिया स्वरूप और शाखाओं से परिचय
CO-3 भाषा में व्याकरण के महत्व का परिचय
CO-4 साहित्य के अध्ययन में भाषा विज्ञान के अंगो की उपयोगिता से परिचय।
CO-5 हिन्दी कम्प्यूटिंग का अध्ययन एवं अभ्यास

इकाई–1	हिन्दी की ऐतिहासिक पृष्ठभूमि – प्राचीन भारतीय आर्य भाषाएं – वैदिक तथा लौकिक संस्कृति और उनकी विशेषताएं । मध्यकालीन भारतीय आर्य भाषाएं – पालि, प्राकृत – शौरसेनी अर्ध माधधी, अपभ्रंश और उनकी विशेषताएं । आधुनिक भारतीय आर्य भाषाएं और उनका वर्गीकरण
इकाई –2	हिन्दी का भौगोलिक विस्तार : हिन्दी की उपभाषाएं, पश्चिमी हिन्दी, पूर्वी हिन्दी, राजस्थानी बिहारी तथा पहाड़ी और उनकी बोलियां । खड़ी बोली, ब्रज और अवधी की विशेषताएं
इकाई–3	हिन्दी का भाषिक स्वरूप – हिन्दी की स्वनिम व्यवस्था – खंडय् खंडेतर । हिन्दी शब्द – रचना, उनसर्ग, प्रत्तय, समास । रू॰ रचना – लिंग, वचन और कारक – व्यवस्था के संदर्भ में, हिन्दी के संज्ञा, सर्वनाम, विशेषण और क्रिया रूप । हिन्दी वाक्य रचना पदक्रम और अन्विति
इकाई–4	हिन्दी के विविध रूप : संपर्क भाषा राष्ट्र भाषा, रास भाषा के रूप में हिन्दी, माध्यम – भाषा, संचार – भाषा, हिन्दी की सवैधानिक स्थिति
इकाई–5	हिन्दी में कम्प्यूटर सुविधाएं : आंकड़ा – संसाधन और शब्उ संसाधन, वर्तनी – शोधक मशीनी अनुवाद, हिन्दी भाषा – शिक्षण, देवनागरी लिपि – विशेषताएं और मानकीकरण

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Class	:	M.A
Subject	:	हिन्दी साहित्य
Semester	:	IV
Paper	:	III
Title of Paper	:	हिन्दी साहित्य का इतिहास
Max. Marks	:	85 मुख्य परीक्षा, 15 आंतरिक परीक्षा
Course Code	:	HIN-2015

पाठ्यक्रम के परिणाम

CO-1 हिन्दी साहित्य के इतिहास के लेखन परंपरा नामकरण एवं युगीन पृष्ठभूमि से परिचय।

CO-2 हिन्दी साहित्य के आदिकाल की पृष्ठ भूमि साहित्य प्रवृत्तियाँ एवं काव्य धारा से परिचय।

CO-3 पूर्व मध्यकाल भक्तिकाल के ऐतिहासिक पृष्ठभूमि सांस्कृतिक चेतना एवं विभिन्न काव्य धाराएँ उनके कवियों के काव्य सौन्दर्य का परिचय।

CO-4 राम और कृष्ण काव्य के प्रमुख कवियों की कृतियों का आस्वादन एवं ररचनागत वैशिष्ट् से परिचय।

CO-5 उत्तर मध्यकाल के ऐतिहासिक पृष्णभूमि से परिचय।

इकाई–1	आधुनिक काल : आधुनिक काल की सामाजिक, राजनीतिक, आर्थिक एवं सांस्कृतिक पृष्ठभूमि, सन् 1857 ई. का प्रथम स्वाधीनता संग्राम और पुनर्जागरण, भारतेन्दु युग – प्रमुख साहित्यकार, रचनाएं और साहित्यिक विशेषताएं
इकाई –2	द्विवेदी युग : प्रमुख साहित्यकार, रचनाएं और साहित्यिक विशेषताएं । हिन्दी स्वच्छन्दतावादी चेतना का अक्रिम विकास, छायावादी काव्य, प्रमुख साहित्यकार, रचनाएं और साहित्यिक विशेषताएं
इकाई–3	उत्तर छायावाद की विविध प्रवृत्तियां : प्रगतिवाद, प्रयोगवाद, नयी कविता । प्रमुख साहित्यकार, रचनाएं और साहित्यिक विशेषताएं
इकाई–4	हिन्दी गद्य की प्रमुख विधाएं, कहानी, उपन्यास, नाटक निबंध
इकाई–5	संस्मरण रेखाचित्र जीवनी, आत्मकथा का विकास । हिन्दी आलोचना का उद्भव एवं विकास । स्त्री विमर्श और दलित विमर्श का परिचय

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Class	:	M.Com.
Semester	:	I
Title of Subject	:	Management Concepts
Paper	:	I
Course Code	:	MCOM-901
Max. Marks	:	85

Course Outcomes

CO1- Student will learn about concept of management and communication and get knowledge about H.R.

CO2- Understand the structure of planning and study about MBO and MBE.

CO3- Learn Organizational structure and study Centralization and Decentralize.

CO4- Detail Study about Direction and Communication.

CO5- Learn Various theory of management and management Education in India.

Particulars

Unit-I **Introduction:** Concept of Management, Scope and Nature of Management, Approaches to Management, Human Relation, Behavior and System approach.

परिचय – प्रबंध की अवधारणा, क्षेत्र एवं प्रबंध की प्रकृति, प्रबंध का दृष्टिकोण, मानवीय संबंध व्यावहारिक एवं प्रणाली दृष्टिकोण

Unit-II **Planning:** Concept of Planning, Objectives and components of planning nature and Process of Planning, Determination of Objectives, Management by objectives, Management by Exception, Concepts, Nature and Process of decision-making. Theories of decision-making.

नियोजन– नियोजन की अवधारणा के उद्देश्य एवं घटक, नियोजन की प्रकृति एवं प्रक्रिया उद्देश्यों का निर्धारण, उद्देश्यों निहित प्रबंध, उपवाद निहित प्रबंध, निर्णयन की अवधारणा प्रकृति एवं, निर्णयन के सिद्वांत।

Unit-III **Organization:** Concept objectives and element of organization, process and principles of organization. Organization Structure and Charts, Span of Management, Delegation of Authority, centralization and Decentralization.

संगठन– संगठन की अवधारणा, उद्देश्य एवं तत्व, संगठन के प्रक्रिया एवं सिद्वांत, संगठन संरचना एवं चार्ट, प्रबंध का विस्तार अधिकारा`का भारार्पण , केन्द्रीयकरण एव ंविकेन्द्रीयकरणं ।

Unit-IV **Direction:** Concept, Nature, Scope, Principles and Techniques of Direction. **Communication:** Concept, Process. Channel and Media of Communication. Barriers to effective communication, Building effective communication system.

निर्देशन : निर्देशन की अवधारणा प्रकृति क्षेत्र, निर्देशन के सिद्वांत एवं तकनीक । सम्प्रेषण **(संवादवाहन)** : अवधारणा प्रक्रिया । सम्प्रेषण (संवादवाहन) के माध्यम एवं चेनल प्रभावी सम्प्रेषण की बाधायें, प्रभावी सम्प्रेषण का निर्माण ।

Unit-V **Contraol:** Concept, Objectives, nature and process of control, level and areas of control. Various control techniques. Z-Theory of Management, Management Education in India: Objectives, Present position and difficulties.

नियंत्रण : नियंत्रण की अवधारणा, उद्देश्य, प्रकृति एवं प्रक्रिय । नियंत्रण के स्तर एवं क्षेंत्र, नियंत्रण की विभिन्न तकनीक, प्रबंध का जैड–सिद्वांत । भारत मे प्रबंध शिक्षा : उद्देश्य वर्तमान स्थिति एवं कठिनाइयॉ ।

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Class	:	M.Com.
Semester	:	I
Title of Subject	:	Business Environment
Paper/	:	II
Course Code	:	MCOM-902
Compulsory / Max. Marks	:	85

Course Outcomes

CO1- Identify different types of Business Environment.
CO2- Recognize tools for & Exacting the Environment
CO3- Explain the Role of Economic System Planning, Government Policies, Banks (Publics Development) Economic reforms, Liberalization Patent lows and its impact on business.
CO4- Realize the importance and impact of changing low and Regulation on a business firm.
CO5- Find out emerging dimension in socio – cultural Environment and its relevance for a business firm

Particulars

Unit-I **Theoretical Framework of Business Environment:** Concept, Significance and nature of business environment; Eloements of environment – internal and external Changing dimensions of business environment. Liberalisation, Privatisation and Globalisation.

व्यवसायिक पर्यावरण की सेद्धांतिक संरचना : व्यावसायिक पर्यावरण, अवधारणा, महत्व एवं प्रकृति । पर्यावरण के तत्व–आन्तरिक एवं बाह्य, व्यवसाय पर्यावरण के परिवर्तनशील आयाम । उदारीकरण, निजीकरण एवं वैश्वीकरण ।

Unit-II Economic Environment of Business: significance and elements of economic Environment, economic systems and business environment, Economic planning in India, Government policies – licensing policy fiscal policy, Industrial Policy monetary policy and EXIM policy

व्यवसायिक का आर्थिक पर्यावरण : आर्थिक पर्यावरण का महत्व एवं तत्व, आर्थिक प्रणालियॉ एवं व्यवसाय पर्यावरण, भारत में आर्थिक नियोजन । सरकारी नीतियॉ–औद्योगिक नीति, अनुज्ञापत्र नीति, प्रशुल्कनीति, मौद्रिकनीति एवं आयात–निर्यात (एक्जिम) नीति ।

Unit-III **Political and Legal Environment of Business:** Monopoly and Restrictive Trade Practices (MRTP) Act, Foreign Exchange Management Act (FEMA), Consumer Protection Act, Patent Laws.

व्यवसायिक का राजनैतिक एवं वेघानिक पर्यावरण : एकाधिकार एवं प्रतिबंधात्मकव्यापार व्यवहार अधिनियम (एम. आर. टी. पी.) विदेशी विनिमय प्रबंध अधिनियम (फेमा), उपभोक्ता संरक्षण अधिनियम पेटेंट कानून ।

Unit-IV **Socio, Cultural & International Environment:** Social Responsibility of business, Characteristics, Components, Scope, relationship between society and business, Socio-cultural business Environment, Social Groups, World Trade Organistion (WTO), International Monetary Fund (IMF), Foreign Investment in India.

सामाजिक, सांस्कृतिक एवं अन्तर्राष्ट्रीय पर्यावरण : व्यवसाय का सामाजिक दायित्व समाज एवं व्यवसाय के लक्षण, तत्व क्षेत्र एवं दोनो में सम्बंध । सामाजिक–सांस्कृतिक व्यावसायिक पर्यावरण–सामाजिक समूह, विश्व व्यापार संगठन (डब्लू. टी. ओ.) एवं अन्तर्राष्ट्रीय मौद्रिककोष (आई. एम. एफ.) भारत में विदेशी विनिमय ।

Unit-V **Technological Environment:** Concept, Online Channels, Online Srvices, Advantage of Online services, E-commerce, Indian conditions of E-commerce, Electronic Banking, Franchise Business.

तकनीकी पर्यावरण–अवधारणा, ऑनलाईन चैनल्स ऑनलाईन सेवाये, ऑनलाईन सेवाओं के लाभ । इलेक्ट्रानिक कॉमर्स, भारतीय दशाओं में इलेक्ट्रानिक कॉमर्स, इलेक्ट्रानिक बैकिंग फ्रेंचाइची व्यवसाय ।

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Class	: M.Com.
Semester	: I
Title of Subject Group	: Advanced Accounting
Paper	: III
Course Code	: MCOM-903
Max. Marks	: 85

Course Outcomes

CO1- Understand the method and Presentation of Financial statement.

CO2- Develop the Understanding and skill to prepare the Bank Reconciliation statement.

CO3- Prepare to present the financial statement of Non Profit Organization.

CO4- State accounting entries regarding the Investment Insolvency and rectification.

CO5- Solve Advance Problem related with dissolution of firms.

<u>Particulars</u>

Unit-I Advanced problems of Final Accounts
अंतिमलेखे के उच्चतरप्रश्न ।

Unit-II Advanced problems of Bank Reconcilation Statement, Rectification of Errors, Accounting for Non Profit Organization
बैंकसमाधानविवरण के उन्नतप्रश्न, त्रुटियोंकासुधार, गैरलाभसंगठनोंकालेखांकन ।

Unit-III Accounting from Incomplete Records, Accounting for Insurance Claim.
अपूर्णअभिलेखोंसेलेखांकन, बीमादावोंकालेखांकन ।

Unit-IV Investment A/c, Voyage A/c, Insolvency A/c.
विनियोगलेखें, जहाजीलेखें, दिवालियालेखें ।

Unit-V Dissolution of partnership firm including sales of Firm and Amalgamation.
साझेदारीफर्मकाविघटन, फर्म के विक्रय एवं एकीकरणसहित ।

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Class	: M.Com
Semester	: I
Title of Subject Group	: Cost Analysis and Control
Paper	: IV
Course Code	: MCOM-904
Max. Marks	: 85

Course Outcomes

CO1- Learn operational analyses – Determination of Cost, BEP.

CO2- Learn Improvement techniques for Business Cost Control Material.

CO3- Learn how to efficiency of business is Evaluativted parameters.

CO3- Study the impact of cost allocation and issue pricing – Right Technique.

CO5- Learn to make Critical but rational decision based on analysis.

	Particulars
Unit-I	Various cost concepts, Cost centre and cost unit, Methods and techniques of Costing. Installation of costing system, Methods of inventory control, Overheads Accounting. विभिन्न लागत अवधारणाएं, लागत केन्द्र एवं इकाई लागत, लागत की पद्धतियां एवं तकनीक, लागत पद्धति की स्थापना, सामग्री नियंत्रण की विधियां, उपरिव्यय लेखांकन ।
Unit-II	Process Accounting Joint product and Bye product, Equivalent Production and Inter Process Profit, Operating Cost. प्रक्रिया लेखांकन, संयुक्त उत्पाद एवं उपोत्पाद, समोत्पादन एवं अन्तः प्रक्रिया लाभ, परिचालन लागत ।
Unit-III	Marginal Costing : Concepts, Break Even Analysis, Uniform Costing and Inter firm comparison. Use of Managerial Costing in business Decision. सीमांतलागत : अवधारणा, समविच्छेद विश्लेषण, एकीकृत लागत, एवं अन्तः फर्म तुलना, व्यावसायिक निर्णयक में प्रबंधकीय लागत का प्रयोग ।
Unit-IV	Budgetary Control : Basic Concepts, Preparation of functional budget: Cost Audit : Objectives and Advantages. बतटरी नियंत्रण : मूल अवधारणायें, क्रियांत्माक बजट की तैयारी, लागत अंकेक्षण : उद्देश्य एवं लाभ ।
Unit-V	Standard Costing and Variance Analysis. मनक लागत एवं विचरण विश्लेषण ।

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Class	:	M.Com.
Semester	:	II
Title of Subject	:	Corporate Legal Framework
Paper	:	I
Course Code	:	MCOM-905
Max. Marks	:	85

Course Outcomes

CO1- Students can work in organization like CCI office company & Secretary as they get knowledge of lows and Provisions.
CO2- Student can approach the authorities to demand action under consumer Protection Act.
CO3- They will be more cautious while handling cheques and other negotiable Instruments because they know the impact now.
CO4- Students get knowledge of Negotiable Instrument and its Act.
CO5- Student Learn about External offers of Business like the knowledge about wto custom valuation and dispute Settlement.

Particulars

Unit-I
इकाई–1
The Companies Act, 1956 (Relevant Provisions): Definition, types of companies, Memorandum of association, Articles of association, Prospectus, Share capital and Membership, Meetings and Resolutions, Company Management, Managerial Remuneration, Winding up and dissolution of companies.

भारतीय कम्पनीअधिनियम (1956) (सम्बन्धित प्रावधान) : परिभाषा, कम्पनियों के प्रकार, पार्षद सीमानियम, पार्षद अर्न्तनियम, प्रविवरण, अंशपूंजी एवं सदस्यता, समाएं एव ंप्रस्ताव, कम्पनी प्रबंध, प्रबंधकीय पारिश्रमिक, कम्पनियों का परिसमापन एवं विघटन।

Unit-II
इकाई–2
The Negotiable Instruments Act, 19881 : Definition, Types of Negotiable Instruments, Negotiation Holder and holder in due course, Payment in due course; Endorsement and Crossing of cheque; Presentation of negotiable instruments.

पराक्राम्य विलेख अधीनियम, 1981 –परिभाषा, पराक्राम्य विलेखों के प्रकार, पराक्राम्य धारक और यथाविधि धारक, यथाविधि भुगतानः चेक का रेखांकन एवं पृष्ठांकन, परक्राम्य विलेखों का प्रस्तुतीकरण।

Unit-III
इकाई–3
MRTP Act 1969: Monopolistic trade practices; Restrictive trade practices; Unfair trade practices.

एकाधिकार प्रतिबंधात्मक व्यापार व्यवहार अधीनियम 1969ः एकाधिकारात्मक व्यापारव्यवहार, प्रतिबंधात्मक व्यापार व्यवहार, अनुचित व्यापार व्यवहार ।

Unit-IV
इकाई–4
The consumer protection Act, 1986: salient features; Definition of Consumer. Right of consumer; Grievance Redressal Machinery.

उपभोगता संरक्षण अधिनियम, 1986ः विशिष्ट लक्षण, उपभोक्ता की परिभाषा, उपभोक्ता के अधिकार, शिकायत निवारणतंत्र (मशीनरी)।

Unit-V
इकाई–5
Regulatory Environment for International Business: FEMA, WTO: Regulatory framework of WTO basic principles and its character, WTO provisions relating to preferential treatment to developing countries; regional groupings, technical standard, anti-dumping duties and other Non Tariff Barriers. Custom valuation and dispute settlement, TRIP and TRIMS.

अंतर्राष्ट्रीय व्यापार के लिए पर्यावरण नियामकः विदेशी विनियम प्रबंध अधिनियम (फेमा), विश्व व्यापार संगठन (W.T.O.)% विश्व व्यापार संगठन की नियामक संरचना, आधारभूत सिद्धांत और इसके लक्षण, विश्वव्यापार संगठन मे ंविकासशील देशो ंके लिए अधिमान्यता संबंधी व्यवहार के प्रावधान, क्षेत्रीय समूहीकरण, तकनीकी प्रमाप, भंडारण प्रतिरोधी प्रभार और अन्य गैर प्रशुल्क संबंधी अवरोध। सीमा शुल्क मूल्यांकन और विवादो ंका निपटान, बौद्धिक संपदा संबंधी व्यापार अधिकार,(TRIPS) विनियोग संबंधी व्यापार व्यवहार (TRIMS)A

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Class	:	M.Com.
Semester	:	II
Title of Subject	:	Organizational Behaviour
Paper	:	II
Course Code	:	MCOM-906
Max. Marks	:	85

Course Outcomes

CO1- Understanding the theories, Principal and concepts applicable to the study of organizations and management.
CO2- Knowledge of Personality and perception and Learning.
CO3- Understanding models and Theories of motivation.
CO4- Get Knowledge about Interpersonal Behavior.
CO5- Critically evaluate models and theories explored Throughout the module

Particulars

Unit-I Organization: Concept, Types and significance, Organization Goal and its determinants. Organization Behaviour: Concept, Nature and Significance, Organizational Behaviour models.
संगठन : अवधारणा, प्रकार व महत्व, संगठनात्मक लक्षय एवं उसके निर्धारक। संगठनात्मक व्यवहारः अवधारणा, प्रकृति और महत्व, संगठनात्मक व्यवहार अभिकल्प।

Unit-II Personality: Concept, Theories, Determinants and importance, Perception: Concept, Process and Theories, Learning: Concept, Components, affecting factors and theories.
व्यक्तित्व : अवधारणा विभिन्न सिद्धांत, निर्धारक एवं महत्व। दृष्टिकोणः अवधारणा प्रक्रिया एवं विभिन्न सिद्धांत। सीखनाः अवधारण, तत्व, प्रभावित करने वाले घठक और सिद्धांत।

Unit-III Motivation: Meaning, types and important elements, Theories of Motivation, Attitudes and Values: Concept, factors, significance and Theories.
अभिप्रेरणः अर्थ, प्रकार, और महत्वपूर्ण तत्व, अभिप्रेरण के विभिन्न सिद्धांत। मूल्य एव व्यवहारः अवधारणा, घटक, महत्व और विभिन्न सिद्धांत।

Unit-IV Interpersonal Behavious: Nature, Transactional Analysis. Concept of Group. Theories of group formation, Group cohesiveness. Power and Authority.
अंर्तवैयक्तिक व्यवहारः प्रकृति, अंर्तक्रियांत्मक विश्लेषण, समूह की अवधारणा, समूह निर्माण के सिद्धांत, समान समूह शक्ति और अधिकार।

Unit-V Organizational Conflicts: Cause and suggestions Developing Sound Organizational Climate, Management of Change Concept and Process of Organizational Development.
संगठनात्मक विरोधः कारण और सुझाव, स्वस्थ संगठनात्मक वातावरण का विकास परवर्तन का प्रबंध संगठनात्मक विकास की अवधाणा और प्रक्रिया।

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Class	:	M.Com.
Semester	:	II
Title of Subject	:	Organizational Behaviour
Paper	:	II
Course Code	:	MCOM-906
Max. Marks	:	85

Course Outcomes

CO1- Understanding the theories, Principal and concepts applicable to the study of organizations and management.
CO2- Knowledge of Personality and perception and Learning.
CO3- Understanding models and Theories of motivation.
CO4- Get Knowledge about Interpersonal Behavior.
CO5- Critically evaluate models and theories explored Throughout the module

	Particulars
Unit-I	Organization: Concept, Types and significance, Organization Goal and its determinants. Organization Behaviour: Concept, Nature and Significance, Organizational Behaviour models. Organizational Skil & Ramayan. संगठन : अवधारणा, प्रकार व महत्व, संगठनात्मक लक्षय एवं उसके निर्धारक। संगठनात्मक व्यवहारः अवधारणा, प्रकृति और महत्व, संगठनात्मक व्यवहार अभिकल्प। संगठात्मक कला एवं रामायान।
Unit-II	Personality: Concept, Theories, Determinants and importance, Perception: Concept, Process and Theories, Learning: Concept, Components, affecting factors and theories. व्यक्तित्व : अवधारणा विभिन्न सिद्धांत, निर्धारक एवं महत्व। दृष्टिकोणः अवधारणा प्रक्रिया एवं विभिन्न सिद्धांत। सीखनाः अवधारण, तत्व, प्रभावित करने वाले घठक और सिद्धांत।
Unit-III	Motivation: Meaning, types and important elements, Theories of Motivation, Attitudes and Values: Concept, factors, significance and Theories. अभिप्रेरणः अर्थ, प्रकार, और महत्वपूर्ण तत्व, अभिप्रेरण के विभिन्न सिद्धांत। मूल्य एव व्यवहारः अवधारणा, घटक, महत्व और विभिन्न सिद्धांत।
Unit-IV	Interpersonal Behavious: Nature, Transactional Analysis. Concept of Group. Theories of group formation, Group cohesiveness. Power and Authority. अंर्तवैयक्तिक व्यवहारः प्रकृति, अंर्तक्रियांत्मक विश्लेषण, समूह की अवधारणा, समूह निर्माण के सिद्धांत, समान समूह शक्ति और अधिकार।
Unit-V	Organizational Conflicts: Cause and suggestions Developing sound Organizational Climate, Management of Change Concept and Process of Organizational Development. संगठनात्मक विरोधः कारण और सुझाव, स्वस्थ संगठनात्मक वातावरण का विकास परवर्तन का प्रबंध संगठनात्मक विकास की अवधाणा और प्रक्रिया।

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Class	:	M.Com.
Semester	:	II
Title of Subject	:	Advanced Statistical Analysis
Paper	:	III
Course Code	:	MCOM-907
Max. Marks	:	85

Course Outcomes

CO1- Distinguish between discrete and continuous random variables.
CO2- Explain the assumptions of binomial distribution and apply it to calculate probabilities.
CO3- Explain why population are sampled and describe methods to sample a population
CO3- Learn about statistical tools to test hypothesis more knowledge of chi-square test and ANOVA test.
CO5- Knowledge to apply regression analysis to estimate the liner relationship between tow variables

	Particulars / विवरण
Unit-I	Theory of Probability – Probability Distributions, Binomial, Poisson and Normal Distribution. प्रयिकता के सिद्धांत–प्रायिकता वितरण द्विपद, पायसन एवं सामान्य वितरण।
Unit-II	Theory of Sampling and Test of Significance न्यादर्श के सिद्धांत और सार्थकता की जांच।
Unit-III	Analysis of Variance (including one way and two way classification), Chin-square Test. विचरण विश्लेण (एकांगी और द्विमांर्गी वर्गीकरण के साथ,) काई वर्ग परीक्षण ।
Unit-IV	Interpolation and Extrapolation. Association of Attributes. अन्तरगणन एवम! बह्यगणन, गुण सम्बन्ध।
Unit-V	Regression Analysis, Statistical Decision Theory:- Decision under Risk and Uncertainty, Decision Tree Analysis. प्रतीपगमन विश्लेण, सांख्यिकी निर्णय सिद्धांत–जोखिम और अनिश्चितता की स्थिति मे ंनिर्णय, निर्णयवृक्ष विश्लेषण।

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Class	:	M.Com.
Semester	:	II
Title of Subject	:	Functional Management
Paper	:	IV
Course Code	:	MCOM-908
Max. Marks	:	85

Course Outcomes

CO1- Student gets knowledge about financial planning and forecast of business strategy.
CO2- Get knowledge about over and under capitalization and now they manage their business Structure and Operation leverage.
CO3- Study about the marketing terms and Conditions to develop market for their product and services.
CO4- Study about how manage their man power and select a beneficial human group.
CO5- Learn to launch of product let types of product, system, products Diversification, Standardization, Simplification and Specialization.

Particulars

Unit-I Financial Management: Concept, Nature and Objectives, Functions of Financial Manager, Financial Planning – Nature, Need and influencing factors, Characteristics of a sound financial plan.
वित्तीय प्रबंध : अवधारणा, प्रकृति एवं उद्देश्य, वित्तीय प्रबंधक के कार्य, वित्तीय नियोजन–प्रकृति आवश्यकता और प्रभावित करने वाले घटक, स्वस्थ वित्तीय योजना के लक्षण।

Unit-II Capitalization: Concept and Theories, Over and Under Capitalization, Capital structure. Balanced Capital Structure, trading on Equity, Leverage; Financial and Operating leverage.
पूंजीकरण : अवधारणा एवं विविध सिद्धांत, अति और अल्प पूंजीकरण, पूंजीसंरचना, संतुलित पूंजीसंरचना, समता पर व्यापार, दंतीकरण (लीवरेज): वित्तीय एवं परिचालन संबंधी दंतीकरण (लीवरेज)।

Unit-III Marketing Management: Concept Nature and Scope of marketing. Functions of marketing management, Marketing mix. Advertising Management; Meaning Objective, functions and scope, Media of advertising. Selecting an advertising media Essential of a good advertising copy, Meaning of Sales Promotion, Importance, limitations and Methods of sales promotion.
विपणन प्रबंध : विपणन की अवधारणा, प्रकृति और क्षेत्र विपणन प्रबंध के कार्य, विपणन मिश्रण विज्ञापन प्रबंध–उद्देश्य, कार्य और क्षेत्र, विपणने माध्यम, एक विज्ञापन माध्यम का चुनाव, अच्छी विज्ञापन प्रति की आवश्यकताएँ, विक्रय प्रर्वतन का अर्थ, महत्व सीमाएं और विक्रय प्रवर्तन की विधियां।

Unit-IV Personnel Management: Concept, Functions Scope and importance Signification of Man-Power Planning. Sources of Recruitment Characeristies of a Good recruitment policy. Concept of Selection. Selection procedure. Importance of employee Training Methods of Training.
कार्मिक प्रबंध की अवधारणाः अवधारणा, कार्य, क्षेत्र और महत्व, मानव शक्ति नियोजन का महत्व, भर्ती के स्त्रोत, अच्छी भर्ती नीति के लक्षण। चयन की अवधारणा, चयन प्रविधि, कर्मचारी प्रशिक्षण का महत्व प्रशिक्षण की विधियां।

Unit-V Production Management: Concept, Importance, Scope and function. Types of production systems, Concept of production planning, objective, elements and steps. Procedure of production control. Process of New Product Development. Concept of Product Diversification. Standardization, Simplification and Specialization.
उत्पादन प्रबंध : अवधारणा, महत्व क्षेत्र, और कार्य, उत्पादन प्रणाली के प्रकार। उत्पादन नियोजन की अवधारणा, उद्देश्य तत्व और चरण, उत्पादन नियंत्रण प्रविधि, नव उत्पाद विकास प्रक्रिया, उत्पाद विविधीकरण, प्रमापीकरण, सरलीकरण और विशिष्टीकरण की अवधारणा।

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Class	:	M.Com.
Semester	:	III
Title of Subject	:	Managerial Economics
Paper	:	I
Course Code	:	MCOM-909
Max. Marks	:	85

Course Outcomes

CO1- Student will learn about concept of management and communication and get knowledge about H.R.

CO2- Understand the structure of planning and study about MBO and MBE.

CO3- Learn Organizational structure and study Centralization and Decentralize.

CO4- Study Detail about Direction and Communication.

CO5- Learn Various theory of management and management Education in Indian

	Particulars
Unit-I	**Meaning of Managerial economics:** Nature and Scope of Managerial economics, Managerial Economist : Role and Responsibilities, Fundamental economic concepts Profit Maximization Theory.
ईकाई–1	प्रबंधकीय अर्थशास्त्र काआशय : प्रबंधकीय अर्थशास्त्र की प्रकृति, क्षेत्र प्रबंधकीय अर्थशास्त्री, भूमिका एवं उत्तरदायित्व, आधार भूत आर्थिक अवधारणा । लाभ अधिकतमीकरण सिद्वांत ।
Unit-II	**Demand Analysis:** Elasticity of Demand, Introduction Explanation Theory of Consumer Choice, Indifference Approach, Revealed Preference Theory.
ईकाई–2	मंग विश्लेषण : मॉग की लोच–परिचयात्मक विवेचन–ग्राहक पसन्दगी का सिद्वांत, उदासीनता विश्लेषण, अधिमान प्रकटीकरण सिद्वांत ।
Unit-III	**Production Function:** Law of Variable Proportions, Law of Returns to Scale.
ईकाई–3	उत्पादन फलन : परिवर्तनशील अनुपात नियम, पैमाने के प्रतिफल का नियम निर्णय ।
Unit-IV	**Business Cycles :** Nature and Phases, Theories of Business Cycles.
ईकाई–4	व्यापार चक्र : प्रकृति एवं चरण, व्यवसाय चक्र के सिद्वांत ।
Unit-V	**Profit Management:** Measurement of Profit, concept of Risk and Uncertainty.
ईकाई–5	लाभ प्रबंध : लाभ का मापन, जोखिम एव ंअनिश्चितता की अवधारणा ।

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Class	:	M.Com.
Semester	:	III
Title of Subject	:	Tax Planning and Management
Paper	:	II
Course Code	:	MCOM-910
Max. Marks	:	85

Course Outcomes

CO1- Study to identify the difference between tax evasion, tax avoidance and tax planning.
CO2- Study about types of incomes and their taxability and provision in respect of free Trade Zone.
CO3- Study about out line the corporate tax lows and their Provision.
CO4- Student will able to Plan tax in relation to siftings up new business.
CO5- Knowledge about to file the returns and assessment independently

Particulars

Unit-I **Concept of Tax Planning** : Meaning, Scope, Inportance, Objectives of Tax Planning.

ईकाई–1 कर नियोजन की अवधारणा : अर्थ, क्षेत्र, महत्व, करनियोजन के उद्देश्य, एवं उद्देश्य ।

Unit-II **Areas of Tax Planning :** Ownership Aspect, Activity Aspects & Locational Aspects, Nature of the Business & Tax Planning.

ईकाई–2 कर नियोजन के क्षेत्र : स्वामित्व पहलू क्रियाशीलता पहलू स्थानीयकरणपहलू, व्यवसाय की प्रकृति एवं कर नियोजन ।

Unit-III **Tax Planning and Setting up New Business**: Deductions Available to new Industrial Undertakings, Amalgamation, Merger and Tax Planning. Special Tax Provisions – Tax Provisions Relating to Free Trade Zones, Infrastructure Sector & Backward Areas.

ईकाई–3 नये व्यवसाय की स्थापना एवं कर नियोजन : नई औद्योगिक इकाईयो को प्राप्त छूटे, एकीकरण, सविलयन एवं कर नियोजन विशेष कर प्रावधान मुक्त व्यापार क्षेत्र संरचनात्मक क्षेत्र एवं पिछड़े क्षेत्र संबंधी कर प्रावधान ।

Unit-IV **Tax Planning and Financial Decisions :** Capital Structure Decision, Dividend, Inter Corporate Dividend, Bonus Shares.

ईकाई–4 कर नियोजन एवं वित्तीय निर्णयन : पूँजी संरचना निर्णय, लाभांश, अर्न्त कम्पनी लाभांश, बोनस अंश ।

Unit-V **Tax Assessment :** Introduction, Difference between Tax Planning and Tax Management, Areas of Tax Management, Return of Income and Assessment, Penalties and Prosecutions, Appeals and Revisions.

ईकाई–5 कर निर्धारण : परिचय, कर नियोजन एवं कर प्रबंध मे अन्तर, कर प्रबंध के क्षेत्र, आय का विवरण एवं कर निर्धारण, अर्थ दण्ड एवं अभियोग, अपील एवं पुनर्विचार ।

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Class	:	M.Com.
Semester	:	III
Title of Subject	:	Entrepreneurship Skill Development
Paper	:	III
Course Code	:	MCOM-911
Max. Marks	:	85

Course Outcomes

CO1- Students get knowledge about entrepreneurship and cant set up their out entrepreneurship.

CO2- Understand the different methods to assess the attractiveness of business opportunities.

CO3- Study Entrepreneurship theories and their implications.

CO4- Detect weakness and strength with in business opportunity and give suggestion for improvement.

CO5- Design, Organize and lead with the goal of bringing new Product and service to market.

	Particulars
Unit-I	**Entrepreneur:** Definition, emergence of Entrepreneurial class; Theories of Entrepreneurship, Socio-economic Environment and Entrepreneur.
ईकाई–1	उद्यमी–परिभाषा, उद्यम वर्ग का उद्भव, उद्यमिता के सिद्वांत सामाजिक–आर्थिक परिवेश एवंउद्यमी ।
Unit-II	**Promotion of a venture:** Opportunity analysis, External Environmental forces, economic, Social, Technological and Competitive factors, Establishment of a new unit.
ईकाई–2	साहसी (उद्यमी) के लियेप्रवर्तन : अवसरविश्लेषण, बाहय पर्यावरणीय शक्तियां, आर्थिक, सामाजिक, तकनीकी एवंप्रतियोगियात्मककारक, एक नईइकाईकीस्थापना ।
Unit-III	**Entrepreneurial Behaviour:** Innovation and Entrepreneurship, entrepreneurial Behaviour, Social Responsibility.
ईकाई–3	उद्यमीव्यवहार : नवाचार एवंउद्यमिता, उद्यमीव्यवहार, सामाजिकउत्तरदायित्व ।
Unit-IV	**Entrepreneurial Development Programme:** Entrepreneurial Development Programme relevance and achievements, role of Government in organizing such programmes.
ईकाई–4	उद्यमिताविकासकार्यक्रम : उद्यमिताविकासकार्यक्रम की प्रासंगिसता एवंउपलब्धियॉं, इनकार्यक्रमों के आयोजनमेसरकारकीभूमिका ।
Unit-V	**Entrepreneurship and Industrial Development:** Planning and growth of industrial activities through industrial Policy of the Government, Role of Industrial Estates, Role of Central and State level Promotional Services.
ईकाई–5	कियाओंकानियोजन एवंविकास, औद्योगिकपरिक्षेत्रों की भूमिकाकेन्द्र एवंराज्य स्तरीय प्रोत्साहनसेवाये ।

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Class	:	M.Com.
Semester	:	III
Title of Subject	:	Accounting for Managerial Decisions
Paper	:	IV
Course Code	:	MCOM-912
Max. Marks	:	85

Course Outcomes

CO1- Study financial, Cost and management accounting and understand Role and duties of management Accountant.
CO2- Learn Limitation of Financial Statement and study to use Ratio Analysis Profitability, Activity and Financial Ratio.
CO3- Get knowledge about Case flow accord tiny to A.S.B.
CO4- Study to method of capital budgeting Terms of investment and Ranking Investment Proposal.
CO5- Comprehend Difference Contemporary issues in management accounting and reports & reporting needs and levels in organization.

	Particulars
Unit-I	Management Accounting: Its meaning, nature and importance. Difference of Management accounting with Cost Accounting and Financial accounting.
ईकाई–1	प्रबंधकीय लेखांकन : अर्थ, प्रकृति एवंमहत्व, प्रबंधकीय लेखांकन, लागतलेखांकन एवंवित्तीय लेखांकनमेंअन्तर ।
Unit-II	Nature and Limitations of Financial Statements: Needs and objectives of financial Analysis.
ईकाई–2	वित्तीय विवरणों की प्रकृति एवंसीमाऐं : वित्तीय विश्लेषण की आवश्यकता एवंउद्देश्य ।
Unit-III	Fund Flow analysis and Cash Flow analysis (Application of A.S.-3)
ईकाई–3	कोषप्रवाहविश्लेषण एवंरोकप्रवाहविश्लेषण (।ैण् दृ 3 का प्रयोग) ।
Unit-IV	Capital Budgeting : Nature and Characteristics of Long Terms Investment Decision, Methods of Ranking Investment Proposals.
ईकाई–4	पूॅजीबजटन : दीर्घकालीननिवेशनिर्णयों की प्रकृति एवंविशेषताएं, निवेशप्रस्तावों की श्रेणीयन की विधि ।
Unit-V	Management Reporting System: Types of Reports, Responsibility Accounting.
ईकाई–5	प्रबंध प्रतिवेदन पद्वति : प्रतिवेदन के प्रकारउत्तरदायित्वलेखांकन ।

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Class	:	M.Com.
Semester	:	IV
Title of Subject	:	Advertising and Sales Management
Paper	:	I
Course Code	:	MCOM-913
Compulsory /Optional	:	Optional
Max. Marks	:	85

Course Outcomes

CO1- Whole study of Advertisement and this benefits, if – Marketing mix, legal ethical and social aspect of advertising.

CO2- Learn about customers than made a edverlisment that fulfill cons tomes layout and our business purpose.

CO3- Devaluation of Advertising effectiveness and Contorting Advertising Budget.

CO4- Able to access personal selling adverlising and methods of sales promotion.

CO5- Study about sales force recruitment selection training, Compensation and evaluation.

	Particulars / विवरण
Unit-I	Introduction: Concept, Scope, Objectives and Functions of advertising. Role of advertising in marketing mix and the advertising process. Legal, ethical and social aspect of advertising. परिचय – विज्ञापन की अवधारण ाा, क्षेत्र, उद्देश्य एवं कार्य, विज्ञापन में विपणन मिश्रण एवं विज्ञापन प्रक्रिया की भूमिका, विज्ञापन के नैतिक, विधिक एवं सामाजिक पहलू ।
Unit-II	Pre-launch Advertising Decision: Determination of target audience, Advertising, media and their choice. Advertising measures, Layout of advertisement and advertising appeal, Advertising copy. विज्ञापन निर्णयन पूर्व प्रदर्शन : लक्षित श्रोता, ग्राहको का निर्धारण, विज्ञापन माध्यम (मीडिया) एवं उनका चयन, विज्ञापन उपाय विज्ञापन अपील एवं विज्ञापन विन्यास, विज्ञापन प्रति ।
Unit-III	Promotional Management: Advertising department, Role of advertising agencies and their selection, Advertising budget, Evaluation of Advertising effectiveness. प्रवर्तनीय प्रबंध : विज्ञापन विभाग, विज्ञापन एजेन्सी का योगदान एवं उसका चयन, विज्ञापन बजट, विज्ञापन की प्रभावशीलता का मूल्यांकन ।
Unit-IV	Personal selling: Meaning and Importance of personal selling, Difference between personal selling, Advertising and sales promotion. Methods and procedure of personal selling. वैयक्तिक विक्रय : वैयक्तिक विक्रय का अर्थ एवं महत्व, वैयक्तिक विक्रय, विज्ञापन एवं विक्रय प्रवर्तन में अन्तर, वैयक्तिक विक्रय की विधियां और प्रक्रिया ।
Unit-V	Sales Management: Concept of sales management, Objectives and Functions of sales managements. Sales organization, Management of sales force and Sales force objectives, Sales force recruitment, selection, training compensation and evaluation. विक्रय प्रबंध : विक्रय प्रबंध की अवधारणा उद्देश्य एवं कार्य, विक्रय संगठन, विक्रय शक्यिों का प्रबंध एवं विक्रय शक्ति के उद्देश्य, विक्रय शक्तियों की भर्ती, चयन, प्रशिक्षण, क्षतिपूर्ति एवं मूल्यांकन ।

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Class	:	M.Com.
Semester	:	IV
Title of Subject	:	International Marketing
Paper	:	II
Course Code	:	MCOM-914
Compulsory /Optional	:	Optional
Max. Marks	:	85

Course Outcomes

CO1- Developed as understanding of major issues related to Export in international marketing.
CO2- Get Knowledge Concept of International marketing its Environment and its selection.
CO3- Get knowledge about terms of payment in International Marketing.
CO4- Study about financing facility in export marketing and knowledge about difference organization.
CO5- Able to assess on organizations ability to enter and compete in International Markets.

Particulars@विवरण

Unit-I International Marketing: Meaning, Scope, Nature and Significance, International Marketing Environment- Internal and External Environment, International Market, Orienatation, Identification and Selection of foreign market, Functions and qualities of an Export Manager.
अंतर्राष्ट्रीय विपणन : अर्थ क्षेत्र, प्रकृति, महत्व अंतर्राष्ट्रीय बाजार वातावरण– आंतरिक एवं बाहय वातावरण। अंतर्राष्ट्रीय बाजार, विदेशी बाजार के चयन और परिचय, अभिमुखीकरण। एक निर्यात प्रबंधक के गुण और कार्य।

Unit-II Export Organization : Meaning, affecting factors and types, Overseas Product Development; It's concept and methods, Pricing and its factors, Methods, of Pricing, Price quotation.
निर्यात संगठन : अर्थ, प्रभावित करने वाले घटक और प्रकार, समुद्रपारीय उत्पाद विकासः इसकी अवधारणा एवं विधियॉ। मूल्य निर्धारण और इसके घटक। मुल्य निर्धारण की वधियां, मॅलय निविदा।

Unit-III Direct Trading and Indirect Trading : Meaning and Methods, Methods of Payment in international Marketing.
प्रत्यक्ष व्यापार और अप्रत्यक्ष व्यापार : अर्थ और विधियां, अंर्त्राष्ट्रीय बाजार में भुगतान की पद्धतियां ।

Unit-IV Export Credit : Meaning, Nature, Influencing factors and significance, Methods of Export Credit, Export Credit and Finance in India, Risk in Export Trade, Role of the Export Credit Guarantee Corporation of India Limited, The Export-Import Bank of India.
निर्यात साख : अर्थ प्रकृति महत्व और प्रभावित, करने वाले घट निर्यात साख की विधियां। भारत में निर्यात साख और वित्त। निर्यात व्यापार में जोखिम। निर्यात साख गारन्टी कारपोरेशन की भूमिका भारत का आयात निर्यात बैंक ।

Unit-V Export and Import Procedure: Documentation in foreign trade, Bilateral and Multilateral Trade Agreements, Its meaning, objective, types and significance, SAARC, Role of WTO in Foreign Trade.
निर्यात आयात प्रविधः विदेशी व्यापार में प्रपत्रीकरणा, द्विपक्षीय एवं बहुपक्षीय व्यापार समझोते–अर्थ, उद्देश्य, प्रकार, और महत्व। साउथ एशिया एसोशिएशन ऑफ रीजनल कोआपोरेशन (सार्क) विदेशी व्यापार में विश्व व्यापार में विश्व व्यापार संगठन की भूमिका ।

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Class	:	M.Com.
Semester	:	IV
Title of Subject	:	Rural & Agricultural Marketing
Paper	:	III
Course Code	:	MCOM-915
Compulsory /Optional	:	Optional
Max. Marks	:	85

Course Outcomes

CO1- Explain about Indian Rural Marketing its demand and dimension and segmentation Fro Approach of Product from rural Areas.
CO2- Students will understand the structure of agricultural marketing's structure and study Agricultural Goods and how its different from manufactured Goods.
CO3- Learn challenges and apport unition of rural marketing.
CO4- Knowledge about regulations of market its Advantage, Limitations and future of Regulated market in India.
CO5- Students will get Insight into difference process and sales method.

Particulars@विवरण

Unit-I Rural Marketing: Position of Indian rural marketing and Approach to rural markets of India, Rural consumer and demand dimensions and Market segmentations, Channels of distribution and physical distribution Product management, Marketing communication and sales force tasks.
ग्रामीण विवपणन (बाजार): भारतीय ग्रामीण विपणन की स्थिति एवं भारत के ग्रामीण बाजारों के प्रति दृष्टिकोण, ग्रामीण उपभोक्ता और मांग के आयाम एवं बाजार विभक्तिकरण, वितरण वाहिकाएँ और भौतिक वितरण उत्पाद प्रबंध, विपणन संचार और विक्रय शक्ति घटक।

Unit-II Agricultural Marketing: Concept, Nature, Scope and Subject matter, Classification of agricultural products and their difference with manufactured goods. Agriculture market: Meaning, Components, Dimensions and Classification. Market structure; Dynamics of Market structure, Components of market, structure and Market forces.
कृषि विपगणन – अवधारणा, प्रकृति, क्षेत्र और विषय सामग्री, कृषि उन्यादो का वर्गीकरण और उनका निर्मित माल से अन्तर, कृषि बाजार–अर्थ घटक आयाम और वर्गीकरण ।
बाजार संरचना–बाजार संरचना की क्रियाशीलता बाजार के घटक, बाजार संरचना की शक्तियॉ।

Unit-III Market Management and Channel Strategy: Modern marketing management and agricultural products, Structured organized markets-commodity exchange and produce exchange, Cash market, Forward dealing, Exchange market, Speculative market, Channels of distribution for consumer goods, Agricultural consumer goods and Agricultural raw materials.
बाजार प्रबंध एवं वाहिका व्यूह रचनाः आधुनिक विपणन प्रबंध और कृषि उत्पाद, संरचनात्मक संगठित बाजार वस्तुवनिमय और उत्पाद विनिमय नकद बाजार अग्रेषित व्यवहार विनिमय बाजार, सट्टा बाजार उपभोक्ता माल के लिए वितरण वहिकाए कृषकीय उपभोक्ता माल कृषिकीय कच्चा माल।

Unit-IV Rurul Market in India: Regulated market, Genesis of regulated market in India, Limitations in present marketing regulation, Advantages and Limitations of regulated market, Organisation of regulated market, Future of regulated and regulated markets in India.
भारत में ग्रामीण बाजारः बाजारों का नियमन – नियमित बाजार भारत में नियमित बाजारों की संरचना, वर्तमान विपणन नियमन सीमाएं, नयमित बाजार के लाभ और सीमाएं नियमित बाजारों का संगठन भारत में नियमित बाजारों का भविष्य ।

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Unit-V Marketing of Farm Products : Packaging – Packing and Packaging, Packing material. Transportation Advantages, Means of transport and Transportation cost. Grading and Standardization-Meaning, Type, Criteria, Labeling and specification, storage, Warehousing, Processing and Selling.

कृषि उत्पादो का विपणन : संवेष्ठन–संवेष्ठन और पैकिंग, सेवेष्ठन, सामग्री, कृषि उत्पादन विपणन यातायात लाभ, यातायात के माध्यम और यातायात लागत। श्रेणीयॉ/ग्रेडिंग एवं प्रमापीकरण–अर्थ, प्रकार, कसौटी, लेबलिग एवं विशिष्टीकरण, संग्रहण प्रक्रियण और बिक्रय।

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Class	**:**	**M.Com.**
Semester	**:**	**IV**
Title of Subject	**:**	**Consumer Behaviour**
Paper	**:**	**IV**
Course Code	:	**MCOM-916**
Compulsory /Optional:		**Optional**
Max. Marks	**:**	**85**

Course Outcomes

CO1- Knowledge about the concept of consumer, and Distinguish between consumer behavior and buyer's behavior.
CO2- Learn about consumer's research process and organizational buying behavior Process.
CO3- Get study about Dynamic nature of consumers, needs of consumers, and development of motivational research.
CO4- Study about consumer personality and their boundaries understanding of consumer diversity.
CO5- Megerment of social class their life style and create a policy for Affluent and non-affluent consumer.

Particulars@विवरण

Unit-I	Introduction: Meaning and Significance of consumer behavior, Determinants of consumer behavior, Consumer behavior Vs. buyer's behavior, Consumer buying process and consumer movement in India. परिचय : उपभोक्ता व्यवहार का अर्थ एवं महत्व, उपभोक्ता व्यवहार के निर्धारक तत्व, उपभोक्ता व्यवहार बनाम क्रेता व्यवहार, उपभोक्ता की क्रय पद्वति एवं भारत में उपभोक्ता आन्दोलन ।
Unit-II	Organizational Buying Behaviour and Consumer Research: Characteristics and Process of organizational buying behavior Determinants of organizational buying behaviour. History of consumer research and Consumer research process. क्रेता का संगठनात्मक व्यवहार एवं उपभोक्ता अनुसंधान : विशेषताएं एवं संगठनात्मक क्रय व्यवहार की प्रक्रिया, संकठान्तमक व्यवहार के निर्धारक तत्व, उपभोक्ता अनुसंधान का इतिहास एवं उपभोक्ता अनुसंधान की प्रक्रिया ।
Unit-III	Consumer Needs and Motivations: Meaning of motivation, Needs and Goals, Dynamic nature of consumer motivation, Types and systems of consumer needs, measurement of motives and Development motivational research. उपभोक्ता की आवश्यकता एवं अभप्रेरणः अभिप्रेरणा का अर्थ, आवश्यकता एवं लक्ष्य, उपभोक्ता अभिप्रेरण की गतिशीलता एवं स्वभाव। उपभोक्ता की आवश्यकताओं के प्रकार एवं पद्धतियां, अभिप्रेरणाओं के उपाय एवं अभिप्रेरण अनुसंधान का विकास।
Unit-IV	**Personality & Consumer Behaviour**: Concept of personality, theories of personality, Personality and understanding, consumer diversity, Self and self-image. उपभोक्ता व्यक्तित्व एवं व्यवहारः व्यक्तित्व की अवधारणा, व्यक्तित्व के सिद्धान्त, व्यक्तित्व और समझ, उपभोक्ता विविधता, स्वयं और स्वयं का प्रतिबिम्ब ।
Unit-V	**Social Class and Consumer Behaviours**: Meaning of social class. Measurement of social class, Lifestyle profiles of the social class, Social-class mobility, Affluent and Non-affluent consumer, Selected consumers behaviour, applications of social class. समाजिक वर्ग एवं उपभोक्ता व्यवहारः सामाजिक वर्ग का अर्थ, सामाजिक वर्ग मापन, सामाजिक वर्गो की जीवन शौली का स्वरूप, सामाजिक वर्ग की गतिशीलता, समृद्ध एवं गैर समृद्ध उपभोक्ता, उपभोक्ताओं के चुने हुये वर्ग में व्यावहारिक अनुप्रयोग ।

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Class	: M. Sc
Semester	: I
Paper	: I
Subject	: Biotechnology
Title of Subject Group	: Cell Biology
Max. Marks	: 85
	: 15 CCE
Course Code	: BT- 4001

Course Outcome

CO1- Student will be able to study the origin and evolution of cell

CO2- They can study the structural and functional organization of cell membrane

CO3- Student will be able to comprehend the cellular architecture fine details of various intracellular organelles

CO4- Student will be able to interpret molecular mechanisms involved at various stages of cell cycle and its regulation.

Student will be able to Study of concept of genes: analysis of genomes, genes, and the flow of genetic information

CO5- Students will be able to study the chromosomal organization of cell and its packaging as nucleosome model.

UNIT-I Historical origins of cell biology: The discovery of cell, development of the cell theory. The molecular evolution. General structure of Cell. Chemical bonds and functional groups in biological molecules.

UNIT-II: The structural and functional organization of cell membrane, ionictransport (Passive and active transport and facilitated diffusion) Na+-K+pump, the extra cellular matrix of eukaryote's cell wall.

UNIT-III: Structure and functions of endoplasmic reticulum, golgi complex, ribosome lysosomes, peroxisomes (glyoxysomes), plastids and mitochondria. Biogenesis of mitochondria and chloroplast.

UNIT-IV: Steps in cell cycle, cell cycle check points, yeast as model system, celldivision control and regulation yeast cdc gene. Genes for social control of cell, proto-oncogenes. Cell signaling: Exocrine, Endocrine, Paracrine and Synaptic strategies of chemical signaling, surface receptor mediated transduction (G-Proteins, Tyrosine kinases, steroid receptor and mediators: DAG, Ca^{+2}, c-AMP)

UNIT-V: Cytoskeleton and cell motility: Microtubules, microfilaments and intermediate elements. Nuclear ingredients: Nuclear membrane, Organization of Chromatin: chromosome structure. Nature of the genetic material, proteins associated with nuclei. Packaging of genetic material: nucleosome

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Class	: M. Sc
Semester	: I
Paper	: II
Subject	: Biotechnology
Title of Subject Group	: Structure, Function & Metabolism of Biomolecules
Max. Marks	: 85
	: 15 CCE
Course Code	: BT- 4002

Course Outcome

CO1- Students will be able to explain the structure-function relationships of biomolecules.

CO2- Student will be able to interpretate molecular structure, their properties and interactions present in carbohydrate

CO3- To learn the structure properties of amino acids and proteins

CO4- To learn the structure function and metabolism of nucleic acids.

CO5- To study the classification nomenclature and metabolism of fatty acids

UNIT-I: **Some important properties of water:** The law of Mass action; Dissociation of water and its ion product. pH, Bronsted Acids, ionization of weak acids and bases; Henderson- Hasselbalch equation, Titration curves and buffering action, physiological buffers. Principle of Thermodynamics.

UNIT-II : Carbohydrates: Classification, structure, function and properties ofsugars, storage polysaccharides and cell walls. Glycolysis, gluconeogenesis, HMP shunt and glycogen metabolism. Synthesis of cellulose and starch. Oxidative phosphorylation, compartmentation of respiratory metabolism. Regulation of carbohydrate metabolism.

UNIT-III: Proteins-Amino Acids: essential and non essential amino acids; common, rare and non-protein amino acids; acid base properties and chemical reactions of amino acids; stereochemistry and absorption spectra of amino acids. Biosynthesis and degradation of following amino acids: alanine, serine, lysine cysteine, arginine, methionine, tryptophan, phenylalanine glutamine. Proteins: Primary, secondary, tertiary and quaternary structure of proteins. Optical and chemical properties of peptides and small proteins. Hydrolysis of proteins: Action of different proteases. Regulation of amino acid metabolism.

UNIT-IV: Nucleic acids: general structure and functions of purines, pyrimidines, nucleosides, nucleotides; hydrolysis of nucleic acids. Biosynthesis of purines and pyrimidines, nucleosides and nucleotides. Degradation of purines and pyrimidines. Salvage pathway.

UNIT-V: Lipids: Classification, nomenclature and structure of fatty acids, triacylglycerols, sphingolipids and phospholipids, waxes, glycolopids and sterols. Beta-oxidation of fatty acids, biosynthesis of fatty acids and triacylglycerols. Lipid proteins system and transport of lipoproteins of blood plasma. Regulation of lipid metabolism.

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Class	**: M. Sc**
Semester	**: I**
Paper	: III
Subject	**: Biotechnology**
Title of Subject Group	**: General & Applied Microbiology**
Max. Marks	: **85**
	: **15 CCE**
Course Code	**:** BT- 4003

Course Outcome

CO1- Students will be able to understand the classification and nomenclature of Micro organism.

CO2- They will be able to learn Bacterial classification and study morphology and physiological characteristics of Bacteria

CO3- They will be able to study morphology and physiological characteristics of Virus

CO4- To study the microbial growth and study the culture collection and maintenance of culture

CO5- To study the control of microbial contamination.

UNIT-I: Introduction to Microbiology: Historical background & scope, Difference between prokaryotic and eukaryotic organisms, structure of cell wall and peptidoglycan, Methods of Microbiology: Pure culture techniques, sterilization techniques, principle of microbial nutrition, preparation of culture media, enrichment culture techniques for isolation of microbes.

UNIT-II: Classification of Bacteria: Basic principle and techniques used inbacterial classification. Phylogenetic polyphasic taxonomy and numerical taxonomy. New approaches of bacterial taxonomic classification including genetic methods, Ribotyping, Ribosomal RNA sequencing, characteristic of primary domains.

UNIT-III: Viruses: General characteristics, Morphology, Classification andstructure of plant, animal and bacterial viruses, Cultivation of viruses, a brief account of Adenoviruses, Herpes, Retrovirus, Viroids and prions.

UNIT – IV: Microbial Growth: The definition of growth, bacterial generation anddoubling time, specific growth rate and yield measurement, Monoauxic, Diauxic and synchronized growth curve. Factors affecting microbial growth. Culture collection & maintenance of culture. Sporulation in bacteria.

UNIT- V: **Control of Microorganism by Physical & chemical agents:** Antimicrobial agents, Sulfa drugs, Antibiotics (penicillin and cephalosporin) Broad Spectrum antibiotics, antibiotics from prokaryotes, Anti fungal antibiotics, Mode of action (a brief account), resistance of antibiotics (a brief account).

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Class	**: M. Sc**
Semester	**: I**
Paper	: IV
Subject	**: Biotechnology**
Title of Subject Group	**: Bioinstrumentation**
Max. Marks	: **85**
	: **15 CCE**
Course Code	**:** BT- 4004

Course Outcome

CO1- They are able to learn various microscopic techniques to study structural and morphological features

CO2- Student will be able to Learn various technique of chromatographi which are involved in isolation, purification and analysis of biomolecules

CO3- Student will be able to Learn instruments like electrophoresis and its various application

CO4- Student will be able to Understand, develop and analyze the principles of spectroscopy

CO5- They will be able to study the radioactivity and its application in life sciences.

UNIT-I: Microscopic Techniques: Principles and Applications of Light, PhaseContrast, Fluorescence Microscopy, Scanning and Transmission Electron Microscopy, Confocal Microscopy, Cytophotomatry and Flow Cytometry, patch clamping, advances of microscopy. Microtomy and its application.

Centrifugation: Preparative and Analytical Centrifuges, Sedimentationanalysis RCF, Density Gradient Centrifugation.

UNIT–II: Chromatography Techniques: Theory and Application of PaperChromatography, TLC, Gel Filtration Chromatography, Ion Exchange Chromatography, Affinity Chromatography, GLC and HPLC.

UNIT–III: Electrophoretic Techniques: Theory and Application of PAGE (SDSand native), Agarose Gel Electrophoresis 2 Dimenssional Electrophoresis, Iso-electric Focusing, Immuno diffusion, Immuno Electrophoresis, ELISA, RIA. Southern, Northern and Western Blotting.

UNIT–IV: Spectroscopic Techniques: Theory and Application of UV and VisibleSpectroscopy, Fluorescence Spectroscopy, MS, NMR, ESR, Atomic Absorption Spectroscopy, X-ray Spectroscopy, LASAR, Raman Spectroscopy. MALDI.

UNIT–V: Radio-isotopic Techniques: Introduction to Radioisotopes. RadioactiveDecay – Types and Measurement, Principles and Applications of GM Counter, Solid and Liquid Scintillation Counter, Autoradiography, RIA, Radiation Dosimetry. Biological Applications of Radioisotopic techniques,

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Class	**: M. Sc**
Semester	**: I**
Paper	: IV
Subject	**: Biotechnology**
Title of Subject Group	**: Laboratory – I**
Max. Marks	: **85**
	: **15 CCE**
Course Code	**: PR-**BT- 4005

1. Chromosome preparation: mitosis-onion root tip, rat/mouse cornea/ human lymphocyte.
2. Chromosome preparation meiosis- rat / mouse testis, grasshopper testis.
3. Polytene chromosome preparation from Drosophila salivary gland.
4. Histochemical localization of DNA and RNA in onion peel.
5. Demostration of microbiological technique-sterilization, autoclaving and incubation etc.
6. Preparation of liquid and solid media for growth of microorganism.
7. Preparation of different stain-simple stain, gram stain and differential stain.
8. Isolation and maintenance of microorganism by plating, streaking and serial dilution method. slants and sub culture for storage of microorganism.
9. Isolation of pure culture from air, soil, water and study of colony characteristic.
10. Staining of bacterial culture -endospores and capsule.
11. Measurement of growth by colony forming unit and turbidometry.
12. Biochemical characterization of selected microbes.
13. Analysis of water for potability and determination of MPN.
14. One step growth curve of coliphage.
15. Determination of lambda max, verification of Beer's law.
16. Titration of amino acid.
17. Colorimetric determination of pk.
18. Quantitive assay of protein by Lowry, Biuret and Bradford method.
19. Quantitive assay of sugar by DNSA and Benedict reagent.
20. Separation of amino acid and sugar by paper and thin layer chromatography.
21. Electrophoresis of protein, native and under denaturing condition.
22. Separation of sub-cellular organelles by diffential centrifugation.
23. Analysis of oil, iodine number, saponification & acid number.
24. Quantitative analysis of amino acids.
25. Quantitative analysis of carbohydrates.
26. Quantitative estimation of lecithins.
27. Calculation of ratio of ionized & unionized dye with known pK value after the pH the solution is altered.

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Class	**: M. Sc**
Semester	**: II**
Paper	: IV
Subject	**: Biotechnology**
Title of Subject Group	**: Laboratory – I**
Max. Marks	: **85**
	: **15 CCE**
Course Code	**: PR-**BT- 4010

1. Assay of antibiotics and demonstration of antibiotic resistance.
2. Study of mutation by Amu test.
3. Isolation of antibiotic resistant bacterial population by gradient plate method.
4. UV induced auxotrophic mutant production and isolation of mutant by replica plating technique.
5. Effect of UV radiation on bacteria.
6. Demonstration of UV repair mechanisms.
7. Immobilization of microorganisms and enzyme.
8. Amylase and urease production in the microorganisms.
9. Assay of acid phosphatase in plant seeds.
10. Assay of alkaline phosphatase in kidney and liver.
11. Determination of Km value of alkaline phosphatase. st.
13. Preparation of standard curve of DNA by DPA method.
12. Measurement of relative enzyme activity of cellulose by reducing sugar assay te
13. Preparation of standard curve of DNA by DPA method.
14. Preparation of standard curve of DNA by orcinol method and qualification of RNA from yeast.
15. Isolation of DNA from prokaryotic cell.
16. Isolation of DNA from eukaryotic cell.
17. Determination of Tm of nucleic acid.
18. Electrophoresis of DNA-linear, circular and super coiled.
19. Protein-DNA interaction.
20. Isolation of plasmid DNA.
21. Preparation of competent cells from E. coli.
22. Demonstration of Blotting techniques.
23. Blood film preparation and identification of cells.
24. Double diffusion and Immuno-electrophoresis.
25. Radial Immunodiffusion.
26. Detection of antigen through ELISA.
27. Preparation of antibody-enzyme conjugates.
28. Purification of IgG from serum.
29. Cell counting and cell viability.
30. Preparation of scrum free media.
31. Culturing continuous cell lines.
32. Extraction/estimation of DNA/RNA/protein from animal tissues.
33. Preparation of single cell suspension from spleen and thymus.

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Class	**: M. Sc**
Semester	**: II**
Paper	: I
Subject	**: Biotechnology**
Title of Subject Group	**: Molecular Genetics**
Max. Marks	: **85**
	: **15 CCE**
Course Code	**:** BT- 4006

Course Outcome

CO1- The student will be able to describe the fundamental molecular principles of genetics

CO2- The student will get an idea about the principles behind molecular genetics which makes students to understand the basic molecular tools and its application in basic research

C03- The student will be able to describe the fundamental of mutation.

C04- The student will be aware with a basic knowledge of modern molecular biology and genomics and genetic basis of cancer.

C05- They will be able to understand bacterial gene regulation

UNIT-I:

History, Scope of genetics, Mendelian law of inheritance, Variations ofmendelian analysis, Linkage and crossing over, Linkage mapping, Sex determination and Sex linked inheritance, Gene Mapping.

UNIT-II:

Microbial Genetics: gene transfer mechanism in microbe transformation, transduction, conjugation and recombination, Horizontal gene transfer, genetics of model organism-Neurospora, Yeast and E. coli.

UNIT-III:

Mutation: Types of mutation, molecular mechanism of mutation, chromosomal mutations changes-changes in the structure and number of chromosomes, polyploidy, types of DNA repair.

UNIT-IV:

Gene concept: Classical concept, molecular concept of the gene. Jumping genes, split genes, Pseudo genes, overlapping gene, repeated gene, natural gene amplification. Molecular basis of cancer – oncogene, tumor suppressor genes,

UNIT-V: Lytic and Lysogenic cycles, IS, and Tn elements in bacteria, Bacterial plasmids, gene regulation during development, E coil recombination system.

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Class	**: M. Sc**
Semester	**: II**
Paper	: II
Subject	**: Biotechnology**
Title of Subject Group	**: Basic Enzymology and Enzyme Technology**
Max. Marks	: **85**
	: **15 CCE**
Course Code	**:** BT- 4007

Course Outcome

CO1- Students will be able to describe structure and functions and mechanism of action of enzymes
CO2- The student will learn kinetics of enzyme catalyzed reactions
CO3- The student will learn factor affecting enzyme activity. They can understand the enzyme inhibitory and regulatory process.
CO4- They will be able to learn the different enzymes like lyzozymes chymotrypsin and allosteric enzymes
CO5- They will get the learning of application of enzyme and various fields and their future potential.

UNIT-I:
Introduction to Enzymes: Enzyme nomenclature, enzyme commissionnumbers, and classification of enzymes. Isolation and purification of enzymes, preparation of purification chart, Enzyme activity, Specific activity and turn over number, Marker enzymes.

UNIT-II:
Enzyme Kinetics: Steady state, pre-steady state, equilibrium kinetics, Michaelis and Menten Equation and its derivation, Different methods to calculate the K_m and V_{max} and their significance.

UNIT-III:
Factor affecting enzyme activity and catalysis: pH, substrate andenzyme concentration, temperature, coenzyme and cofactors, Mechanism of action of enzymes involving two/more substrates. Role of metal ions in enzyme catalysis. Enzyme inhibition, different types of inhibitors and activators.

UNIT-IV:
Structure and function of enzymes: Lysozyme, chymotrypsin, DNApolymerase, RNase, proteases. Enzyme regulation and control of their activity. Introduction to allosteric enzymes and isozymes.

UNIT-V: Enzyme Technology: Immobilization of enzymes and their application, commercial production of enzymes, RNA-catalysis, Catalytic antibodies -abzymes, Protein and Enzyme engineering: Design and construction of novel enzymes. Structure and Application of protease, lipases, papain.

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Class	: M. Sc
Semester	: II
Paper	: III
Subject	: Biotechnology
Title of Subject Group	: MOLECULAR BIOLOGY
Max. Marks	: 85
	: 15 CCE
Course Code	: BT- 4008

Course Outcome

CO1- Students will be able to learn the structure and properties of nucleic acids

C02- They will be able to learn the mechanism of replication

CO3- The students will be able to describe the gene expression and its regulation at transcriptional and post transcriptional level.

C04- Students will be able to understand the translation and the modifications in post translation

C05- Students will be able to understand the regulation of gene expression in prokaryotes and eukaryotes

UNIT-I:

Nucleic Acid Structure: DNA as genetic material, Chemical structureand base composition of nucleic acids, Double helical structures. Different forms of DNA, Forces stabilizing nucleic acid structure. DNA Supercoiling. Properties of DNA, Renaturation and denaturation of DNA - Tm and Cot curves. RNA – structure, types and function.

UNIT-II:

DNA Replication: General features of DNA replication, Enzymes andproteins of DNA replication. Models of replication – Conservative, semi-conservative and dispersive. Regulations of DNA replication, Prokaryotic and eukaryotic replication mechanism. Replication in phages. Reverse transcription

UNIT-III: Transcription: Mechanism of transcription in prokaryotes andeukaryotes. RNA polymerases and promoters. Post-transcriptional processing of tRNA, rRNA and mRNA (5' capping, 3' polyadenylation and splicing). RNA as an enzyme- Ribozyme.

UNIT-IV:

Translation: Genetic code, General features, deciphering of geneticcode, Code in mitochondria, Translational mechanism in prokaryotes and eukaryotes, post translational modifications (acetylation, glycosylation, phosphorylation etc.) and transport, Protein targeting, Non ribosomal polypeptide synthesis - Antibiotic inhibitors and translation

UNIT-V: Regulation of Gene Expression in Prokaryotes and Eukaryotes: Operon concept, Positive and negative control, Structure and regulation of lac, trp and arb operon, regulation of gene expression in eukaryotes (a brief account), anti-sense RNA, RNAi

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Class	**: M. Sc**
Semester	**: II**
Paper	: IV
Subject	**: Biotechnology**
Title of Subject Group	**: Immunology and Animal Cell Culture**
Max. Marks	: **85**
	: **15 CCE**
Course Code	**:** BT- 400**9**

Course Outcome

CO1- Students will be able to understand the basic concepts of immunity and types of immunity

CO2- Students will be aware of the structure and diversity of the antibodies and they are able to understand the morphology and functions of the various immune cells such as neutrophils, macrophages and their association with the MHC molecule will be studied

CO3- The various immunological techniques and concept of vaccine can be studied.

CO4- The students will be able to study the animal cell culture and the concept of bioreactors for mammalian cell. .

CO5- The students will be able to study the specialized techniques and and its applications.

UNIT-I:

Immunology: An introduction and historical perspective, antigens andantigenicity, addjuvants, immune system organs, tissues & cell lymphocytes, lymphoid organs, mono nuclear phagocytic system, mycloid system, immunity–active & passive, Natural humoral and cellular immunity.

Immunoglobulins: Structure of IgG (b), various classes of antibodies, Antibodies diversity-theories and molecular mechanism, class-switching, monoclonal antibodies (hybridoma technology), recombinant antibodies, antigen- antibody interaction.

UNIT-II:

Complement System: Classical, alternative and lactin pathways and their regulations.

Immunological Responses: Cell mediated immune response, MajorHisto-compatibility Complex, Cellular interactions in the immune response–antigen processing and presentation. recognition of antigens by T & B cells, T – cell receptor complex, B–cells receptor complex.

Dendritic cells and N cells. cytokines, immunological tolerance, hypersensitivity, anti-immune diseases & AIDS.

UNIT-III:

Autoimmunity: Mechanism and therapeutic approaches, immunodeficiency syndrome and their diagnosis, vaccines-active and passive immunization, whole organism vaccines, macromolecules as vaccines, recombinant vector vaccines, synthetic peptide vaccines and subunit vaccines, DNA vaccines, Immunodiagnostic: precipitation techniques, agglutination, fluorescence techniques.

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UNIT-IV:

Animal cell culture: An introduction, concept of aseptic techniques, animal tissue culture media, cell propagation, preservation and storage of cells, detection of contamination, safety consideration in laboratory cell culture.

General cell culture techniques: Dispersion and disruption of tissue, monolayer culture technique, measurement of growth and viability of cell, determination of 50% end point titer, Bulk culturing of animal cells, Concept of bioreactors for mass culture of mammalian cell, Micro carrier culture, harvesting and purification methods for end products recovery.

UNIT-V:

Specialized Techniques: Cell immobilization techniques, celltransmission, Amniocentesis, CEA production and its clinical application, Interferons derived from human cells, 3-D animal cell culture and tissue engineering, FISH and application of animal cell culture.

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Class	**: M. Sc**
Semester	**: III**
Paper	: IV
Subject	**: Biotechnology**
Title of Subject Group	**: Laboratory – I**
Max. Marks	: **85**
	: **15 CCE**
Course Code	**: PR-**BT- 4016

1. Bacterial culture and antibiotic selection media. Preparation of competent cells.
2. Isolation of phage DNA.
3. Restriction mapping of plasmid DNA.
4. Preparation of single stranded DNA template.
5. Gene expression of E. coli and analysis of gene product.
6. Preparation of helper phage and its titration.
7. PCR.
8. Calculation of the mean, median, mode and standard deviation using MS-Excel.
9. Graphical representation of various types of biological data using MS - Excel.
10. Biological data resources and data retrieval.
11. Sequence analysis using BioEdit software tools and other online tools.
12. Structural bioinformatics.
13. Protein structure prediction.
14. Isolation of industrially important microbes from environment.
15. Determination of TDP and TDT of microorganisms for design of a sterilizer.
16. Determination of growth curve of industrial organism and substrate degradation profile, also compute specific growth rate and growth yield.
17. Comparative study of ethanol production using different substrates.
18. Microbial production of citric acid using Aspergillus niger.
19. Preparation of media for plant tissue culture.
20. Sterilization of plant tissue.
21. Study of the effect of different tissue sterilizing agents.
22. Study of antifungal properties of plant extracts.
23. Callus induction from different explants: - seed, root & shoot.
24. Determination of organogenesis in mulberry.
25. Isolation of protoplast and culture.
26. Agrobacterium culture, selection of transformants, receptor genes (GUS) assays
27. Genomic DNA isolation from seed and plant tissue and their electrophoretic analysis
28. Restriction digestion of plant genomic DNA
29. Viability testing of seeds under different environmental conditions
30. Isolation of nitrogen fixing organisms like Cyanobacteria and Rhizobium and themcharacterization.
31. Measurement of nitrate reductase from Nostoc muscorum.
32. Analysis of total protein content of seeds by TCA precipitations method.
33. Isolation of VAM from soil by wet sieving and decanting method.

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34. Isolation and cultivation of mushroom.
35. Determination of pesticide /metal detoxification by microbial species
36. Isolation of bacteriophage from sewage water.
37. Isolation and study of fungus responsible for food spoilage.
38. Detection of coliforms from determination of purity of potable water.
39. Determination of BOD of a sewage sample.
40. Determination of COD of a sewage sample.
41. Survey of degradative plasmid in microbes growing in polluted environment
42. Bioinsecticide isolation, purification and assay.

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Class	: M. Sc
Semester	: III
Paper	: I
Subject	: Biotechnology
Title of Subject Group	: Genetic Engineering
Max. Marks	: 85
	: 15 CCE
Course Code	: BT- 4011

Course Outcome

CO1- Student will be able to comprehend the importance of various DNA modifying enzymes in developing various molecular techniques used in rDNA technology

CO2- They will be able to understand the selection of suitable hosts for the individual vectors for different purposes and to know the uses of restriction and other enzymes in molecular cloning, PCR and genetic manipulations.

CO3- Students will be able to carryout construction and screening of the genomic and cDNA libraries and to design experiments for expression of the cloned gene (s) for useful products.

CO3- students will be able to uncderstand the Types of PCR and its various applications in the field of biotechnology.

CO5- They will able to understand the DNA Chip technology, genomics proteiomix and their applications with special reference to Arabidopsis and Rice.

UNIT-I:

Introduction: Historical background, Restriction enzymes andmodifying enzymes, Restriction mapping, Construction of chimaeric DNA- staggered cleavage, Addition of poly dA and dT tails, Blunt end ligation, Gene cloning.

UNIT-II:

Cloning and Expression Vectors: Vehicles for gene cloning, Plasmids, Bacteriophages, Cosmids and Phagemids as vectors, P1 vectors, F-factor based vectors, Plant and animal viruses as vector, Artificial chromosomes as vectors (YAC, BAC, PAC and MAC vectors), Expression vactors- use of promoters and expression cassettes, Bacculoviruses as expression vectors, Virus expression vectors, Binary and shuttle vectors.

UNIT-III:

Isolation Sequencing and Synthesis of Genes: Methods of geneisolation, Construction and screening of genomic and cDNA libraries, Chromosome walking, Chromosome jumping, Transposone tagging, Map based cloning, DNA sequencing Techniques (Maxam Gilbert's chemical degradation methods, Sanger's dideoxy chain termination method, High thourghput sequencing and pyrosequencing), Automated DNA sequencing, and Organochemical gene synthesis.

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UNIT-IV: Molecular Probes and PCR: Molecular probes, labeling of probes, Radioactive vs. Non radioactive labeling, Uses of molecular probes. Polymerase Chain Reaction- basic principle, Modified PCR (Inverse PCR, Anchored PCR, PCR for mutagenesis, asymmetric PCR, Real time and reverse Transcriptase PCR, Primer walking), Gene cloning Vs. Polymerase chain reaction; Applications of PCR in biotechnology, Ligase chain reaction.

UNIT-V:

Molecular Markers and DNA Chip Technology: Molecular-Markers-types and applications, Construction of molecular maps (genetic and physical maps), DNA chip Technology & Microarrays (a Brief account).

Genomics and Proteomics: Whole genome sequencing and functionalgenomics (a brief account), Applications of genomics and Proteomics with special reference to Arabidopsis and Rice.

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Class	: M.Sc
Semester	: III
Paper	: II
Subject	: Biotechnology
Title of Subject Group	: Biostatistics and Bioinformatics
Max. Marks	: 85
	: 15 CCE
Course Code	: BT- 4012

CO1- Students will be able to tabulate, organize and summarize biological data of various fields like Statistical tools to analyze public health, clinical and biological research problems

CO2- They will be able to understand the key concepts of probability and correlation and regression to deterring and analyzing biological data

CO3- Student will be able to conduct basic bioinformatics research through bioinformatics softwares and to develop new platform for molecular biology research experiments

CO4- The students will learn to approach a research problem logically and will be able to do statistical analyses in research. And to develop algorithms to solve complex biological problems

CO5- They will be able to analyze sequence and structure bio-macromolecule data and to apply the knowledge of bioinformatics in it.

UNIT-I:

Introduction and definition of Biostatistics. Concept of variables in biological systems. Collection, classification, tabulation graphical and diagrammatic representation of numerical data. Measures of central tendency: mean, median and mode and their relationship, measures of dispersion: Range, quartile deviation, mean deviation, standard deviation. Coefficient of variation, skew ness and kurtosis. Probability: Random experiment, events, sample space, mutually exclusive events, independent and dependent events. Various definitions of probability, addition and multiplication theorems of probability (only statement), Random variables (discrete and continuous). Probability density functions and its properties.

UNIT-II:

Some probability distributions such as binomial, Poisson and normal (Basic idea about these distributions) and their applications. Concept of populations and sample. Simple random sampling without replacement. Definition of simple random sample. Chi-square (X^2), student's t and f-distributions (derivations not required) their properties and uses. Concept of standard error. Correlation and Regression, linear and quadratic regression Analysis of variance: One- way and two-way classifications with single observation per cell.

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UNIT-III-Introduction to Bioinformatics: Definition, role, scope different areas, and limitation of Bioinformatics. Data mining techniques and its applications–hidden morkov model, neural network. Database management system (basic idea). Biological data & databases: Classification of biological database. Nucleic acid sequence database: GenBank, EMBL, DDBJ. Protein Resources: UniProtKB. Expression database: Swiss-2D-PAGE, GEO, ArrayExpress, Secondary sequence databases: PROSITE, Pfam, PRODOME. Structure database: PDB and CATH.

Small Molecule database: DrugBank, ChemSpider, PubChem. Specialized Database: KEGG. Data formats: GenBank, UniProt, PDB, FASTA, PHYLIP, Clustal W.

UNIT-IV:

Sequence Comparison: Pairwise alignment – Dot matrix methods, Dynamic programming. Concept of gap penalty and scoring matrix-PAM and BLOSUM, Significance, Significance of alignment.

Sequence Homology Search: BLAST and FASTA algorithm, various programs and application.

Multiple sequence alignment: Concept, Algorithm, tools and importance, Phylogenetic analysis: concept of tree, methods and tools. Gene Prediction methods and tools, primer designing tools, codon usage analysis and tools. Pattern and motif analysis.

UNIT-V:

Structural Bioinformatics: Introduction & Importance. Coordinatesystems. Visualization & presentation of structure. Molecule Visualization models, Molecular visualization and modeling software (Introductory notes and feature application) – SPDBV, RASWIN, ChemSketch, PyMOL, ArgusLab, AutoDock, Discovery Studio, LeadIT-FlexX Protein Structure Prediction: Chau-Fasman, GOR, Neural Network, Homology modeling, Threading method. Protein Folding: Interacting forces, theories of protein folding, methods of protein folding study, protein folding in-vivo. Molecular Modeling – molecule designing, force field types, conformational search methods, Molecular docking – concept and methods. Drug Discovery and drug Designing.

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Class	: M. Sc
Semester	: III
Paper	: III
Subject	: Biotechnology
Title of Subject Group	: Plant Biotechnology
Max. Marks	: 85
	: 15 CCE
Course Code	: BT- 4013

CO1- Students will be able be familiar with organization of PTC Lab and to learn the techniques of aseptic transfer and culturing tissues, single cells. They will be able to understand the large scale in vitro propagation of plants and plan commercial production through micropropagation

CO2- **They will be able to understand the** protoplast and anther culture, hairy root culture and germplasm conservation

CO3- The students will gain knowledge generate plants with desirable/novel traits through genetic manipulations using different methods of gene transfer

CO4- They are able to understand the biological nitrogen fixatin and the basic concept to the plant diseases and the control methods used for it

CO5- The student will able to differentiate various types of intellectual property rights and report measures for conservation of biodiversity.

UNIT-I:

Plant tissue culture: Cleaning, sterilization, sterile handling of tissueculture of plant. Nutritional requirement for in vitro culture. Concept of cellular totipotency, single cell culture, micro propagation, somoclonal variation and its application for plant improvement, somatic embryogenesis, anther and ovule culture, haploid and double-haploid production.

UNIT-II:

Protoplast culture: Isolation, fusion and culture, somatic hybridization, selection system for hybrids, cybrid production and their application in crop improvement, cryobiology of plant cell culture and establishment of gene banks, production of virus free plants using meristem culture.

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UNIT-III:

Plant cloning vectors: Ti and Ri plasmid and viral vectors (CaMVbased vectors, Gemini virus, TMV based vectors). Mechanism of DNA transfer, role of virulence genes, use of 35S promoters, use of reporter genes, methods of nuclear transfer, particle bombardment, electroporation, microinjection, transformation of monocots, transgene stability and gene silencing for herbicide, insect and salt resistance, Plant DNA fingerprinting - Hybridization, Genetic markers, molecular markers, PCR based markers (RFLP, SSRs, RAPD, QTLS, SCARS, AFLP etc.)

UNIT-IV

Biological nitrogen fixation and biofertilization, molecular mechanismof nitrogen fixation, genetics of nif gene.

Plant diseases- general account, biological control of pests and disease, biopesticides, seed production technique, plant cell culture for the production of useful secondary metabolism-pigments, perfumes, flavor, pharmacologically important compounds, biodegradable plastics. Automation in Plant Tissue Culture for its commercial application

UNIT-V:

Transgenic plants, commercial status and public acceptance, Bio-safetyguidelines for research involving GMO's, benefits and risks. Socio economic impact and ecological consideration of GMO's, Gene flow, IPR and IPP. Patenting of biological.

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Class	: M. Sc
Semester	: III
Paper	: IV
Subject	: Biotechnology
Title of Subject Group	: Bioprocesses & Biochemical Engineering
Max. Marks	: 85
	: 15 CCE
Course Code	: BT- 4014

CO1- Students will be able to apply the concepts of basic chemical engineering principles in a bioprocess to Produce bio-products on an industrial scale using fermenters

CO2- Students will be able to describe the design and operation s of various fermenters.

CO3- Students will be able to operate and optimize process parameters like aeration and agitation for producing industrial products

CO4- Students will be able to perform down streem processing and product recovery operations.

CO5- They will be able to do the classification of product formation. They are able to study the mass balance and energy balance in bioprocess system

UNIT-I:

Introduction to bioprocesses engineering. Isolation, preservation & maintenance of industrial microorganisms. Factors that influence solid- state fermentation. Kinetic of microbial growth and death, media for industrial fermentation.

UNIT-II:

Air and media sterilization, safety in fermentation laboratory. Strainimprovement of industrially important microorganism. Bioreactors: principle, kinetics, types, design, analysis and application. Types of fermentation processes: analysis of batch, fed-batch and continuous bioreactions, stability of microbial reactions.

Untt-III:

Aeration and agitation systems for bioreactor. Flow behavior of fermentation fluids. Gas-liquid mass transfer, solid and liquid-phase mass transfer and heat transfer. Measurement and control of bioprocess parameters.

UNIT-IV:

Downstream processing: introduction, removal of microbial cells and solid matter. Foam reparation, precipitation, centrifugation, cell disruption, chromatography. Product recovery processes and unit operations. Safety consideration in down stream processing bioprocess economics

UNIT-V:

Classification of product formation, product synthesis kinetics, mass balance in bioprocesses system, energy balance in bioprocess system.

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Class	: M. Sc
Semester	: III
Paper	: V
Subject	: Biotechnology
Title of Subject Group	: Applied Biotechnology
Max. Marks	: 85
	: 15 CCE
Course Code	: BT- 4015

CO1- Students will be able to apply basic knowledge of pharmaceutical manufacturing in the production of biopharmaceuticals like antibiotics, vaccines, proteins and hormones

CO2- They are able to study aspects related to agriculture biotechnology.

CO3- Students will be able to explain the industrial aspects of Biotechnology for the production of various of industrial products of food industry.

CO4- The student will be able to evaluate the potential of biodegradation of organic pollutants taking microbial and physical chemical environments as well as the chemical structure of the compound itself into consideration

CO5- It helps to understand the recrnt advanced techniques like stem cell technology, nanotechnology, biosensors

UNIT-I:

Industrial Biotechnology: Microbial strain of industrial importance, microbial production of antibiotics (penicillin, streptomycin & tetracycline), Vitamins (Vit B12), amino acids (glutamic acid) & enzymes (amylase, protease, invertase & pectinase), microbial production of alcoholic beverages (whisky & brandy), vinegar, citric acid, acetic acid, glycerol, acetone, foods–SCP, Biotransformation of steroids and pesticides.

UNIT-II:

Agricultural Biotechnology: Role of biofertilizers and biopesticides insustainable development, petrocrops, aquaculture, Improvement of nutritional value of seed storage protein, starch, oil. Transgenic plants for increased shelf life molecular mapping of genes of agricultural importance, sericulture, transgenic fish Plant Variety Protection Act, Plant breeder's rights, International Convention on biological diversity.

UNIT-III:

Food Biotechnology: Prokaryotic & Eukaryotic based products(fermented meats, milk products, yoghurt, cheese, cereal, wine, beer), Impact of biotechnology on microbial testing of food, current/traditional methodology and new approaches (use of gene probes, RDT, Bioluminescence), Safety evaluation of genetically engineered enzyme/novel food products, Natural Control of Micro Organism and preservation, Biogums, Bio-colours Fumaric acid, sweetener, fat substitutes, natural & modified starch, fats & oils food.

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UNIT-IV:

Environmental Biotechnology: Environmental pollution and theirmanagement, concept of Global Warming and Ozone depletion (Ecofarming, Green house effect & acid rain), Waste water treatment, solid waste management, conventional & modern fuels & their environmental impact, Bioremediation, Biodegradation of xenobiotic compounds, Biomineralization, Biotechnological approaches for preserving biodiversity (Gene banks, Germ Plasm Banks & their management).

UNIT-V:

Frontiers in Biotechnology: Stem Cell Technology, Human Cloning Ethical issues & risks associated with it, Nano biotechnology: – Introduction to nanoscience, size matter, tools for measuring nanostructure Biosencer development and application, Nanofabrication, Nanotech impact on types of DNA chips & their production, SNP and genome mismatch signals, functional proteomics – RT PCR Human Genome Project , Bioterrorism.

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Sadhu Vaswani Autonomous College
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Syllabus recommended by Board of Studies of BIOTECHNOLOGY
Session 2016-17 to 2020-21

Class	**: M. Sc**
Semester	**: IV**
Paper	: IV
Subject	**: Biotechnology**
Title of Subject Group	**: Laboratory – I**
Max. Marks	: **85**
	: **15 CCE**
Course Code	**: PR-**BT- 4020

CO1- Students will be able to understand the immunological techniques like immuno diffusion, immune electrophoresis, ELISA, FAT etc.
CO2- Student will be able to understand the
CO3- Student will be able to learn the production of monoclonal antibody
CO4- They can learn the use of technique of immobilization of enzyme
CO5- They are able to learn the use of microbiological analysis of food production.

1.Immunodiffusion.
2.Immunoelectrophoresis.
3.Study of agglutination & rosette formation.
4.PAGE on native gel & study of isozyme by activity staining.
4. Permanent slide on mammalian physiology.
5.Determination of aspartate content is given sample by enzymatic method.
6.To immobilize chymotrypsin on agarose gel beads by Oxirane method.
7. Production of monoclonal antibody against purified protein.
8.To detect nitrate reductive in leaf extracts by immnuno diffusion test.
9. To detect antibodies in sera by competitive ELISA.
10.Identification of bacteria by using fluorescent antibody techniques (FAT).
11. Quality testing of milk by resazuring test.
12.Determination of phosphatase activity in butter, whey, milk powder.
13. Microbiological analysis of food production.
14.Presumptive test for coliform in butter.
15.Analysis of mycotoxin in fungal contaminated food materials.

Note: 70% of the above list should be compulsorily performed

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Course Outcome recommended by Board of Studies of BIOTECHNOLOGY
Session 2016-17 to 2020-21

Class	: M. Sc
Semester	: IV
Paper	: I
Subject	: Biotechnology
Title of Subject Group	: Advances in Fermentation and Food Biotechnology
Max. Marks	: 85
	: 15 CCE
Course Code	**:** BT- 401**7**

CO1- The students will able to understand the biochemical activities and conversions that takes place during fermentations

CO2- This course provides theory about micro organisms used in fermentation processes and about application of these microbes in food fermentation process. Theoretical background of functional microorganisms like lactic acid, bacteria, yeasts and moulds and to study their behavior as fermentation starters.

CO3- Students can understand the role of fermentation microorganisms in major food fermentation.

CO4- Students are able to understand the role of microbes in food spoilage, food toxicology and preservation.

CO5- They are able to carry out food fermentation processes and monitor their progress by measurements and analyses

UNIT-I

Characterization and Techniques of fermentation systems. Role of Fermentation, Biochemistry of Fermentation-Fermentation of Carbohydrates, Protein. Lipid Metabolism, Formation of favour.

UNIT-II

Advanced continuous fermentation for anaerobic microorganisms, Fermentation process development of carbohydrate based therapeutics, Bioprocess development for detoxification and decolorization, Fermentation process validation. Genetic manipulation of industrially important Microorganisms-Methods of reproduction.

Recombination, strain modification, Stabilization of transformants, Autonomous replication. Production of foreign protein, Commercial production of plant proteins in microorganisms. Economics of fermented products.

UNIT-III

Microorganisms involved in natural fermentation, Microbial succession. Sources of Food spoilage, Food Toxicology, Food Processing and preservation.

UNIT-IV

Composition and nutrition of fermented products. Microbial toxins –control of mycotoxin and algal toxin in food. Sensory evaluation of fermented food. Bioreactors in food fermentation. Packaging of fermented food products.

UNIT-V

Protein engineering in food technology: methods, targets and applicationsin foods. Biosensors. Biological monitoring of foods, waste management and food processing. HACCP and hurdle technology.

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Course Outcome recommended by Board of Studies of BIOTECHNOLOGY
Session 2016-17 to 2020-21

Class	: M. Sc
Semester	: IV
Paper	: II
Subject	: Biotechnology
Title of Subject Group	: Principles of Drrug Designing
Max. Marks	: 85
	: 15 CCE
Course Code	: BT- 4018

CO1- Students will be able to understand the basic concept of immunization and immunological techniques to study the antigen antibody interections.

CO2- They are able to understand the working of the immunofluorescence microscopy, immunoelectron microscopy**.**

CO3- They are able to understand the use of FACS and SCID- HC in immunology.

CO4- The use of immunodiagnostics for detection of the cancer and autoimmune diseases.

CO5- The student will be able to explain that how principles of immunology have been applied to development of new therapeutic drugs and recombinant vaccines

UNIT-I

Immunization, routes of immunization, adjuvants; Equilibrium dialysisto measure antibody affinity and avidity, Precipitation reaction, Immunoelectrophoresis, ELISA, ELISPOT assay, Phage display libraries for antibody V-region production.

UNIT-II

Immunofluorescence microscopy; Immunoelectron microscopy; Immunohistochemistry; Immunoblotting (Western blotting).

UNIT-III

Isolation of lymphocytes by Ficoll-Hypaque gradient, Flow Cytometry, Flurescence Activated Cell Sorting (FACS), Congenic mice, SCID-HU mice and their use in immunology

UNIT-IV

Immunodiagnostics for detection of infectious agents, cancer, anautoimmune diseases; Immunosensors.

UNIT-V

Therapeutic monoclonal antibodies; Biological response modifiers, Recombinant v

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Course Outcome recommended by Board of Studies of BIOTECHNOLOGY
Session 2016-17 to 2020-21

Class	: M. Sc
Semester	: IV
Paper	: III
Subject	: Biotechnology
Title of Subject Group	: Applied Immunology and Immunodiagnostics
Max. Marks	: 85
	: 15 CCE
Course Code	: BT- 4019

CO1- Students will be able to organize and make the construction stratergies for the biochemical and molecular level screening system The knowledge of clinical trial and patenting of drugs is also impart by this unit.

CO2- Students will be able to understand the Classification of QSAR, Statistical concept of QSAR and its application in drug designing.

CO3- Students will be able to understand the molecular mechanics and Molecular Modeling methods.

CO4- Student will be able to understand the algorithms, modelingmultimolecular system. Drug designing and. 3D database search methods

CO5- Student will be able to understand the Modeling drug receptor interaction

UNIT-I

Organized drug discovery & development: Pharmacological, microbial, recombinant, biochemical and molecular levelscreening system and their construction strategies. Alternative strategies in lead identification and lead optimization. Preclinical development: clinical trials, patenting & clearance for application.

UNIT-II

Quantitative Structure Activity Relationships (QSAR):

Types of QSAR models, Classification of parameters utilized in QSAR studies, Statistical concept of QSAR, Hansch model of QSAR, De Novo model of QSAR, Hammett and Taft model of QSAR equations, Applications of QSAR in drug design. Receptor verses enzyme mediated drug action. Principles in Agonist and antagonist action.

UNIT-III

Thermodynamic and structural principles: Objective & approaches in the native ligand modification; Molecular graphic and modeling tools: hardware and software component of molecular graphics. Molecular modeling methods:MO theory, empirical methods, geometry optimization, force field, Conformational search, Perturbation free Energy. Molecular Mechanics: electrostatic models, point changes, Solvents, modeling reactivity.

UNIT-IV

Simulated annealing: Conformational space search algorithms, dynamic monte carlo simulation, modeling multimolecular system. Calculation and analysis of molecular field: electrostatic potential, electrostatic field, steric field, other fields and comparison. drug design by receptor site fit, active site confirmation, docking problems and methods. 3D database search methods. Automated structure construction methods.

UNIT-V

Modeling drug receptor interaction: Receptor- introduction and soruce of informations. Receptor fitting. Receptor mapping-pharmacophore concept. Pseudoreceptor. Role of solvent. Peptidomimetic design- goal and achievement. Enzyme catalytic principle - recapitulation, affinity labels, principles of suicide inactivation, design strategies scope and limitations. Illustrative examples of hydrolases, PLP based enzyme, isomerases & redox enzymes inhibitors. Synthetic peptide libraries, peptide libraries through phage display: application in epitope a agretope mapping & in synthetic vaccine designing.

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Course Outcome recommended by Board of Studies of BIOTECHNOLOGY
Session 2016-17 to 2020-21

Class	: M. Sc
Semester	: IV
Paper	: IV
Subject	: Biotechnology
Title of Subject Group	: Disstration
Max. Marks	: 85
	: 15 CCE
Course Code	: BT- 4020

CO1- Student will be able to gain the practical knowledge on the implementation of the biotechnological techniques on various fields like Pharma industry,

CO2- The research area choosen by student help to Interpret, discuss and communicate scientific results in written form;

CO3- It help to Gain experience in writing a scientific proposal and Learn how to present and explain their research findings to the audience effectively.

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Course Outcome recommended by Board of Studies
Session 2016-17 to 2020-21

Class – M.sc CS **Max.Mark:85**

Semester - I

Subject –Computer Science & Application

Paper Title – Discrete Mathematics Structures

Course Code -COMP-801

Course out comes

C01. Solve real world problems logically using appropriate set, function and relation models and interpret the associated operations and terminologies in context.

C02. Analyze and synthesize the real world problems using Discrete mathematics.

C03.Use Mathematical Logic and predicate calculus for solving problem.

C04.Apply the concepts of Lattices and Boolean Algebra.

C05.Perform graph traversals using BFS and Algebra

Unit I - Mathematical Logic: Statements and notations, Connectives: Negation, Conjunction, Disjunction. Statement formulas and truth tables, conditional and Biconditional, Well formed formulas. Tautologies, Equivalence of formulas, duality law, Tautological implications, contradiction contingency, Algebra of propositions, the predicate calculus: predicates, the statement function. Variables and Quantifiers, predicate formulas, free and bound variables, theuniverse of discourse.

Unit II- Set Theory: Basic concepts of set theory, notation, inclusion and equality of sets, the power set,types of sets, operations on set, Venn diagrams, some basic set identities, the principle of specification, ordered pains, Cartesian products, relations & ordering.

Unit III- Algebraic Structures: Introduction, algebraic system: example and its general properties, semigroups and monodies: definitions and examples, homomorphism and monoids, grammars andlanguages, polish expressions and their compilations: polish notations, conversion of infix expressions to polish notation.

Unit IV- Lattices and Boolean Algebra: Lattices and algebraic system, principle of duality, basic properties of algebraic systems defined by lattices, distributive and complemented lattices, Boolean lattices and Boolean algebra, identity of Boolean algebraic Boolean functions and Boolean expression, normal forms, simplification of logic expressions using Karnaugh map,switching circuits.

Unit V- Graph Theory: Introduction, basic terminology, multi-graphs and weighted graphs, digraphs and relations, representation of graphs: incidence matrix, operations on graphs, path and circuits,Graph traversal: Depth first search, breadth first search, shortest paths in weighted graphs.

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Course Outcome recommended by Board of Studies
Session 2016-17 to 2020-21

Class – M.sc (CS)

Semester - I **Max.Mark:85**

Subject –Computer Science & Application

Paper Title – PROGRAMMING IN C++

Course Code -COMP-802

Course out comes

C01. After completing the course, the student must demonstrate the knowledge and ability to:

C02. Develop a greater understanding of the issues involved in programminglanguage design and implementation.

C03. Develop an in-depth understanding ofobject oriented paradigm with principles ofclasses, objects and functions.

C04. Apply Inheritance and Exception Handling concepts in program code.

C05.Manage console I/O operations with manipulators.

UNIT I-OOPS: Introduction to oops principles, procedure oriented programming vs. object orientedprogramming, advantages of OOPS, application. Examples of object oriented languages. Introduction to C++: tokens, expressions, Keywords, identifiers, basic data types, user defined data type, derived data types, symbolic constants, type compatibility, variable declaration, dynamic initialization of variables, reference variables. Operators in C++: scope resolution operator, memory management operators, manipulators, type cast operators, operator precedence. Control structuresArrays: single, multidimensional, array of strings. Function prototyping, function call, scope rules of functions, call by value, call by reference, calling functions with arrays.

UNIT II- Classes and objects: Specifying a class, defining member function, private member functions, scope resolution operator, memory allocation for objects, static data members, static member function, arrays of objects, objects as function arguments, returning objects, Inline functions, friend functions. Constructors: definition, types: default, copy, parameterized, multiple, constructors with defaultarguments, Destructors.

UNIT III- Overloading: definition, rules of overloading, function overloading, Operator overloading and its restrictions, overloading unary and binary operators, operator overloading using a friend function.

UNIT IV- Inheritance: derived class and base class, defining derived classes, types of inheritance- single,multiple, multilevel, hierarchical, hybrid inheritance. Making a private member inheritable, passing parameter to the base class, constructors and destructors in derived classes, nesting of classes. Virtual Base class, abstract classes. Template, Template classes, Explicit Class, Exception handling, Exception, HandlingFundamentals, The try Block, the catch Exception Handler, The throw Statements.

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UNIT V- Managing Console I/O Operations: C++ streams, stream classes, unformatted and formattedi/o operations, managing output with manipulators. Working with files: classes for file stream operations, opening and closing files, detecting end of file, sequential i/o operations, commandline argument.

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Session 2016-17 to 2020-21

Class – M.sc (CS)

Max.Mark:85

Semester - I

Subject –Computer Science & Application

Paper Title – Computer Organization & Architecture

Course Code -COMP-803

Course out comes

C01. Identify, understand and apply different number systems and codes.

C02. Understand the digital representationof data in a computer system & memory organization.

C03.Represent data using Number system.

C04.Draw sequential and combinational digital logic circuits.

C05.Explain Memory organization of Computer.

UNIT I

Data Representation: Data types (Number System – Octal and Hexadecimal Number, DecimalRepresentation, and Alphanumeric Representation), Complements, Fixed Point and Floating- Point Representation.Digital Logic Circuits: Digital Computer, Logic Gates, Boolean Algebra, Map Simplification, Combination Circuits: Adder, Subtract or, multiplexor, DE multiplexoretc. Flip- Flops: SR Flip-flops, D Flip- Flops, JK Flip-Flops, T Flip-Flops, Edge Triggered Flip- Flops, master- slave, Execution Table, Sequential Circuits.

UNIT II

Register Transfer and Micro – Operations: Register Transfer Language, Register Transfer, Bus and Memory Transfer, Micro operations: Arithmetic, Logical, Shift Micro- Operations, Arithmetic logic shift unit.Basic Computer Organization and Design: Instruction Codes, Computer Resisters, ComputerInstructions, Timing and Control, Instruction Cycle, Memory Reference Instruction, Input- Output and Interrupt, Complete Computer Description, Design of Basic Computer.

UNIT III

Programming the Basic Computer: Machine language, Assembly language, The Assembler, Program Loops, Programming arithmetic and logic operations, input- Output Programming, character manipulation, program interrupt. Central Processing Unit: Introduction, General Register Organization, Stack Organization,Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control,RISC and CISC Characteristics.

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UNIT IV

Memory Organization: Introduction, memory hierarchy, main memory, auxiliary memory, Associative memory, cache memory, locality of reference, hit/miss ratio, various mapping process: Associative mapping, direct mapping, and Set-Associative mapping, memory management hardware.

UNIT V

Input- Output Organization: Peripheral Devices- ASCII alphanumeric Characters, Input- Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Access (DMA), Input- Output Processor (1OP), Serial Communication.Introduction to Parallel processing, pipelining. Introduction to multiprocessors.

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Course Outcome recommended by Board of Studies
Session 2016-17 to 2020-21

Class – M.sc (CS) **Max.Mark:85**

Semester - I

Subject –Computer Science & Application

Paper Title – Windows & PC- Software

Course Code -COMP-804

Course out comes

C01.Use the features a available in Windows.

C02.Work with System Tools and use Accessibility Features of Windows.

C03.Create documents using MS Word.

C04.Create Spreadsheets using MS Excel.

C05.Create effective presentations using MS Power Point.

UNIT I

Introduction to Windows: Features of Windows. Difference e between CUI & GUI Interfaces,Hardware Requirement for Running Version of Windows. New Installation & Up gradation, Managing Hardware & Software- Installation of Hardware & Software, Desktop, Start Button,Start Menu, wall paper, Use of Recycle Bin, Computer, Network Icon, Using Scanner Web Camera, Printers, searching files and programs, Multiple User Feature of Windows, Creating and Deletion Wiser, Changing User Password etc. Creating folder and shortcuts of applicationon desktop, Using Windows Explorer, Accessories, Control Panel: Display, Internet Options, User Accounts, Backup and Restore, Data and Time, Taskbar, Start Menu, Windows Firewall,Windows Update, Devices and Printers.

UNIT II

System Tools - Backup, Character Map, Clipboard Viewer, Disk Defragmenter, Drive Space, Scandisk, System Information, System Monitor, Disk Cleanup, Browsing the Web with Internet Explorer and other browsers, Accessibility Features of Windows – Sharing Folders and Drives, Browsing the Entire Network, Using Shared Printers. OLE – Embed/Link Using Cut and Paste an Embed/ Link, Using Insert Object Manage Embedded/ Linked Object. Introduction to Processing (MS Word): Advantages of Word Processing, Introduction &Installation Editing a File, working with 'options' under file menu, Formatting Tool Bar, Setting margins, orientation and size of page. Using Paragraph Styles, Formatting Text, inserting page number, Format Painter, Spell Check &Word Count, Newspaper Style Column, Drop Cap, Header & Footer, Endnote and Footnote.

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UNIT III

Advanced Features of MS- Word: Managing page breaks and section breaks, Inserting Objects, Inserting Hyperlink, Cross reference, Bookmark. Inserting Illustration (Smart Art, Shapes, Charts & Pictures), Adding symbols, signature & equations, Setting Up Printer, Printingoptions, inserting watermark, Mail Merge, printing labels and envelops, Mathematical Calculations, Using Macros, Table Handling, Creating Table of Contents & Index, Use ofThesaurus, saving document versions, comparing two versions of document, protecting document.

UNIT IV

Introduction to Spread Sheet (MS Excel): Definition and Advantages of Electronic Worksheet Working on Spreadsheet, Range and Related Operations, Inserting, Deleting, Coping and Moving of data Cells, Inserting and Selecting Rows and Columns, Protecting Cells, protecting worksheet and workbook, printing a WORKSHEET, Graph Creation: Types of Graph, creating a Chart on Chart Sheet, Printing the Chart. Sort & Filter, Data Validation, consolidate data, Goalseek, Data Table, Subtotal, Group 7 ungroup data. Freeze panes, split window, conditional formatting, inserting comment, pivot table, text to column/column to text, what-if-analysis. Importing data from access, from web and from other sources. Built in functions- mathematical,logical, text, date& time, lookup and reference. Working with 'Options' under file menu.

UNIT V

Introduction to MS- Power Point: Elements of Power Point, Exploring Menus of Power Point, Working with Dialog Boxes, Creating presentation with Auto content Wizard, Designing Presentation: Slide Setup, Adding Text, Formatting Text, Inserting Photo Album, WordArt, Graph, Object and Picture to Slide, Inserting, Deleting and duplicating slides, Adding movie andsound to slide, Adding animation to Slide, Custom Animation, Slide Transition, Protecting Presentation, Printing Slides, View Slide, Outline, Slide Sorter Notes and Slides Show.

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Class – M.sc (CS) **Max Marks:50**

Semester - I

Subject –Computer Science & Application

Paper Title – Lab I (C++ Programming)

Course Code -PR-COMP-802

Course Outcome

C01.Apply Inheritance and Exception Handling concepts in program code.

C02.Manage console I/O operations with manipulators.

1. Define a STUDENT class with Roll No. Name, and Marks in 3 tests of a subject. Declarean array of 10 STUDENT objects. Using appropriate functions, find the average of the two better marks for each student. Print the student details.
2. Write a volume function which calculates the volume of sphere, rectangle and cylinder using function overloading.
3. Write a program to find roots of Quadratic equation, displaying the answer, whether rootsare equal, real or complex.
4. Write a C++ Program to demonstrate private, public and protected access specifiers.
5. Write a program to implement single and multiple level inheritance.
6. Write a C++ Program to create a class called COMPLEX and implement the followingoverloading functions ADD that return a complex number:

(i) ADD(a, s2) – where 'a' is an integer (real part) and s2 is a complex number.

(ii) ADD(s1, s2) – where s1 and s2 are complex number.

7. Write a C++ program to create an ACCOUNT class which has a parameterized constructor for inputting values of account number, name and balance. Class should alsocontain three more functions – Deposit for adding amount, withdraw for subtraction amount (if account balance is more than withdrawal amount) and Print Details for printing the whole account details.
8. Write a C++ Program to create a template function for sorting of integers and doubles.
9. Write a C++ Program to create a class called STUDENT with data members Roll No. Name field as Age. Using inheritance, create the classes UGSTUDENT and PGSTUDENT having fields as semester, Fees and

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Stipend. Enter the data for at least 5students. Find the semester- wise average age for all UG and PG students separately.

10. Write a program to create a file and than write some text into the file through C++program.
11. Write a C++ Program to write and real values using variables in/from file.
12. Write a C++ Program to write and real object using real and write function.
13. Write a program implementing basic operation of class ios. i.e. setf, unsetf, precision etc.
14. Write a program to implementing I/O operations on characters. I/O operations includes inputting a string, calculating length of the string, Storing the string in a file, fetching thestored characters from it, etc.
15. Write a program to copy the contents of one file to another.
16. Write a program to perform read/write binary I/O operation on a file(i.e. write the object of a structure/ class to file).
17. Write a program to maintain elementary database of students using files.

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Class – M.sc (CS) **Max. Marks: 50**
Semester - I
Subject –Computer Science & Application
Paper Title – Lab II (Office Tools)
Course Code -PR-COMP-804
Course Outcome
C01.Create documents using MS Word.
C02.Create Spreadsheets using MS Excel
Suggested List of Practicals

I. System Tools & MS Word

1. Usage of system Tools (Backup, Character Map, Clipboard Viewer, Disk Defragmenter,Drive Space, Scandisk, System information, system monitor, Disk Cleanup etc.)
2. Printing documents with even- odd pages on both sides on a network printer.
3. Revision of basic tools of MS-Word.
4. Implementing Newspaper Style Column, Drop Cap.
5. Use of Header & Footer, Endnote and Footnote.
6. Learning to manage page breaks and section breaks.
7. Inserting Objects, Hyperlinks, Cross reference, Bookmark, illustrations, symbols,signature & equations, watermark.
8. Mail Merge, printing labels and envelops, mathematical calculations, Using Macros.
9. Table Handling, Creating Table of Contents & Index.
10. Protecting documents.

II. MS Excel

1) Revision of basic formulas of MS-Excel.
2) Protecting cells, worksheet and workbook.
3) Applying Sort & Filter, Data Validation, Conditional Formatting.
4) Formulas: and, or, if, sumif, sumifs, countif, countifs.
5) Implementing Pivot Table.

III. MS Power point

1) Adding animation to slide, Custom Animation, slide Transition
2) Creation of photo Album, with automatic transition of slides in 10 seconds with loopbackon end.
3) Creation of presentation with continuation of single audio during whole presentation(despite of slide change)
4) Printing using Handouts.

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Session 2016-17 to 2018-19

Class – M.sc CS **Max Marks :50**

Semester - II

Subject –Computer Science & Application

Paper Title – JAVA PROGRAMMING

Course Code -PR-COMP-808

Course out comes

C01. Use an integrated developmentenvironment to write, object-oriented Java programs.

C02. Use object oriented concepts in Java Programming.

Practical List

1. WAP to print the message on the screen.

2. WAP to calculate factorial of given number.

3. WAP to program Calculate table of given number.

4. WAP to add the digit of given number.

5. WAP to reverse the given number.

6. WAP to Calculate the mean of one dimensional array.

7. WAP to Calculate Area of Circle using Object.

8. WAP to display Structure of Vehicle using simple Inheritance.

9.Create an interface Shape & implement it by two classes to Calculate area.

10. Create a package college, define students & professor's classes and import the packing in any other class.

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Class – M.sc CS **Max Marks :50**
Semester - II
Subject –Computer Science & Application
Paper Title – Data Structure using C++
Course Code -PR-COMP-805
Course out comes

C01.Introduce the concept of arrays and matrices.

C02.Illustrute stacks, quire and Trees.

Practical List

1. Write a program form insertion, deletion and traversal of elements of an array.

2. Write a program for complete implementation of stack using array with push, pop and traversal operations.

3. Write a program for complete implementation of queue using array with insertion, deletion and traversal operations.

4. Write a program to create singly link list (creation, insertion, deletion and traversal).

5. Write a program for complete implementation of stack using link list with push, pop and traversal operations.

6. Write a program for implementation of binary search tree (creation, insertion, deletion), with preorder, inorder and postorder transversal.

7. Write a program for implementing graphs and showing depth first search and breadth first search traversals.

8. Write a program for linear search.

9. Write a program for bubble sort.

10. Write a program for selection sort.

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Sadhu Vaswani Autonomous College
Sant Hirdaram Nagar, Bhopal
Course Outcome recommended by Board of Studies
Session 2016-17 to 2018-19

Class – M.sc CS **Max Marks :85**

Semester - II

Subject –Computer Science & Application

Paper Title – Data Structures and Algorithms

Course Code -COMP-805

Course out comes

C01.Introduce the concept of arrays and matrices.

C02.Illustrute stacks, quire and Trees.

C03.Importance of Searching in Trees.

C04.Understand Graph Search methods in data structures

C05.Explain Dynamic programming in DS.

UNIT I-

Data Representation; Introduction, List, Formula Based Representation, linked in directing Addressing, Simulating Pointers, A Comparison Applications, convex Hull, Arrays and Matrices; Arrays, Matrices, Special Matrices- Sparse Matrices.

UNIT II

Stacks; The Abstract Data Type, Derived Class and Inheritance, Formula Based Representation, Linked Representation, Application.

UNIT III

Priority Queues: Introduction, Linear List, Application. Tournament Trees; Introduction, the ADT Winear Tree, The Class Winner Tree, Loser Tree Applications. Search Trees; Binary Search Tree, AVL Trees, Red Black Tree, B-Tree, Applications

UNIT-IV

Graphs; Defination, Applications, Properties, The ADTs Graph and Diagraph, Representation of Network, Class Defination; Graph Integrators, Language Features, Graph Search Methods, Applications. The Greedy Method; Optimization Problem, the greedy method, Application. Divide and Computer; The Method, Application.

UNIT-V

Dynamic Programming; The Method, Application.Backtracking; The Method, Application.Branch and Bound; The Method, Applications.

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Session 2016-17 to 2018-19

Class – M.sc CS **Max Marks :85**
Semester - II
Subject –Computer Science & Application
Paper Title – OPERATING SYSTEM
Course Code -COMP-806
Course out comes
C01. Understand the basic working process of an operating system.
C02. Concept of File Management and Allocation Methods.
C03. Understand the importance of process states and scheduling.
C04 Understand the issues in synchronization and memory management.
C05. Understand the Techniques for device management.

UNIT I

Overview Of The Operating System ; Evaluation Of Operating System , Classification Of Operating System, Batch OS Multiprogramming Time Sharing, Real Time Combination Distribute OS Different Views Of Operating System; Operating System As A Processor Manager, Memory File Manager Device Manager Etc System Services, System Cell, Hierarchical & Extended Machine View, Design And Implementation OF OS Function Requirement, Implementation.

UNIT II

File Management; File Concept, File Types, Based Systems , Disk , Based System, Blocking File Operation Creating Writing Riding Delecting File Access Methods, File Allocation Methods Contiguous Contiguous Dynamic Linked And Indexed Allocation Performance Of Allocation Methods Under Various Size Of File Directory System Single Level Two Level Structured , File Protection Mechanism Layered File System.

UNIT-III

Processor Management Process Views, Structure, State, Process, Control Block Multiprogramming Levels of Scheduler And Scheduling Algorithms . Evaluation Of Various Scheduling Algorithms, Multiple Processor Scheduling Process Synchronization, Synchronization Mechanism, Virtual Processors, Interrupt Mechanism, Future Trends In Processor Management.

UNIT-IV

Memory Management; Memory Management Schemes, Contiguous Allocations. Single & Partitioned (State & Dynamic) Segmentation, Non Contiguous Allocating Paging Virtual Memory, Concepts, Demand Paging Performing, Page Default, Page Replacement Algorithms, Segmentation And Paging Future Trends In Memory Management, Large Main Memories , Storage Hierarchies, Hardware Support Of Memory Management.

UNIT V

Technique For Device Management, Dedicated Dices , Shared Devices, Virtual Devices, Sequential Access Direct Access, Devices, Channel And Control Unit, Independent Devices, Operation, Buffering, Multiple Paths, Block Multiplexing Device Allocation Consideration, I/O Traffic Controller, I/O Scheduler, I/O Device Handlers, Virtual Devices, Spooling System.

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Class – M.sc CS **Max Marks :85**
Semester - II
Subject –Computer Science & Application
Paper Title – COMPUTER NETWORKS WITH WINDOWS NT
Course Code -COMP-807
Course out comes

C01.Introduce basic concepts of computer networks.
C02.Understand IEEE standards and OSI model.
C03.Use of various internet working devices.
C04.Understand Various Internet Protocols and cryptography.
C05.Illustrate windows MT. Features, Server and workstations.

UNIT I
Analog & digital signal, electronic spectrum, asynchronous & synchronous transmission. Ideal channel, brand rate, base broad band channel, multiplexer FDM, TDM, STDM, carries, modulation, AM, FM, PCM, PWM, SWM, encoding, schemes, the needs and importance of networking, type of network, server based, peer based, hybrid, Layered architecture, LAN tapology, network adopted card, Logical tapology, modem.

UNIT II
Switching technique, message Switching, circuit Switching, packet Switching, virtual circuit, transmission media, OSI reference model IEEE standards, 802,3.802.5 ALOHA, SLOTTED ALLOHA, CSMA CSMA/CD Bitrmap CCITTX.25, CCITT x. 11 token ring, token bus.

UNIT III
Fast Ethernet, FDDI token ring. Wireless LAN, ATM network, principles of internetworking internet working devices, bridge, routers gateways, repeater, rooting algorithms, distance vector routing, shortest path routing, broadcast routing, multicast routing, ICP/IP protocol, IPV6 addressing, congestion control, traffic shaping.

UNIT IV
TELNET, FTP, SMTP, MINE, SNMP, UDP, URL (Uniform resource Locater) THTTP source routing, bridge, transport bridge, ISDN channel, ISDN services, base band ISDN, broadband ISDN, Different switches, PBX network, network securing application of cryptography to security, data encryption transposition cipher, substitution cipher, PSA algorithms.

UNIT V
Introduction to Windows NT, Various Features, Differences With Other Windows Environment And Other OS, Windows NT Workstations Versus Server. Kernel and Its Subsystems. Security Models: System Level Restrictions, Server Application Security, Domain Group Access.

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Class – M.sc CS **Max Marks :85**
Semester - II
Subject –Computer Science & Application
Paper Title – PROGRAMMING IN JAVA

Course Code -COMP-808

Course out comes
C01. Use an integrated developmentenvironment to write, object-oriented Java programs.
C02. Use object oriented concepts in Java Programming.
C03. Concept of Inheritanceand end exception Handling.
C04. Execute programs using Inheritanceand Multi-Threaded programming.
C05. Design and develop basic Applets.

UNIT I
History and design feature of JAVA, how java Works, basic of JAVA. Apllication and Applets, using the tools in JDK, javadoc, java, jdb etc. Applets Programming- Creating and executing java applets, inserting applets in web page, Java Security.

UNIT II
JAVA Language- Keyboard, Constants, Variable, and Data type, Operators and statement: Break, continue, and return. Array, String and String Buffer Classes, Wrapper Classes.Classes, Objects and methods Defining a class , adding variables and methods creating objects constructors, class inheritance.

UNIT III
Inheritance, Basic types, using super, multi level hierarchy, obstract and final classes, object class, packages and interfaces, packages. Exception Handling, Fundamentals exception types, uncaught exception, throws, try –catch, final, built in exception, creating your own exceptions.

UNIT IV
Multithreading Fundamentals, Java Thread model: priorities, synchronization, messaging, thread class, Runnable interface, Interhead communication, suspending, resuming and stopping threads.
Input-Output- Basics Streams, Byte and character Streams, predefined streams, Reading and writing from console and files using standard Java Packages (lang, util, io)
Networking- Basics, networking classes and inheritance, using java. Net package, doing TCP/IP and Datagram Programming.

UNIT V
AWT Classes, Event Handling and Swing classes, AWT Programming, working with Windows Graphics and text, Using controls, Layout managers and menus Handling image, animation, sound and video Event Handling –Different mechanism, the Delegation Event Model, Event Classes, Event Listener interface, Adapter and Inner Classes.Java Swing japplet, icons and labels, text fields, buttons, combo boxes, tabbed and scroll panes, trees, tables.

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Class – M.sc CS **Max.Mark:50**
Semester - III
Subject –Computer Science & Application
Paper Title – Oracle
Course Code -PR- COMP-810
Course out comes
C01. Understand, effectively & explain the underlying concepts of database Technologies.
C02. Design and implement a database schema for a given problem-domain.
Practical List

1.Create a table client_master with the following field is : Client_no, name, Address, City, Pincode, Baldue and Insert at least 04 records in table.
2.Apply the following queries:
I. Delete from client master, where the columns city holds the value 'Bhopal'
II. Drop table client master if already exits and create table client master and data values being inserted into the columns client to must start with the capital letter C.
III. List the client details of the client name Arun, Mamta and Ivan.
3.Create a table product and find the products and their quantities for the orders placed by client no 'C0001' and 'C0002' by using join.
4.Create a sequence by the name ADDR_SEQ, which will generate number from 1 up to 9999 in ascending order with on interval of 1. The sequence must restart from 1 after generating number 999.
5.Apply the following quires: -
6.Create a function that accepts a client no and checks if the clint_no exist in the table clint_master. If the client no exists display a message. Valid clint and if the clint_no does not exist then display an appropriate error message.
7.Display client_name, client_no and Bal due of the first 03 client holding the higest amount in bal due.

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Class – M.sc CS **Max.Mark:50**

Semester - III

Subject –Computer Science & Application

Paper Title – Advance Java Programming

Course Code COMP-813

Course out comes

C01. Identify classes, objects, members, and functions in JAVA.

C02. Concept of Java Virtual Machine Programs.

Practical List

1. Write a Program to print “Hello World”.
2. Write a Program to Modified color with multiple buttons.
3. Write a Program to layout regions Board.
4. Write a Program to display card layout in applet Java.
5. Write a Program to Create logic page.
6. Write a Program to copy of text and past of text in applet Java.
7. Write a Program to select choice of content of items.
8. Write a Program to use list of component in list applet Java.
9. Write a Program to display menu of the items.
10. Write a Program to create list box, checked box, radio button and submit button.
11. Write a Program to display multiple images for J component.
12. Write a Program to create J toggle button component.
13. Write a Program to display J slides component.

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Class – M.sc CS **Max.Mark:85**
Semester - III
Subject –Computer Science & Application
Paper Title – RDBMs Concepts and Oracle
Course Code -COMP-810
Course out comes

C01. Understand, effectively & explain the underlying concepts of database Technologies.

C02. Design and implement a database schema for a given problem-domain.

C03. Normalize a database and query a database using SQL DML/DDL/DCL/TCL/DQL commands. Declare and enforce integrity constraints on a database.

C04.Fomulate Solution of Data Management Problems using SQL.

C05.Apply Joint on Tables and used TCL and DCL Commands.

Unit I
Relational Model: storage organization for relations, relational Algebra, Relational calculus, Functional Dependencies, Multivalued dependencies and normalization. Relational query Language.Functional Dependencies, Good and Bad Decomposition, Anomalies as a database: A consequences of bad design, Universal Relation, Normalization: 1NF,2NF,3Nf, BCNF,4NF, 5NF.Relational Algebra, Structured query Language(SQL), Using MS Access, implementing SQL functions, integrity, indexing, View Using MS Access.

Unit II
Degree Of Data Abstraction, The Database Life cycle(DBLC): Initial study Of the Database, Database Design, Implementation and loading, testing and evaluation, Operation , Maintenance and Evaluation.

Unit III
Centralized Verses Decentralized Design, what is a Transaction? Concurrency Control (locking Methods Time Stamping Method, Optimistic Method) DDBMS (Distributed Database Management systems), Advantage and disadvantages. Homogeneous and Heterogeneous DBMS, Distributed Database Transparency features. Level Of Data And Process Distribution: SPSD (single –site Processing, single- site Data) , MPSD (Multiple-site Processing , single–site Data),MPMD (Multiple-site Processing ,multiple-site data).

Unit IV
Systems, Client/Server : Architecture And Implementation Issues. Client/Server? The forces that Drive Client/Server.

Unit V

DSS (Decision support systems) : Operational Data Vs. Decision Support Data , The DSS Database Requirements . The Datawarehouse: The Evaluation of the data Warehouse, Rules for Datawarehouse, Online Analytical Processing (OLAP) : OLAP Architecture Relational , OLAP And Comparison ,Data Mining.

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Class – M.sc CS **Max.Mark:85**
Semester - III
Subject –Computer Science & Application
Paper Title – Multimedia Tools and Applications
Course Code -COMP-811
Course out comes
C01. Concepts of Plain and formatted text.
C02.Understand to Sound Depth, channels, sound on PC.
C03. Concept of Analog and Digital Video How to use Video on PC.
C04. Type of Multimedia authoring tools.
C05.Understand to Graphics support in HTML, Image Map, video on the web.

UNIT-I
Multimedia: Needs and Areas of use, Development platforms for multimedia-DOS , windows , Linux . Identifying Multimedia elements – Text, Images, Sound, Animation and video, Making simple Multimedia with PowerPoint.
Text – Concepts of Plain and formatted text, RTF & HTML texts , using common text preparation tools, conversion to and from of various text formats ,using standard software ,object linking and embedding concept, Basics of font design ,Overview of some fonts editing and designing tools, Understanding & using various text effects.
Images: Importance of graphics in multimedia, Vector and Raster graphics, image capturing methods – Scanner , Digital camera etc. various attributes of images – size ,color, depth etc, Various Image file format – BMP,DIB,EPS,CIF,PEX,PIC,JPG,TGA,PNG and TIF format – their Features and limitations ,graphic file formats conversions , processing images with common software tools such as photoshop ,paint shop pro ,Corel draw etc.

UNIT-II
Sound : sound and it attributes ,Mono V/s Stereo sound ,Sound Channels ,Sound and its effect in multimedia , Analog V/s Digital sound ,Basics of sound's –sampling , frequency ,Sound Depth,channels,sound on PC , Sound standards On PC, capturing and editing sound on PC ,
Overview and using some sound recording, editing software .Overview of various sound file formats on PC-WAV,MP3,MP4,Ogg Vorbose etc.
Animation : Basics Of animation , Principle and Use of Animation in Multimedia .Effect of Resolutions , pixel depth , Images size on Quality and Storage . Overview of 2-D and 3-D animation techniques and Software – Animation Pro , 3D studio & Paint shop Pro animator , Animation on the Web – Features and limitations , Creating simple animations for the Web using GIF Animator and Flash.

UNIT -III
Video : Basics of Video – Analog and Digital video , How to use Video on PC. Introduction to graphics accelerator cards , DirectX , Introduction to AV/DV and IEEE1394 cards , Digitization of analog video to digital video standards – NTSC , PAL , SECAM , HDTV , Introduction to video capturing Media & instrument - Videodisk , DVCAM , Camcorder , Introduction to digital video compression techniques and various file Formats – AVI , MPEG ,MOVE Real Video .
Brief Introduction to video editing and movie making tools – Quick time, video for Windows & Adobe Premier..

UNIT –IV
Authoring Tools CD Based Multimedia: Type of Multimedia authoring tools, key factors of selecting CD based multimedia authoring tools, planning and distribution of a multimedia project. Multimedia Development team & skills requirement,

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Stages in designing & producing multimedia products for CD, Testing of Product, Distribution of multimedia product, Various formats of CD's and DVD's.

UNIT –V

Multimedia on the Web: Bandwidth relationship, broadband technologies, text in the web – Dynamic and embedded font technology, Audio on the web – Real Audio and MP3/MP4, Audio support in HTML, Graphics – HTML safe color palate , Interlaced V/s Non interlaced Model , Graphics support in HTML , Image Map , video on the web – Streaming video , Real video , MPEG and SMIL , Virtual reality on the web.

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Session 2017-18 TO 2018-19

Class – M.sc CS **Max.Mark:85**
Semester - III
Subject –Computer Science & Application
Paper Title – Software Engineering
Course Code -COMP-812
Course out comes
C01. Describe theories, models, and techniques that provide a basis for the software lifecycle.
C02. Use software metrics to estimate various software project parameters.
C03. Design, test, deploy and maintain Software.
C04. Illustrate Software project management, Time management, Cost and Quality management.
C05. Describe Project Human resource management, Configuration management and use CASE tools.

UNIT –I
The Software Problem, Software Engineering Problem, Software Engineering approach – Phased development Process, Project management and Matrices. Software Processes – Processes, Projects Components, Characteristics. Software Development Process – Process step specification, Waterfall model, prototyping, iterative enhancement, spiral model.

UNIT –II
Software Requirement Analysis and specification – Software Requirements, Problem Analysis, Requirement Specification, Validation, Metrics.

UNIT-III
Planning a Software Project – Cost Estimation, Project Scheduling, Staffing and Personnel Planning, Software Configuration Management Plans, Quality Assurance Plans, Project Monitoring Plans, Risk Management.

UNIT –IV
Software Design – Design Principles, Module level concepts, Design Notation and specification, Structured design Methodology, Verification. Coding – Programming Practice, Verification and Metrics.

UNIT- V
Software Testing – Testing Fundamentals, Functional testing, Structural testing, testing process. Software Quality Assurance (SQA): Software Reviews, Software Quality factors, SQA activities, Formal Technical Reviews , SQA Approach. Software Configuration Management – Configuration Identification, change control , Status Accounting and Auditing.

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Class – M.sc CS **Max.Mark:85**
Semester - III
Subject –Computer Science & Application
Paper Title – Advanced JAVA Programming
Course Code -COMP-813
Course out comes
C01. Understand object oriented programming concepts.
C02. Concept of inheritance, polymorphism, overloading and reusability of objects.
C03. Identify classes, objects, members, and functions in JAVA.
C04. Concept of Java Virtual Machine Programs.
C05.Understand HTML Tags & Applets Programs.

UNIT-I
JAVA BASICS REVIEW java streaming – Networking – Event Handling – Multithreading – Byte code Interpretation – Customizing Application – Data Structures – Collection classes.

UNIT –II
DISTRIBUTING COMPUTING Custom Sockets – Remote Method Invocation – Activation – Object Serialization – Distributed garbage collection – RMI –IIOP-Interface Definition Language – COBRA – JINI overview.

UNIT –III
JAVA BEANS AND SWING Bean concepts – Events in bean box- Bean Customization – persistence – Application – Deployment using swing – Advanced swing techniques – JAR file handling.

UNIT-IV
JAVA ENTERPRISE APPLICATIONS JNI – Servlets – Java server pages – JDBC – Session Beans- entity Beans – Programming and Deploying enterprise java Beans – Java Transactions.

UNIT V
Graphics Java Media Frame work -3D graphics- Internationalization case study- Deploying n- tier application, E-commerce applications.

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Class – M.sc CS **Max.Mark:50**

Semester - IV

Subject –Computer Science & Application

Paper Title – ASP. NET

Course Code -PR-COMP-819

Course out comes

C01. Data Binding concept with web, data grid and web server controls.

C02. Using XML, SOAP, web service description language.

Practical List

1. Write a program in ASP.NET Mathematical Indication.
2. Write a program in ASP.NET simple interest factorial.
3. Create Login page in ASP.NET.
4. Create Your college registration from.
5. Display a record in data grid to input of data.
6. Create a web page using validation.
7. Create a crystal report to book bills.
8. Design resume in crystal reports.
9. Give an authentication and Authorization in ASP page.

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Class – M.sc CS **Max.Mark:50**

Semester - IV

Subject –Computer Science & Application

Paper Title – Shell Programming in UNIX

Course Code -PR-COMP-820

Course out comes

C01.Explain to structure of OS and process management.

C02.Understand System Calls and Concept of Pipes.

Practical List

1. Write a shell script to calculate the factorial of a number in UNIX.
2. Write a shell script to REVERSE A NUMBER GIVEN BY A USER IN unix.
3. Write a shell script to find the largest number among the 3 given number in UNIX.
4. Write to find out the sum of the given number using command line argument in UNIX.
5. Write to create a pyramid of number in UNIX.
6. Write a find the value of one number raised to the power of another in UNIX.
7. Write a script that finds total no. of uses and find out how many of them are currently togged in UNIX.
8. Write a shell program for swapping without using third variable.
9. Write a program to check the current year is leap or not.
10. Write a shell script to read data from file in UNIX.
11. Write a shell script to make a menu driven calculator using case in.

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Class – M.sc CS
Max.Mark:85
Semester - IV
Subject –Computer Science & Application
Paper Title – UNIX Internals, SHELL programming & LINUX
Course Code -COMP-815
Course out comes

C01.Explain to structure of OS and process management.
C02.Understand System Calls and Concept of Pipes.
C03. Describe memory and disk management techniques in OS.
C04.Implement basic scripts in shell.
C05. Execute Linux commands.

UNIT I
Introduction to kernel :- Architecture of the Unix, the buffer cache , Internal representation of files : Inode , accessing blocks , releasing blocks , structure of regular files , conversion of path name to an inode , inode assignment to new file , allocation of disk – block.

UNIT II
System calls for the file systems :- OPEN,READ,WRITE,CLOSE. PIPES :- the Pipes system call opening a named pipes, reading and writing pipes , closing pipes , DUP , LINK , UNLINK ,system call for TIME and CLOCK.

UNIT III
The structure of Processes :- Process states and transitions . Layout of system memory , the context of a process, saving the context of the process , Manipulation of the process address space.
Process Control : - Process creation , signals , Process termination , awaiting process termination ,the user id of a process , changing the size of the process.

UNIT IV

Shell Programming :- Study of different types shell like C shell , Bourne shell etc. Shell variable , Shell Script . Shell Command . Looping and Making choices :- For Loop , While and Until , Passing Arguments to Scripts Programming in different shells.

UNIT V

LINUX File systems , Hierarchy , editors , common Linux Command , Mounting & Un- Mounting CD-ROM , Floppy Disk , Different access permission , Backing & Restoring , Network Configuration Command Ipconfig , Hostname ,Telnet.

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Class – M.sc CS **Max.Mark:85**
Semester - IV
Subject –Computer Science & Application
Paper Title – Compiler Design
Course Code -COMP-816
Course out comes

C01.Understand deterministic and non-deterministic finite automata.
C02. Learn compiler programming and regular grammar.
C03. Parsing technique in regular grammar and its algorithms.
C04. Concept of Static & Dynamic Memory Allocation
C05.Handling lexical syntax errors and learn optimization.

Unit I
Automata Introduction to Finite Automata, Structure Representation, Automata and Complexity, Alphabets, String, Language informal picture of Finite Automata, Deterministic Finite Automata, Nondeterministic Finite Automata, an Application.

Unit II
Introduction To Compiler, Overview of Compilation, Process, Typical Compiler Structure, Implementing A Compiler Programming Language Grammars, Elements of a Formal Language Grammar, Derivation, Reduction & Syntax Trees, Ambiguity Regular Grammar & Regular Expression- Context free Grammar.

Unit III
Scanning & Parsing Techniques – The Scanner Regular Grammar and Fsa, Top Down Parsing, Parsing Algorithms, Top Down Parsing Without Backtracking, Predictive Parsers, Bottom up Parsing, Parsing Lr Parsers, Shift Reduce Parsing.

Unit IV
Symbol Table Organization, Memory Allocation – Static & Dynamic Memory Allocation, Compilation Control Transfer, Procedure Calls, Conditional Execution, Iteration Control Construct.

Unit V
Lexical Syntax Errors, Semantic, Major Issues In Optimization, Optimizing. Transformations, Local Optimization, Program Flow Analysis, Global Optimization.

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Class – M.sc CS **Max.Mark:85**
Semester - IV
Subject –Computer Science & Application
Paper Title – ASP.NET And C#
Course Code -COMP-817
Course out comes

C01. Exposed to objects, interfaces and applications of C#.
C02. Connection between web page and SQL server Database file
C03. Data Binding concept with web, data grid and web server controls.
C04. Using XML, SOAP, web service description language.
C05.Understand of Programming Languages and Structure

UNIT I

Overview of ASP.NET framework, Understanding ASP.NET Controls , Applications Web Servers , installation of IIS . Web forms ,web from controls – server controls , client controls , web forms & HTML, Adding controls to a web Form , Buttons , Text box , Labels , Checkbox , Radio Buttons , List Box etc. Running a web Application , Creating a multiform web Project.

UNIT II

Form Validation: Client Side Validation , Server Side Validation , Validation Controls : Required Field Comparison Range . Calendar control . State Management – View State , Session State , Application State.

UNIT III

Architecture of ADO.NET , Connected and Disconnected Database ,Create connection using ADO.NET Object Model , Connection Class , Command Class , Data Adapter Class , Dataset Class . Display data on data bound Controls and Data Grid . Database Accessing on web applications : Data Binding concept with web creating data grid , Binding Standard web , Creating data grid , Binding Standard web server controls . Display data on web form using Data bound controls.

UNIT IV

Writing Datasets to XML , Reading datasets with XML. Web services : Introduction , Remote method call using XML , SOAP , web service description language , building & consuming a web service , Web Application deployment .

UNIT V

Overview of C# , C# and .NET , Similarities & differences from JAVA , Structure of C# Program . Language Features : Type system , boxing and unboxing , Flow controls , Classes , Interfaces , Serialization , Delegates , Reflection.

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Class – M.sc CS **Max.Mark:85**
Semester - IV
Subject –Computer Science & Application
Paper Title – Elective Paper I
Course Code -COMP-818
Course out comes
C01. Concept of Artificial Intelligence and various search algorithms.
C02. Understanding knowledge system in Artificial Intelligence.
C03. Concept of Prolog programming and its implementation
C04. Explanation of Natural Language Processing.
C05. Understanding of expert system life cycle.

Artificial Intelligence and Expert Systems

UNIT I
General issues and overview of AI , AI techniques , AI problems , AI Techniques , Importance and areas of AI, Problem solving state space search – DLF , BFS Production System , Problem characteristics. Heuristic Search Techniques : Generate and Test , Hill Climbing , Best First Search , Problem reduction , Constraint satisfaction – Crypt Arithmetic and Problems.

UNIT II

Knowledge representation & mapping, approaches to knowledge to representation, issues in knowledge representation , Representing simple facts in logic , representing instance and relationships , Resolution and natural deduction Representing knowledge using rules , Procedural v/s Declarative knowledge , Logic Programming , Forward v/s Backward chaining , Matching & Control Knowledge.

UNIT III
AI Programming Language: Prolog – Objects , Relationships , Facts, Rules and Variables , Prolog : Syntax and data structures , representing objects & relationships by using " trees " and " lists " , use of cut , I/O of characters and Structures . Symbolic reasoning under uncertainty : Introduction to monotonic reasoning , Logics for Non monotonic reasoning , implementation issues , implementation : DFS & BFS.

UNIT IV

Slot and Filler Structures : Semantic nets , Frames , Conceptual Dependency , Scripts , CYC Natural languages and NLP , Syntactic processing parsing techniques , Semantic analysis case grammar , Augmented transition net , Discourse & Pragmatic Processing , Translation.

UNIT V

Definition and characteristics of Expert System , representing and using domain knowledge , Expert system Shells Knowledge Engineering , Knowledge acquisition , expert system life cycle & expert system tools , MYCIN & DENDRAL examples of expert system.

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Course Outcome recommended by Board of Studies
Session 2019-20 TO 2020-21

Class – M.sc CS **Max. Marks: 50**
Semester - II
Subject –Computer Science & Application
Paper Title – Lab I (Data Structures & Algorithms)
Course Code -PR-COMP-822
Course Outcome
C01. To use appropriate algorithmic strategy for better efficiency.
C02.Explain the algorithms related to linked lists and graphs.
Suggested List of Practical

1. Write a choice based menu driven program to traverse an array, insert an item at the k^{th} position in the array and delete item at k^{th} position from the array.
2. Write a program for matrix multiplication.
3. Write a program to find the maximum number from the given array elements.
4. Write a program to implement PUSH 8 POP operations on a stack using array.
5. Write a program for evaluation of a postfix expression using stack.
6. Write a program for conversion of infix expression into postfix expression using stack.
7. Write a program for parenthesis matching of given expression using stack.
8. Write a program for selection sort.
9. Write a program fur quick sort.
10. Write a program for merge sort
11. Write a program for linear search.
12. Write a program for binary search.
13. Write a program to Implement Insertion and deletion operation on queue using array.
14. Write a program to implement linked list.
15. Write a program to implement binary tree.

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Class – M.sc CS **Max. Marks: 50**
Semester - II
Subject –Computer Science & Application
Paper Title – Lab-II (Advanced RDBMS)
Course Code -PR-COMP-825
Course Outcome
C01.Able to handle errors and use triggers.
C02. Master the basic concepts andappreciate the applications of database systems and the basics of SQL and construct queries using SQL.
Suggested List of Practical
1. Write a PL/SQL code to create an employee database with the tables and fields specified as below.
a) Employee b) Works c) Company d) Manages Note: Primary keys are underlined.
2. Write a PL/SQL code to create a student database with the tables and fields specified as below.
a) Student (Roll no, student_name, course, gender)
b) Student_personal (Roll_no, dob, fathers_ name, address, city)
c) Student enrollment (Roll_no, course, course code, sem, total_marks, percentage)
3. Write a PL/SQL code to calculate the total and the percentage of marks of the students in four subjects from the Table-Student with the schema given below. STUDENT (RNO, S1 , S2, S3, S4,total, percentage)
4. Write a PL/SQL code to display employee number, name and basic of 5 highest paid employees.
5. Write a PL/SQL code to calculate the total salary of first n records of emp table. The value of n ispassed to cursor as parameter.
6.Write a PL/SQL code to update the salary of employees who earn less than the average salary.
7.Write a row trigger to insert the existing values of the salary table in to a new table when the salarytable is update
8.Write a trigger on the employee table which shows the old values and new values of Ename after anyupdations on ename on Employee table.
9.Writ a PL/SQL procedure to find the number of students in first, second, and third division respectively in each course by using database tables as described in problem 2 above. Also write thecode to call your procedure
10. Create a stored function that accepts 2 numbers and returns the addition of passed values. Also writethe code to call your function.
11. Write a PL/SQL function that accepts department number and returns the total salary of thedepartment. Also write a function to call the function.

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Class – M.sc CS
Max.Mark:85
Semester - II
Subject –Computer Science & Application
Paper Title – DATA STRUCTURES AND ALGORITHMS
Course Code -COMP-822
Course out comes
C01. Have practical knowledge on theapplication of data structures.
C02. Apply algorithm, Flowchart and applications of graphs and trees to simplify real time problems.
C03. To use appropriate algorithmic strategy for better efficiency.
C04.Explain the algorithms related to linked lists and graphs.
C05.Apply greedy method, Divide and Conquer and Dynamic Programming in problem solving.
UNIT-1
Data Representation: Introduction Linear List. Formula Based Representation, Linked representation.Indirect Addressing. Simulating Pointers.Arrays and Matrices: The abstract data type. Operations: traversing. insertion, deletion. Searching (linear & binary search) and their algorithms. row major & column major representation. Matrices:definition and operations. Special Matrices, Sparse Matrices.

UNIT-II
Stacks: The Abstract Data Type. PUSH & POP operations, Array representation. Linked Representation. Applications.Queues: The Abstract Data Type, Formula Based Representation. Linked Representation. Applications.Priority Queues: Introduction, Linear List. Applications.

UNIT-III
Binary and other Trees: Trees, Binary Trees. Properties, Representation, Common Binary Tree Operation. Binary Tree Traversal, The ADT Binary Tree, The Class Binary Tree, ADT and Class Extensions. Applications. Tournament Trees: Introduction, The ADT Winner Tree, The Class Winner Tree. Loser Tree Applications. Search Tree: Binary Search Tree.
AVL Trees, Red-Block, B-Tree Applications.

UNIT-IV
Graphs: Definitions. Applications. Properties, The ADTs Graph and Digraph, Representation ofNetwork. Class Definition: Graph Iterators Language Features, Graph Search Methods. Applications.The Greedy Method: Optimization Problems, The Greedy Method. Applications. Divide and Conquer the Method, Applications: merge sort, quick sort and selection sort.

UNIT-V
Dynamic Programming: The Method. Applications.

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Class – M.sc CS **Max.Mark:85**
Semester - II
Subject –Computer Science & Application
Paper Title – ADVANCED COMPUTER NETWORKS
Course Code -COMP-823

Course out comes
C01. Understand the concepts of data communication at different layers and compare ISO - OSI model with TCP/IP model.
C02. Knowledge of networking protocolsat data link layer.
C03. Analyze various routing algorithms and protocols at network layer & transportlayer protocols and congestion control algorithms.
C04. Explore protocols at application layer and understanding the concepts of ITAct & Cyber Law.
C05.Be aware of IT Act and Cyber Laws and the issues in Network Security.

UNIT I
Introduction: Protocols and standards. Standards Organizations, Internet Standards. Internet Administration; Overview of Reference models: The OSI model, TCP/IP protocol Suite, Addressing, IP versions. Connectors. Transceivers and Media converters, Network interface cards and PC cards, Repeaters. Hubs. Bridges. Switches. Routers and Gateways.
UNIT II
IPV6: why IPV6, basic protocols. Extension & option, support for QOS, Security. etc, neighbor discovery, auto.-configuration. routing. Change to other protocols. Application Programming interface for IPV6. 6Bone.
Introduction to Cryptography: Basic Terms-Plain Text, Cipher Text, Encryption Decryption. Cryptography Cryptanalysis, Cryptology, Secret Key. Cipher Principles-Security. Attacks. Services andMechanisms. Classical Encryption Techniques-Substitution and Transposition Techniques.
UNIT III
Mobility in Network: Mobile. Security related issues. IP Multicasting, Unicast Routing Protocols –RIP, OSPF, BGP. Multicasting Routing Protocols, Host Configuration: BOOTP AND DHCP .
UNIT IV
TCP extensions for high speed networks. Transaction oriented Applications. ARP, RARP, Internet Protocol, ICMP, IGMP, TCP. UDP. Introduction to Socket & Ports. Socket Class, Methods of Socket.
UNIT V
Network Security at various layers. Secure-HTTP, SSL, PSP, authentication Header. Key distribution protocols, digital Signature, Digital Certificates, Firewalls.IT Act & Cyber Laws: Cyber Crime and Cyber Laws, Types of Cyber Crimes. Cyber Law Issues in E- Business Management. Overview of Indian IT Act. Information Technology Act 2000, International Scenario in Cyber Laws: Data Protection Laws in EU and USA, Ethical Issues in Intellectual property rights, Copy Right. Patents, Data privacy and protection. Domain Name. Software piracy, Plagiarism, Issues in ethical hacking.

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Class – M.sc CS **Max.Mark:85**
Semester - II
Subject –Computer Science & Application
Paper Title – ADVANCED RDBMS
Course Code -COMP-824
Course out comes

C01. Master the basic concepts andappreciate the applications of database systems and the basics of SQL andconstruct queries using SQL.
C02. Be familiar with a commercial relational database system (Oracle) by writing SQL using the system & with the relational database theory, and relational algebra expressions for queries.
C03.Master sound design principles forlogical design of databases, including theE-R method and normalization approach.
C04.Be familiar with basic databasestorage structures and access techniques:file and page organizations, indexingmethods including B-tree, and hashing,query optimization & transactionprocessing and concurrency control.
C05.Able to handle errors and use triggers.

UNIT I

The Database Life Cycle (DBLC): Initial Study of The Database, Database Design, Implementation and Loading. Testing And Evaluation, Operations and Maintenance.Database Administration: The Role of Database Administrator. Modeling Enterprise Data, planningfor Databases, Managing Data Security. Backing Up Databases. Controlling Concurrent Access. Managing Data Quality, Data Dictionaries and Repositories.

UNIT II

Transactions: ACID properties, states of transaction, Concurrent executions. concepts of serializabilityand recoverability.
Concurrency control: Overview of Locking, modes of locking: shared & exclusive, 2 phase lockingprotocol, time stamping. Timestamp-ordering protocol. validation-based protocol. multi-versioning, Deadlock Handling. Recovery: Transaction failure classification, stable storage implementation. log based recovery, Shadow paging, recovery with concurrent transactions. checkpoints & rollback.
Security & Integrity: Security measures for protection of data at various levels, authorization, views.granting of privileges, security specifications in SQL, Encryption.

UNIT III

Database System architectures: Centralized systems. Client-Server Systems: Architecture and Implementation. transaction servers. data servers, Parallel systems, Parallel database architectures. Distributed systems and databases: Introduction, Distributed database transparency features. levels ofdata and process distribution, SPSD (Single site Processing. Single-site data). MPSD (Multiple Site Processing. Single-site data), MPMD (Multiple Site Processing. Multiple- Site data). Advantage and disadvantages of distributed database systems.

UNIT IV

PL/SQL: Introduction, the SQL execution environment, the PL/SQL syntax, block structure -declarativepart, executable part. exception handling part, variable declaration using %type, %rowtype, if statements, looping structures, oracle transactions, cursors & its types, cursor attributes. nesting of cursors, parameterized cursors, error handling in SQL.
Concurrency control: Locks, implicit locking, levels of locks, explicit locking, select for...update statement, using lock table statement.

UNIT V

Error handling: User named exception handlers for i/o validation and business rule validation. Stored Procedures and Functions: Creating a stored procedure or function, syntax for declaration. Execution and exception handling parts, advantages of using procedure or function. Deleting a procedure or function. Database Triggers: Introduction. use, database triggers vs procedures, database triggers vs declarative integrity constraints. how to apply triggers. Types of triggers, creating a trigger, deleting trigger. User defined error messages through Raise Application Error Procedure.

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Class – M.sc CS **Max.Mark:85**
Semester - II
Subject –Computer Science & Application
Paper Title – Information Storage Management
Course Code -COMP-825
Course out comes
C01.Explain the various storage technologies.
C02.Explain the concepts and algorithms of storage system architecture.
C03.Elaborate about the various network storage architectures.
C04.Ensure information availability and use disaster recovery methods.
C05.Able to manage and monitor databases.

UNIT I
Introduction to Storage Technology: Data proliferation and the varying value of data with time & usage. Sources of data and states of data creation. Data centre requirements and evolution to accommodate storage needs, Overview of basic storage management skills and activities. The five pillars of technology. Overview of storage infrastructure components, Evolution of storage, Information Lifecycle Management concept. Data categorization within an enterprise. Storage and Regulations.

UNIT II
Storage Systems Architecture: Intelligent disk subsystems overview. Contrast of integrated vs. modular arrays. Component architecture of intelligent disk subsystems, Disk physical structure components, properties, performance, and specifications. Logical partitioning of disks, RAID & parity algorithms, hot sparing. Physical vs. logical disk organization. protection, and back end management. Array caching properties and algorithms, Front end connectivity and queuing properties. Front end to host storage provisioning, mapping, and operation. Interaction of file systems with storage. Storage system connectivity protocols.

UNIT III
Introduction to Networked Storage: JBOD, DAS, SAN, NAS & CAS evolution, Direct Attached Storage (DAS) environment: Elements, connectivity & management. Storage Area Networks (SAN): elements & connectivity, Fiber Channel principles standards & Network management principles, SAN management Principles, Network Attached Storage (NAS): Elements. connectivity options, connectivity protocols (NFS, CIFS, ftp), & management principles. IP SAN elements, Standards (SCSI, FCIP, FCP), connectivity principles. Security and management principles. Content Addressable Storage (CAS): elements, connectivity options, standards, and management principles. Hybrid Storage solutions Overview including technologies like virtualization & appliances.

UNIT IV
Introduction to Information Availability: Business Continuity and Disaster Recovery Basics, Local business continuity techniques, Remote business continuity techniques, Disaster Recovery principles & techniques.

UNIT V
Managing & Monitoring: Management philosophies (holistic vs system & component). Industry management standards (SNMP, SMI-S, CIM). Standard framework applications, Key management metrics (thresholds, availability, Capacity, Security, Performance), Metric analysis methodologies & trend analysis. Reactive and pro-active management best practices, Provisioning & configuration change planning, Problem reporting , prioritization and handling techniques. Management tools overview.

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Class – M.sc CS Max
Marks: 50

Semester - III

Subject –Computer Science & Application

Paper Title – Linux and Shell Scripting

Course Code -PR-COMP-826

Course Outcome

C01.Install packages and manage user accounts in Linux.

C02.Implement basic scripts in shell.

Linux Commands:

- mkdir
- cd
- rm. rm -f
- cp
- move
- rename
- cat. cat >, cat>>
- find command: -name. -uname, -size,-ctime -mtime
- Search a given string in a file(grep command)
- Making group. groupadd command
- useradd with –d, -s, -c, -g, -G switch
- usermod
- userdel, groupdel
- Is, Is-l, chmod(with alphabetic or numeric permissions)
- Chown and chgrp command
- Edit Crontab file to wall message on system on particular time automatically.

2. Vi editor:

1. Create file, edit, save and quit
2. highligting the searched term within a file
3. cut, yank, undo

3. Shell Scripting

1. Write a shell script to print a message.
2. Write a shell script to access arguments passed on command line.
3. Write a shell script to create files with the names passed on command line.
4. Write a shell script to input number from user and display its factorial.
5. Write a shell script to input file name and create multiple directories individually for the namein the file given.
6. Write a shell script to input number from user and display whether it is prime number or not.
7. Write a shell script to list all the files in any directory given by the user
8. Write a shell script that receives any number of file names as arguments checks if everyargument supplied is a file or a directory

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Session 2019-20 TO 2020-21

Class – M.sc CS
Max. Marks: 50
Semester - III
Subject –Computer Science & Application
Paper Title – Programming skill with Java
Course Code -PR-COMP-828
Course Outcome
C01.Create Java Programs using inheritance and exception handling.
C02.Execute multiple programs simultaneously using multi-threaded programming.

Core Java Programming Lab (Using any Text editor)

1. Write a Program to find sum & average of 10 no. using arrays.
2. Find greater number between two numbers. (Using conditional operator.)
3. Find the factorial of number if number is given by user using command line argument
4. Write a program to display grade according to the marks obtained by the student
5. Write a program to convert the given no. of days into months & days using with classes, objects and method.
6. Write a program to convert given string into Uppercase and lowercase and get the length of string using array.
7. Create a package called "Arithmetic- that contains methods to deal all arithmetic operations. Also write a program to use the package.
8. Define an exception called 'Marks out of Bound" exception that is thrown if the entered marks are greater than 100.
9. Using application of single inheritance. Write a program to Find the area of rectangle &volume of cube.
10. Develop a simple real life application to illustrate the use of multithreading.
11. Write a program using multiple inheritance calculate area and parameter of a circle
12. Write a program which takes input from keyboard and sends output to the console.

Advanced Java Programming Lab (Using NetBeans/Eelipse)

13. Design a web page having blue color background and white color text with title, student details".
14. Design a web page having three hyperlinked text and two hyperlinked images.
15. Design a web page to create a registration form having name, address, password, gender, course, nationality. skill and CV with appropriate GUI control.
16. Write an applet program to draw a Filled Rectangle. (color = orange)
17. Write a Program in Java netbeans to find whether a no. is prime or not.
18. Write a program in java netbeans to find whether a no. is even or odd.
19. Write a program in java netbeans to find area of a right-angled triangle
20. Write a program in netbeans to implement JDBC.
21. Write a program in netbeans to calculate simple interest/ Compound interest on choice.
22. Write a program in netbeans to accept employee data and insert into oracle table.

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Class – M.sc CS **Max. Marks: 85**
Semester - III
Subject –Computer Science & Application
Paper Title – PROGRAMMING SKILLS WITH JAVA
Course Code –COMP-828
Course out comes

C01.Use an integrated development environment to write, compile, run, and test simple object – oriented Java Programs.
C02.Create Java Programs using inheritance and exception handling.
C03.Execute multiple programs simultaneously using multi-threaded programming.
C04.Design and develop basic Applets.
C05.Connect database to front end Java Application.

UNIT I
An overview of Java. History and design features of Java, how java works, java virtual machine (JVM) Java development kit(JDK), Java Vs C++, Data types. Variables, and constants. Arrays, Operators Control statements- Branching, Looping and Jumping Object-Oriented Programming: Classes, Objects, and methods: defining a class, adding variables and methods. creating objects, Constructors. Implementing & Designing Classes.

UNIT II
String and string buffer classes, Wrapper classes, Inheritance -Types of inheritance, Accessspecifiers using super, method overriding, Packages and interface, Importing package, standard java packages. Defining and implementing interface, Extending interface, Nested interface. Multiple Inheritance, Exception handling fundamentals, exception types, uncaught exceptions, throws, throw, try-catch, final,built in exceptions, creating your own exceptions.

UNIT III
Multithreading fundamentals, Java thread model: priorities, synchronization, messaging, thread class, Runnable interface. Java collections Input/ Output-basics-streams, byte and character streams. predefinedstreams, reading and writing from console and files. Networking - basics, networking classes and interfaces, using Java.net package, Sockets- doing TCP/IP and datagram programming.

UNIT IV
Application Vs Applets- using the tools in JDK, Javadoc, Java, Jdb etc. Applets programming-creating and executing Java applets, inserting applets in a web page, Java security. Java Graphics fundamentals. AWT classes, event handling and swing classes, AWT programming. working with windows, graphics and text, using AWT controls, layout managers and menus, handling image, animation, sound and video. Event handling- different mechanism, The delegation event model, event classes. event listener interfaces, adapter and inner classes. Java swing applet, icons and labels, text fields, buttons, combo boxes, tabbed and scroll panes. trees, tables.

UNIT V
JDBC Overview, Connection Classes and interfaces JDBC, ODBC Bridge, Servlets, Life cycle ofservlet, Cookies, RMI-Remote Method Invocation 2 tier 3 tier Architecture. Object serialization, CORBA - JINI overview. JAVA BEANS AND SWING Bean concepts. Events in bean box - Bean customization - Persistence-Application - deployment using swing - Advanced swing techniques - JAR file handling

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Class – M.sc CS **Max. Marks: 85**
Semester - III
Subject –Computer Science & Application
Paper Title – LINUX & SHELL PROGRAMMING
Course Code –COMP-826
Course out comes

C01.Explain to structure of OS and process management.
C02. Describe memory and disk management techniques in OS.
C03.Execute Linux commands.
C04.Install packages and manage user accounts in Linux.
C05.Implement basic scripts in shell.

UNIT I

Introduction: Definitions, functions and types of operating system. System components. Operating system Structure, System Calls. System Programs, Interrupts, Microkernel. **Process Management**:Process Concepts, Process states & Process Control Block. Process Scheduling: Scheduling Criteria, Scheduling Algorithms (Preemptive & Non- Preemptive) -FCFS, SJF. RR. Priority. Multiple-Processor. Real-Time, Multilevel Feedback Queue Scheduling. **Process Synchronization:** Critical Section Problem, Semaphores, Classical Problems of Synchronization and their Solutions. Deadlock Characterizations, Method for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock

UNIT II

Memory Management: Introduction, Address Binding, logical versus Physical Address Space. Swapping. Contiguous & Non-Contiguous Allocation. Fragmentation (Internal & External), Compaction, Paging, Segmentation. Virtual Memory, Demand Paging. Performance of Demand Paging. Page Replacement Algorithms.
File & Disk Management: Concept of File System (File Attributes, Operations, Types). Functions of File System, Types of File System, Access Methods (Sequential, Direct & other methods), Directory Structure (Single-Level, Two-
Level, Tree-Structured, Acyclic-Graph, General Graph), Allocation Methods (Contiguous, Linked, Indexed) **Disk Management:** Disk Scheduling Algorithms (FCFS, SSTF, SCAN, C-SCAN, LOOK), Swap Space Management, Disk Reliability, Recovery, Security:Security Threats, Protection, Trusted Systems, Windows Security.

UNIT III

Linux Basics: Introduction to Linux, History, GNU Movement. System Organization (Kernel and Shell), Difference between CLI OS & GUI OS, Windows v/s Linux. Importance of Linux Kernel, Files and Directories. Concept of Open Source Software, Linux, Linux Architecture. Linux File System
Types of user-Root user (#) and normal user($). Multiple logins at same time (Ctrl + Alt + F1, F2 F6), Help: whatis, --help, man command, init and run levels.
Linux Installation, touch. ls, ls –lt, ls-al, mkdir, rm, rm-rf, cat, cat > file, cat >> file, cp, move, rename, who, Use of all directories under, absolute path & relative path, Basic calculator, date utilities.
Vim Editor: Command mode & Insert mode. cut, yank. undo.

UNIT IV

Linux Administration: Managing multiple processes, changing process priority with nice, cron commands. kill. ps. Filter Commands: tr. head, tail, last, grep. sort, piping. Find Command with various options.
Managing user accounts- Sudo, users: useradd, usermod & userdel, passwd, Group creation: Primary & Secondary Group. chgrp, chown, permissions: adding and removing permissions. Package installationthrough GUI/ apt-get/yum/dnf. Process,

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Setup, Partition, fdisk.

UNIT V

Shell Programming: Types of Shells. Shell Meta Characters – $#, $*, $?, Shell Variables, Shell Scripts,Debugging scripts, echo, read, operators, keywords, Integer Arithmetic and String Manipulation, Decision Making: if...elif...else...fi, case esac. Loop Control: while, for, until, break & continue, Functions, I/O Redirection and Piping. Exception Handling. Creating shell programs for automating tasks, file handling, trapping signals etc.

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Class – M.sc CS **Max. Marks: 85**
Semester - III
Subject –Computer Science & Application
Paper Title - COMPILER DESIGN
Course Code -COMP-827
Course out comes

C01.Demonstrate the use of Finite Automata in Compiler Design.
C02.Explian compiler structure and use Context free Grammar for problem solving.
C03.Perform Lexical Analysis on strings.
C04.Evalute the correctness of syntax according to syntactical rules.
C05.Demonstrate the use of Symbol tables.

UNIT I

Introduction to finite automata, Nondeterministic Finite Automata, transition diagrams, transition tables.acceptance of input strings by automata, deterministic finite automata, conversion of NFA to DFA, construction of NFA from regular expression.

UNIT II
Compilers and translators, features of a good compiler, Interpreter, Comparison of interpreter and compiler, The structure of a compiler, Error handling, Compiler writing tools, some typical compiler structures. Bootstrapping, cross compiler, context free grammar. The formal definition of a context free grammar, Notational conventions, derivations, parse trees and derivations, ambiguity, regular grammars and regular expressions.

UNIT III
Lexical Analysis : The Role of the lexical analyzer, lexical analysis versus parsing, Tokens. patterns and lexemes. Attributes for tokens, lexical errors, the need for lexical analysis, input buffering: Buffer Pairs,Sentinels, specification of tokens. Recognition of tokens

UNIT IV
Syntax Analysis: Introduction, The role of the parser, parsers, Representation of a parse tree. Parsing techniques: Bottom up parsing, shift reduce parsing, handles. handle parsing, stack implementation of shift reduce parsing, constructing a parse tree. operator precedence parsing, operator precedence relations from associativity and precedence. The operator precedence parsing algorithm. Top down parsing, elimination of left recursion. recursive descent parsing, productive parsers.

UNIT V
Symbol Tables: The Contents of a symbol table, Names and symbol table records, recurring symbol table space, Indirection in symbol table entries, storage allocation information, Data Structures for symbol table: Lists, search trees, hash table errors. classification of errors. lexical and syntax errors, semantic errors, Run time errors.

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Class – M.sc CS
Max. Marks:85
Semester - III
Subject –Computer Science & Application
Paper Title – DATA WAREHOUSING & DATA MINING
Course Code -COMP-829
Course out comes

C01.Explain the concepts and architecture of Data Warehouse.
C02.Use OLAP technology and Data concepts.
C03.Apply mining for frequent patterns, find associations and correlations
C04.Describe various clustering methods.
C05.Explain advanced applications of Data mining like Web mining, Text Mining etc.

Elective -I

UNIT I

Introduction to Data warehouse: Need for strategic information. Decision support system. Knowledge discovery & decision making, need for data warehouse, Evolution, Definition. Data warehousing Components. Data warehouses and data marts. meta data, Planning your data warehouse. Data Warehouse Architecture, Data Warehouse Backend Process: Data Extraction. Data Cleaning, DataTransformation, Data Reduction, Data loading and refreshing. ETL and Data warehouse.

UNIT-II

Data modeling strategies: Multi dimensional data models. Fact tables, Data Cube presentation of fact tables, Star Schema, Snowflake schema, Fact Constellation. **OLAP technology**: Characteristics, Major features and functions, drill down and roll-up. **OLAP Models:** MOLAP and ROLAP, Physical design consideration, Indexing, Data Warehouse deployment activities. **Introduction to Data Mining:** Data Mining Functionalities, Classification of Data Mining Systems, Integration of Data Mining System with a Database or Data Warehouse System Data Preprocessing: Data Cleaning. Data Integration and Transformation. Data Reduction, Data Discretization and Concept Hierarchy Generation.

UNIT III

Mining Frequent Patterns, Associations, and Correlations: Basic Concepts of Association Rules, Efficient and Scalable , Frequent Item set Mining Methods. Mining Various Kinds of Association Rules. Association Mining to Correlation Analysis. Constraint-Based Association Mining. Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Introduction.Bayesian Classification. Rule Based Classification, Associative Classification, Lazy Learners. Other Classification Methods, Prediction.

UNIT IV

Cluster Analysis: Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods. Hierarchical methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Clustering High-Dimensional Data, Constraint-Based Cluster Analysis. Outlier Analysis

UNIT V

Advanced Topics: Mining Object, Spatial Multimedia. Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Data Mining, Multimedia Data Mining, Text Mining, Mining the World Wide Web.

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Course Outcome recommended by Board of Studies
Session 2019-20 TO 2020-21

Class – M.sc CS **Max. Marks: 50**
Semester - IV
Subject –Computer Science & Application
Paper Title – Lab-I Big Data Analysis
Course Code –PR-COMP-834
Course Outcome

C01. Apply Big Data analytics in Business applications.
C02. List the components of Hadoop and Hadoop Eco-Syste

Suggested Practical List

1. Setting up a multi-node Apache Hadoop cluster from scratch
2. Performing file, I/O using HDFS.
3. Implementing an end-to-end data pipeline with Hive
4. Creating User Defined Functions in Hive
5. Working with HBase Shell and loading data from Hive
6. Running a Map/ Reduce Job - Word Count
7. Using Eclipse to build Map/Reduce Applications
8. Deploying Map/Reduce Jobs un Cluster
9. Analyzing Stock Market Data using Pig/Latin
10. Working with Complex Data Types
11. Analyzing weather data using Hive
12. Working with Hbase Shell
13. Loading Data in HDFS, Hive & Hbase in Various formats

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Class – M.sc CS **Max.Marks:50**
Semester - IV
Subject –Computer Science & Application
Paper Title – Lab II : PHP & MySQL
Course Code –PR-COMP-835
Course Outcome

C01. Create programs for data and file handling in PHP
C02. Retrieve, insert, update, and delete data from the relational database MySQL

Suggested Practical List

1. Create a simple HTML. form and accept the user name and display the name through PHP echo statement.
2. Write a PHP script to demonstrate arithmetic operators, comparison operator. and logical operator.
3. Write PHP Script to input marks, generate result and display grade.
4. Write PHP Script for addition of two 2x2 matrices.
5. Write PHP script to obtain factorial of a number using function
6. Write PHP script to demonstrate string, date and math function.
7. Write PHP script to demonstrate
8. Create student registration form using text box, check box, radio button, select, submit button. And displayuser inserted value in new PHP page.
9. Write two different PHP script to demonstrate passing variables through a URL.
10. Write two different PHP script to demonstrate passing variables with sessions.
11. Write PHP script to demonstrate passing variables with cookies.
12. Write a program to keep track of how many times a visitor has loaded the page.
13. Write PHP script to demonstrate exceptional handling.
14. Write a PHP script to connect MySQL server from your websitc.
15. Write a program to read customer information like cust no, cust name, Item purchase, and mob_no, fromcustomer table and display all this information in table format on output screen.
16. Write a program to edit name of customer to "Bob" with cost no =1, and to delete record with cust_no=3.
17. Write a program to read employee information like emp_no., emp_name, designation and salary from EMPtable and display all this information using table format.
18. Create a dynamic web site using PHP and MySQL.

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Class – M.sc (CS)
Max. Marks: 85
Semester - IV
Subject –Computer Science & Application
Paper Title – BIG DATA ANALYTICS
Course Code -COMP-830
Course out comes
C01. Apply Big Data analytics in Business applications.
C02.List the components of Hadoop and Hadoop Eco-System
C03. Access and process Data on Distributed File System
C04.Use Spark and NoSQL for data analysis
C05. Apply Machine Learning Techniques using R

UNIT-I
Introduction to Big Data: Introduction- distributed file System-Big Data and its importance, Four Vs Drivers forBig data, Big data analytics, Big data applications. Algorithms using map reduce.

UNIT-II
Introduction to Hadoop: Hadoop Architecture, Big Data - Apache Hadoop & Hadoop Eco System, Moving Datain and out of Hadoop - Understanding inputs and outputs of Map Reduce- Data Serialization

UNIT-III
HDFS, HIVE AND HIVEQL, HBASE: HDFS-Overview, Installation and Shell, Java API. Hive Architecture and Installation, Comparison with Traditional Database. HiveQL Querying Data, Sorting and Aggregating, Map Reduce Scripts, Joins & Sub queries, HBase concepts, Advanced Usage, Schema Design, Advance Indexing, PIG,Zookeeper, how it helps in monitoring a cluster. HBase uses Zookeeper and how to Build Applications with Zookeeper.

UNIT-IV
SPARK: Introduction to Data Analysis with Spark, Downloading Spark and Getting Started, Programming with RDDs. Machine Learning with MLlib.
NOSQL: No SQL databases, Why No SQL? Advantages of No SQL. Use of No SQL in Industry, SQL Vs No SQL,New SQL.

UNIT-V
Data Analytics with R Machine Learning: Introduction. Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with Big R

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Class – M.sc CS
Max.Marks:85
Semester - IV
Subject –Computer Science & Application
Paper Title – COMPUTER GRAPHICS AND MULTIMEDIA
Course Code -COMP-831
Course out comes

C01. Describe the working of various display devices
C02. Implement various algorithms to scan, convert basic geometrical primitives, transformations, Area Filling, Clipping
C03. Explain 3D-transformations
C04. Explain the use of Text & Audio file compression concepts
C05. Apply the fundamentals of video and animation file formats and compressions used in computer graphics

UNIT-I

Devices: Storage tube graphics display - raster scan displays, random scan systems, 3D viewing devices, Plotters, printers, digitizers. Light pens etc. Active & Passive graphics devices, Scan Conversion techniques, line drawing: simple DDA, Bresenham's Algorithm, Circle Drawing Algorithms. Scan line polygon fill algorithm, boundary-fill and flood-fill algorithms

UNIT-II

2D transformations: Translation, Rotation, Scaling. Shearing. Reflection. Inverse Transformation. Homogenous coordinate system, Matrices Transformation, Composite Transformation. Windowing & Clipping: World Coordinate System, Screen Coordinate System, Viewing Transformation, Line Clipping, Cohen Sutherland. Midpoint Line clipping algorithms, Polygon Clipping: Sutherland -Hodgeman, Weiler -Atherton algorithms.

UNIT-III

3D transformations: Translation, rotation, scaling, Parallel & Perspective Projection, Types or Parallel &Perspective Projection. Hidden Surface elimination: Depth comparison, Back face detection algorithm, Painters algorithm. Z-buffer algorithm. Curve generation. Bezier and B-spline methods, Diffuse reflection, Specularreflection. Phony Shading. Gour and shading. ray tracing, color models like RGB, YIQ, CMY, HSV.

UNIT-IV

Multimedia: Multimedia Terms, Multimedia Hardware, Basic tools in Multimedia, Uses of Multimedia, Multimedia System Architecture, Text -Types, text compression, Text file formats RTF. TIFF, hypertext and hypermedia Audio-Components of an audio system, Digital Audio: digital audio, MPEG, MIDI, processing sound, sampling, compression. Sound cards, Audio file formats, Audio Processing Software.

UNIT-V

Video: Analog and Digital Video. Introduction to graphics accelerator cards, intro to AV/DV and IEEE1394 cards, Video file formats, compression standards.
Animation: Uses of Animation, Principles of Animation, Computer based animation, 2D and 3D Animation techniques. Animation file formats. Animation software’s. Compression.

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Session 2019-20 TO 2020-21

Class – M.sc CS
Semester - IV
Subject –Computer Science & Application
Paper Title – PHP& MySQL
Course Code -COMP-832
Course out comes
C01. Create, debug and execute simple programs in PHP
C02. Design programs to implement functions and strings in PHP
C03. Create programs for data and file handling in PHP
C04. Retrieve, insert, update, and delete data from the relational database MySQL
C05. Test, debug, and deploy web pages containing PHP and MySQL

UNIT-I
BASICS OF PHP: Introduction to PHP, what does PHP Do? Object Oriented Programming with PHP, language basics, installation of XAMPP/LAMP, syntax, comments, variables. constants and data types, expressions and operators, flow control statements, including html code in PHP, embedding PHP in web pages.

UNIT- II
FUNCTIONS & STRINGS: Defining a function, Calling a function, variable scope. function parameters, return values, predefined functions.
Strings: Creating & accessing string, searching and replacing strings, encoding and escaping. comparing strings, formatting strings, regular expression.

UNIT-III
Data & File Handling: PHP Forms: $_GET, $_POST, $_REQUEST, $_FILES, $_SERVER, $GLOBALS. $_ENV. Input/ Output controls, validation, Cookies and Sessions.
File Handling: File and directory, open, close, read, write, append, delete, uploading and downloading files. File exists, File Rename, Reading and display all/selected files present in a directory.

UNIT-IV
MYSQL AN OVERVIEW: Introduction, Php My Admin, entering queries, Creating and using a database, Creating and selecting a database, creating a table, loading data into a table, retrieving information from a table, selecting all data, selecting particular rows, selecting particular columns. sorting, date, calculations, working with NULL values, pattern matching. counting rows, using more than one tables.

UNIT- V
MYSQL DATABASES IN PHP: Introduction. connecting to a My SQL database, querying the database. Retrieving and displaying the results, modifying data and deleting data through front end. Designing applications using PHP & MySQL.

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Session 2019-20 TO 2020-21

Class – M.sc CS **Max.Marks:85**
Semester - IV
Subject –Computer Science & Application
Paper Title – (i) ENTERPRISE RESOURCE PLANNING
Course Code -COMP-833
Elective –I
Course out comes
C01. Explain the concepts of ERP, MRP, MIS and DSS
C02. Describe business process re-engineering and SCM
C03. Distinguish between ERP modules and analyze ERP market in the Indian context
C04. Implement ERP and evaluate ROI of ERP
C05. Illustrate interoperation of ERP, Internet and E-commerce.

UNIT I
History of ERP, Concept of ERP System. Reasons to go for ERP, Need of ERP. Evolution of ERP, Structure of ERP, Concept of Material Requirement Planning (MRP), Manufacturing Resource Planning (MRP II), Common Misconceptions about ERP, Benefits of ERP. Disadvantages of ERP, ERP and Related Technologies, MIS (Management Information System), DSS (Decision Support System), EIS (Executive Information System), Data Warehouse. Data Mining.

UNIT-II
BPR (Business Process Reengineering), How ERP is related with BPR, Barriers to the Success of BPR, Role and Importance of Data Warehouse in ERP, Role of Data Mining in ERP, Supply Chain Management (SCM). Evolution and Components of SCM, Characteristics of SCM, How ERP is related with SCM, Role and Need of Customer Relationship Management, Integration of ERP, SCM and CRM.

UNIT-III
ERP Modules. Finance, Plant Maintenance. Quality Management, Material Management: Domain of ERP as well as areas affected by ERP e.g. Aerospace. Automobiles etc., Market Players SAP. JD Edwards. BANN, PeopleSoft, Oracle etc., ERP market in Indian Context; Assemble-To-Order, Make-To-Order, Just in Time (JIT); Hidden Costs involved in ERP Implementation. Planning and Project Management. Training. Data Conversion, Dirty Data. Integration Testing. Data Analysis.

UNIT IV
ERP Implementation Lifecycle, Evaluation Criteria for ERP Product, Integrating ERP into organizational Culture. Critical Factors in the Success and Failure of ERP, ERP Success inhibitors. Return On Investment of ERP Implementation. Useful Guidelines for ERP Implementation, Role of Vendors in ERP Implementation, Evaluation Criteria for Vendors, Role and Need of' ERP Consultants. Role of End Users in ERP Implementation. Training of End Users, Motivation for End Users,

UNIT V
ERP and Internet, ERP and E-Commerce, How ERP interoperate E-Commerce, Future Directions in ERP, New Evolving Markets, Faster Implementation Methodologies. New Business Segments. Concept of Extended ERP. e-ERP, e-CRM, e-SCM, Case Study on SAP, ORACLE, PeopleSoft etc.

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Syllabus recommended by Board of studies of Industrial Chemistry
Session 2016-17 to 2020-21

Class	:	M.Sc.
Semester	:	I
Subject	:	Chemistry
Paper	:	I
Title of paper	:	Inorganic Chemistry
Course Code	:	CHE-701
Compulsory / Optional	:	Compulsory
Max. Marks	:	85 + CCE 15

Course Outcomes

After pursuing this course, the students understand:

CO1 - stereochemistry and bonding in main group compounds, $d\pi$-$p\pi$ bond, Bent rule

CO2 - stepwise and overall formation constants, factors affecting the stability of metal complexes with reference to the nature of metal ion and ligand, chelate effect, determination of binary formation constants by potentiometry and spectrophotometry

CO3 - concept of reaction mechanism of transition metal complexes

CO4 - metal ligand bonding

CO5 - HSAB theory

Particulars

Unit I Stereochemistry and Bonding in Main Group Compounds:

VSEPR, Walsh diagram (triatomic and penta-atomic molecules), $d\pi$-$p\pi$ bond, Bent rule and energetics of hybridization, some simple reactions of covalently bonded molecules.

Unit II Metal-Ligand Equilibrium in Solution

Stepwise and overall formation constants and their interaction, trends in stepwise constant, factors affecting the stability of metal complexes with reference to the nature of metal ion and ligand. Chelate effect and its thermodynamic origin, determination of binary formation constants by potentiometry and spectrophotometry.

Unit III Reaction Mechanism of Transition Metal Complexes

Energy profile of a reaction, reactivity of metal complex, inert and labile complexes, kinetic application of valence bond and crystal field theories, kinetics of octahedral substitution, acid hydrolysis, factors affecting acid hydrolysis, base hydrolysis, conjugate base mechanism, direct and indirect evidences in favour of conjugate mechanism, anion reactions, reactions without metal ligand bond cleavage. Substitution reactions in square planar complexes, the trans effect, mechanism of the substitution reaction. Redox reaction, electron transfer reactions, mechanism of one electron transfer reactions, outer sphere type reactions, cross reactions and Marcus-Hush theory, inner sphere type reactions.

Unit IV Metal-Ligand bonding

Limitation of crystal field theory, molecular orbital theory for bonding in octahedral, tetrahedral and square planar complexes, π -bonding and molecular orbital theory.

Unit V HSAB Theory:

Classification of acids and bases as hard and soft; HSAB principle, theoretical basis of hardness and softness; Lewis-acid base reactivity approximation; donor and acceptor numbers, E and C equation; applications of HSAB concept.

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Syllabus recommended by Board of studies of Industrial Chemistry
Session 2016-17 to 2020-21

Class	:	M.Sc.
Semester	:	I
Subject	:	Chemistry
Paper	:	II
Title of paper	:	Organic Chemistry
Course Code	:	CHE-702
Compulsory / Optional	:	Compulsory
Max. Marks	:	85 + CCE 15

Course Outcomes

After completion of this course, the students understand:

CO1 - nature of bonding in organic molecules

CO2 -basic concept of symmetry in the molecules, optical activity in the presence and in the absence of chiral carbon, the stereochemistry of compounds containing nitrogen, sulphur and phosphorus.

CO3 - conformational analysis and linear free energy relationship, The Hammett equation, Taft equation

CO4 - different types of reaction mechanisms, kinetic and thermodynamic control and methods of determination of mechanisms

CO5 - concept of o aliphatic nucleophilic substitution

Particulars

Unit I Nature of Bonding in Organic MoleculesDelocalized chemical bonding-conjugation, cross conjugation, resonance hyperconjugation, bonding in fullerences, tautomerism. Aromaticity in benzenoid and non-benzoid compounds, alternate and non-alternate hydrocarbons. Huckel's rule, energy. Level of π-molecular orbitals, annulenes, anti-aromaticity, homo-aromaticity, PMO approach. Bonds weaker than covalent-addition compounds, crown ether complexs and cryptands, inclusion compounds, catenanes and rotaxanes.

Unit II Stereochemistry Strain due to unavoidable crowding Elements of symmetry, chirality, molecules with more than one chiral center, threo and ertythro isomers, methods of resolution, optical purity, enantiotopic and diastereotopic atoms, groups and faces, stereospecific and stereoselective synthesis, Asymmetric synthesis. Optical activity in the absence of chiral carbon (biphenyls, allenes and spirane chirallity due to helical shape. Stereochemistry of the compounds containing nitrogen, sulphur and phosphorus.

Unit III Conformational analysis and linear free energy relationship Conformational analysis of cycloalkanes, decalines, effect of conformation on reactivity, conformation of sugars. Generation, structure, stability and reactivity of carbocations, carbanions, free radicals, carbenes and nitrenes. The Hammett equation and linear free energy relationship, substituents and reaction constants, Taft equation.

Unit IV Reaction Mechanism: Structure and Reactivity Type of mechanisms, types of reactions, thermodynamic and kinetic requirements, kinetic and thermodynamic control, Hammond's postulate, Curtin-Hammett principle. Potential energy diagrams, transition states and intermediates, methods of determining mechanisms, isotope effects.

Unit V Aliphatic Nucleophilic SubstitutionThe SN2, SN1, mixed SN1 and SN2 and SET mechanism. The neighboring group mechanism, neighboring group participation by p and s bonds, anchimeric assistance. Classical and nonclassical carbocations, phenomium ions, norborynl systems, common
carbocation rearrangements. Application of NMR spectroscopy in the detection of carbocations. The SN1 mec
Nucleophilic substitution at an allylic, aliphatic trigonal and a vinylic carbon. Reactivity effects of substrate s
attacking nucleophile, leaving group and reaction medium, phase transfer catalysis and ultrasound, ambident nucleophile, regioselectivity.

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Class	:	M.Sc.
Semester	:	I
Subject	:	Chemistry
Paper	:	III
Title of paper	:	Physical Chemistry
Course Code	:	CHE-703
Compulsory / Optional	:	Compulsory
Max. Marks	:	85 + CCE 15

Course Outcomes

After undergoing this course, the students understand:

CO1 - the quantum mechanics, Schrodinger equation and its model systems

CO2 - various approximate methods and their application to the Helium atom, Molecular Orbital Theory and its various applications

CO3 - Angular Momentum, Eigen functions, Eigen values of angular momentum.

CO4 - classical thermodynamics, laws of thermodynamics, non-ideal systems and application of phase rule to three component systems.

CO5 - statistical thermodynamics, concepts of distribution and applications of partition functions.

Particulars

Unit I Introduction to Exact Quantum Mechanical Results

Schrödinger equation and the postulates of quantum mechanics. Discussion of solutions of the Schrödinger equation to some model systems viz., particle in a box, the harmonic oscillator, the rigid rotor, the hydrogen atom and helium atom.

Unit II Approximate Methods

The variation theorem, linear variation principle. Perturbation theory (First order and nondegenerate). Applications of variation method and perturbation theory to the Helium atom.

Molecular Orbital Theory

Huckel theory of conjugated systems, bond and charge density calculations. Applications to ethylene, butadiene, cyclopropenyl radical, cyclobutadiene etc. Introduction to extended Huckel theory.

Unit III Angular Momentum

Ordinary angular momentum, generalized angular momentum, eigenfucntions for angular momentum, eigenvalues of angular momentum, operator using ladder operators addition of angular momenta, spin, antisymmetry and Pauli exclusion principle.

Unit IV Classical Thermodynamics

Brief resume of concepts of laws of thermodynamics, free energy, chemical potential and entropies. Partial molar free energy, partial molar volume and partial molar heat content and their significance. Determinations of these quantities. Concept of fugacity and determination of fugacity. Non-ideal systems: Excess function s for non-ideal solutions. Activity, activity coefficient, Debye Huckel theory for activity coefficient of electrolytic solutions; determination of activity and activity coefficients; ionic strength. Application of phase rule to three component systems; second order phase transitions.

Unit V Statistical Thermodynamics

Concept of distribution, thermodynamic probability and most probable distribution. Ensemble averaging, postulates of ensemble averaging. Canonical, grand canonical and micro-canonical ensembles, corresponding distribution laws (using Lagrange's method of undetermined multipliers). Partition functions-translation, rotational, vibrational and electronic partition functions, Calculation of thermodynamic properties in terms of partition. Application of partition functions. Fermi-Dirac Statistics, distribution law and applications to metal. Bose-Einstein statistics distribution Law and application to helium.

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Class	**:**	M.Sc**.**
Semester	:	I
Subject	**:**	**Chemistry**
Paper	:	IV
Title of paper	:	**Group Theory and Spectroscopy**
Course Code	:	CHE-704
Compulsory / Optional	:	**Compulsory**
Max. Marks	**:**	85 **+ CCE** 1**5**

Course Outcomes

After pursuing this course, the students understand:

CO1 - concept of symmetry, symmetry elements, symmetry operation, group, sub group, representation of group by matrices and character tables

CO2 - Microwave Spectroscopy, rotational transitions in rigid and non- rigid rotor

CO3 - Infrared Spectroscopy will give knowledge about vibrational energy of diatomic molecules and harmonicity, vibration of polyatomic molecules, selection rules, factors affecting band position and intensities

CO4 - Raman spectroscopy gives knowledge about classical and quantum theory of Raman effect, spectra, Resonance Raman Spectroscopy and CARS

CO5 - electronic spectroscopy, Frank-Condon principle and concept of photoelectron spectroscopy

	Particulars
Unit I	Symmetry and Group theory in Chemistry Symmetry elements and symmetry operation, definition of group, subgroup. Conjugacy relation and classes. Point symmetry group. Schonfilies symbols, representations of groups by matrices (representation for the C_n , C_{nv}, C_{nh}, D_{nh} group to be worked out explicity). Character of a representation. The great orthogonality theorem (without proof) and its importance. Character tables and their use; spectroscopy. Derivation of character table for C_{2v} and C_{3v} point group Symmetry aspects of molecular vibrations of H_2O molecule
UnitII	Microwave SpectroscopyClassification of molecules, rigid rotor model, effect of isotopic substitution on the transition frequencies, intensities, non-rigid rotor. Stark effect, nuclear and electron spin interaction and effect of external field. applications.
UnitIII	Infrared-Spectroscopy Review of linear harmonic oscillator, vibrational energies of diatomic molecules, zero-point energy, force constant and bond strengths; anharmonicity, Morse potential energy diagram, vibration-rotation spectroscopy. P.Q.R. branches, Breakdown of Oppenheimer approximation; vibrations of polyatomic molecules. Selection rules, normal modes of vibration, group frequencies, overtones, hot bands, factors affecting the band positions and intensities, far IR region, metal ligand vibrations, normal co-ordinate analysis.
UnitIV	Raman Spectroscopy Classical and quantum theories of Raman effect. Pure rotational, vibrational and vibrational-rotational Raman spectra, selection rules, mutual exclusion principle, Resonance Raman spectroscopy, coherent anti stokes Raman spectroscopy (CARS).
Unit V	Electronic Spectroscopy Molecular Spectroscopy Energy levels, molecular orbitals, vibronic transitions, vibrational progressions and geometry of the excited states, Franck-Condon principle, electronic spectra of polyatomic molecules. Emission spectra; radio-active and non-radioactive decay, internal conversion, spectra of transition metal complexes, charge-transfer spectra. Photoelectron Spectroscopy Basic principles; photo-electric effect, ionization process, Koopman's theorem. Photoelectron spectra of simple molecules, ESCA, chemical information from ESCA. Auger electron spectroscopy-basic idea.

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CLASS	**:M.SC**
Semester	**: I**
Subject	**: Chemistry**
Title of paper	**: Mathematics for Chemists**
Paper No.	**: V (a)**
Course Code	**:CHE-705**
Compulsory/ Optional	**: Compulsory (For students without Mathematics in B.Sc.)**
Max. Marks	**: 85 + CCE 15**

Course Outcomes

After completion of this course, the students understand:

CO1 – basics of vectors, vector calculus and matrix algebra

CO2 – differential calculus

CO3 – integral calculus

CO4 **-** elementary first order and second order differential equations and its application to chemical kinetics, quantum chemistry etc.

CO5 **-** permutations, combinations and probability

Particulars

Unit I Vectors Vectors, dot, cross and triple products etc. gradient, divergence and curl, Vector Calculus. Matrix Algebra Addition and multiplication; inverse, adjoint and transpose of matrices.

Unit II Differential Calculus Functions, continuity and differentiability, rules for differentiation, applications of differential calculus including maxima and minima (examples related to maximally populated rotational energy levels, Bohr's radius and most probable velocity from Maxwell's distribution etc.).

UnitIII Integral calculus Basic rules for integration, integration by parts, partial fractions and substitution. Reduction formulae, applications of integral calculus. Functions of several variables, partial different co-ordinate transformations (e.g. Cartesian to spherical polar).

Unit IV Elementary Differential Equations First-order and first degree differential equations, homogenous, exact and linear equations. Applications to chemical kinetics, secular equilibria, quantum chemistry etc. second order differential equation and their solutions.

Unit V Permutation and Probability Permutations and combinations, probability and probability theorems average, variance root means square deviation examples from the kinetic theory of gases etc., fitting (including least squares fit etc with a general polynomial fit.

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Class	**:**	M.Sc**.**
Semester	:	I
Subject	**:**	**Chemistry**
Paper	:	V (B)
Title of paper	:	**Biology for Chemists**
Course Code	:	CHE-706
Compulsory / Optional	:	**Compulsory** (**For students without Biology in B.Sc.)**
Max. Marks	**:**	85 **+ CCE** 15

Course Outcomes

After completion of this course, the students understand:

CO1 - basics of cell structure and functions, metabolic processes and origin of life

CO2 - structure and basic functions of carbohydrates

CO3 - lipids

CO4 - aminoacids, peptides and proteins

CO5 - nucleic acids

Particulars

Unit I Cell Structure and Functions Structure prokaryotic and eukaryotic cells, intracellular organelles and their functions, comparison of plant and animal cells. Ove4rview and their functions, comparison of plant and animal cells. Overview of metabolic processes-catabolism and anabolism. ATP - the biological energy currency. Origin of life-unique properties of carbon chemical evolution and rise of living systems. Introduction to bio-molecules, building blocks of bio-macromolecules.

Unit II Carbohydrates Conformation of monosaccharides, structure and functions of important derivatives of mono-saccharides like glycosides, deoxy sugars, myoinositol, amino sugars. N-acetylmuramic acid, sialic acid disaccharides and polysaccharides. Structural polysaccharides cellulose and chitin. Storage polysaccharides-starch and glycogen. Structure and biological function of glucosaminoglycans of mucopolysaccharides. Carbohydrates of glycoporteins and glycolipids. Role of sugars in biological recognition. Blood group substances. Ascorbic acid.

Unit III Lipid Fatty acids, essential fatty acids, structure and function of triacylglycerols, glycerophospholipids, sphingolipids, cholesterol, bile acids, prostaglandins. Liproproteins-compositiion and function, role in atherosclerosis. Properties of lipid aggregates-micelles, bilayers, liposomes and their possible biological functions. Biological membranes. Fluid mosaic model of membrane structure. Lipid metabolism-b-oxidation of fatty acids.

Unit IV Amino-acids, Peptides and Proteins Chemical and enzymatic hydrolysis of proteins to peptides, amino acid sequencing. Secondary structure of proteins. force responsible for holding of secondary structures. a-helix, -b-sheets, super secondary structure, triple helix structure of collagen. Tertiary structure of protein-folding and domina structure. Quaternary structure. Amino acid metabolism-degradation and biosynthesis of amino acids, sequence determination: chemical/enzymatic/mass spectral, racemization/detection. Chemistry of oxytocin and tryptophan releasing hormone (TRH).

Unit V Nucleic Acids Purine and pyrimidine bases of nucleic acids, base pairing via Hbounding. Structure of ribonucleic acids (RNA) and deoxyribonucleic acid (DNA), double helix model of DNA and forces responsible for holding it. Chemical and enzymatic hydrolysis of nucleic acids. The chemical basis for heredity, an overview of replication of DNA, transcription, translation and genetic code. Chemical synthesis of mono and trinucleoside.

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Class	:	M.Sc.
Semester	:	I
Subject	:	Chemistry
Paper	:	Pratical
Title of paper	:	Inorganic Chemistry
Course Code	:	PR-CHE-701
Compulsory / Optional	:	Compulsory
Max. Marks	:	33

(Duration: 6-8 hrs in each branch)
Practical examination shall be conducted separately for each branch.
Course Outcomes
After pursuing this course, the students can:

- analyse inorganic mixture containing eight radicals including insoluble and rare earths,
- perform chromatographic techniques like column chromatography, paper chromatography
- prepare various inorganic compounds and perform spectral analysis and magnetic susceptibility measurement of these compounds

Examination Scheme

Quantitative Analysis	:	08 Marks
Chromatography	:	08 Marks
Preparation	:	08 Marks
Record	:	04 Marks
Viva Voce	:	05 Marks
Total	:	33 Marks

Experiments

1. Qualitative Analysis of Inorganic Mixture containing eight radicals (including insoluble and rare earth)
   a. Less common metal ions: Ti, Mo, W, Ti, Zr, Th, V, U (two metal ions in cationic/anionic forms).
   b. Insoluble- Oxides, sulphates and halides.

2. Chromatography Separation of cations and anions by Paper Chromatography and column chromatography: ion exchange
3. Preparations
   Preparation of selected inorganic compounds and their studies by I.R. electronic spectra, Mossbauer, E.S.R. and magnetic susceptibility measurements. Handling of air and moisture sensitive compounds.
   1. $VO(acac)_2$
   2. $TiO(C_9H_8NO)_2H_2O$
   3. cis-$K[Cr(C_2O_4)_2(H_2O)_2]$
   4. $Na[Cr(NH_3)_2(SCN)_4]$
   5. $Ni(acac)_2$
   6. $K_3[Fe(C_2O_4)_3]$
   7. Prussian Blue, Turnbull's Blue.

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Class	**:**	M.Sc**.**
Semester	:	I
Subject	**:**	**Chemistry**
Paper	:	Pratical
Title of paper	:	O**rganic Chemistry**
Course Code	:	PR-CHE-702
Compulsory / Optional:		**Compulsory**
Max. Marks	**:**	**33**

(Duration: 6-8 hrs in each branch)

Practical examination shall be conducted separately for each branch.

Course Outcomes

After completion of this course, the students can:

- separate, purify and perform identification of simple organic compounds of binary mixture and ternary mixture.
- synthesize simple organic compounds by different reactions and characterize the products by spectral techniques.

Examination Scheme

Qualitative Analysis	:12 Marks
Organic Synthesis	:12 Marks
Record	:04 Marks
Viva Voce	:05 Marks
Total	:33 Marks

Experiments

1. Qualitative Analysis Separation, purification and identification of compounds of binary mixture (one liquid and one solid) using TLC and columns chromatography, chemical tests. IR spectra to be used for functional group identification.

2.Organic Synthesis

Synthesis of organic compounds by applying following methods

(i)Acetylation
(ii)Oxidation
(iii)Halogenation
(iv) benzoylation
(v)Reduction

The products may be characterized by spectral techniques.

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Class	**:**	M.Sc**.**
Semester	:	I
Subject	**:**	**Chemistry**
Paper	:	Pratical
Title of paper	:	Physical **Chemistry**
Course Code	:	PR-CHE-703
Compulsory / Optional:		**Compulsory**
Max. Marks	**:**	**3**4

(Duration: 6-8 hrs in each branch)
Practical examination shall be conducted separately for each branch.

Course Outcomes

After completion of this course, the students can:

- do calibration of volumetric apparatus like burette, pipette etc.
- determine velocity constant, order of the reaction and energy of activation for saponification, solubility and solubility product of sparingly soluble salts and strength of strong and weak acid;
- determine molecular weight by cryoscopic method, activity coefficient of an electrolyte, degree of dissociation of weak electrolyte;
- study surface tension concentration relationship,
- determine congruent composition and temperature of a binary system and also learn to construct phase diagram for three component system

Examination Scheme

Error Analysis and Statistical Data Analysis	:	08 Marks
Conductometry	:	09 Marks
Solution	:	08 Marks
Record	:	04 Marks
Viva Voce	:	05 Marks
Total	:	34 Marks

Experiments

1. Error Analysis and Statistical Data Analysis
   Errors, types of errors, minimization of errors distribution curves precision, accuracy and combination; statistical treatment for error analysis, 't test, null hypothesis, rejection criteria. F & Q test; linear regression analysis, curve fitting. Calibration of volumetric apparatus, burette, piette and standard flask.

2. Conductometry
   i. Determination of the velocity constant, order of the reaction and energy of activation for saponification of ethyl acetate by sodium hydroxide conductometrically.
   ii. Determination of solubility and solubility product of sparingly soluble salts (e.g. $PbSO_4$, $BaSO_4$)

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conductometrically.

iii. Determination of the strength of strong and weak acid in a given mixture conductometrically.

iv. to study the effect of solvent on the conductance of AgNO3/acetic acid and to determine the degree of dissociation and equilibirum constant in different solvents and in their mixtures (DMSO, DMF, dioxane, acetone, water) and to test the validity of Debye-Huckel-Onsager theory.

v. Determination of the activity coefficient of zinc ions in the solution of 0.002 M zinc sulphate using Debye Huckel's limiting law. Solution

i. Determination of molecular weight of non-volatile and volatile electrolyte/ electrolyte by cryoscopic method and to determine the activity coefficient of an electrolyte.

ii. Determination of the degree of dissociation of weak electrolyte and to study the deviation from ideal behaviour that occurs with a strong electrolyte. Adsorption To study surface tension-concentration relationship for solutions (Gibbs equation). Phase Equilibria

i. Determination of congruent composition and temperature of a binary system (e.g. diphenylamine-benzophenone system).

ii. To construct the phase diagram for three component system (e.g. chloroform-acetic acid-water).

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Class	**:**	**M.Sc.**
Semester	:	**II**
Subject	**:**	**Chemistry**
Paper	:	**Pratical**
Title of paper	:	**Inorganic Chemistry**
Course Code	:	**PR-CHE-**707
Compulsory / Optional	:	**Compulsory**
Max. Marks	:	33

(Duration: 6-8 hrs in each branch)
Practical examination shall be conducted separately for each branch.
Course Outcomes
After completion of this course, the students can:

- separate and determine two metal ions using volumetric and gravimetric methods
- separate cations and anions by column chromatography and ion exchange chromatography.
- prepare selected inorganic compounds and also learn their structural spectral studies

Examination Scheme

Quantitative Analysis	:	08 Marks
Chromatography	:	08 Marks
Preparation	:	08 Marks
Record	:	04 Marks
Viva Voce	:	05 Marks
	:	33 Marks

Total

Experiments
1. Quantitative Analysis Separation and determination of two metal ions Cu-Ni, Ni-Zn, Cu-Fe etc. involving volumetric and gravimetric methods.
2. Chromatography Separation of cations and anions by Column Chromatography: Ion exchange.
3. Preparations
   Preparation of selected inorganic compounds and their studies by I.R., electronic spectra, Mossbauer, E.S.R. and magnetic susceptibility measurements. Handling of air and moisture sensitive compounds.
   1. $[Co(NH_3)_6]\,[Co(NO_2)_6]$
   2. cis-$[Co(trien)\,(NO_2)_2]Cl.H_2O$
   3. $Hg[Co(SCN)_4]$
   4. $[Co(Py)_2Cl_2]$
   5. $[Ni(NH_3)_6]Cl_2$
   6. $Ni(dmg)_2$
   7. $[Cu(NH_3)_4]SO_4.H_2O$

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Class	:	**M.Sc.**
Semester	:	**II**
Subject	:	**Chemistry**
Paper	:	**Pratical**
Title of paper	:	**Organic Chemistry**
Course Code	:	**PR-CHE-708**
Compulsory / Optional	:	**Compulsory**
Max. Marks	:	33

(Duration: 6-8 hrs in each branch)

Practical examination shall be conducted separately for each branch.

Course Outcomes

After completion of this course, the students can:

- synthesize organic compounds with name reactions
- perform quantitative analysis alongwith determination of some parameters of oil and water samples

Examination Scheme

Organic Synthesis	: 12 Marks
Qualitative Analysis	: 12 Marks
Record	: 04 Marks
Viva Voce	: 05 Marks
Total	: 33 Marks

Experiments

1. Organic Synthesis
   (i) Synthesis of p-nitroaniline and p-bromoaniline. The Products may be Characterized by Spectral Techniques.
   (ii) Synthesis involving following reactions
      a. Aromatic electrophilic sustitutions:
      b. Condensation reaction
      c. Rearrangement reaction
   d. Diazotisation reaction

2. Quantitative Analysis

   Determination of the percentage or number of hydroxyl groups in an organic compound by acetylation method. Estimation of amines/phenols using bromate bromide solution/or acetylation method. Determination of iodine and Saponification values of an oil sample. Determination of DO, COD and BOD of water sample.

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Class	:	M.Sc.
Semester	:	II
Subject	:	Chemistry
Paper	:	Pratical
Title of paper	:	Physical Chemistry
Course Code	:	PR-CHE-709
Compulsory / Optional	:	Compulsory
Max. Marks	:	34

(Duration: 6-8 hrs in each branch)
Practical examination shall be conducted separately for each branch.

Course Outcomes

After completion of this course, the students can:

- determine the velocity constants of hydrolysis of an ester, oxidation of iodide ions by hydrogen peroxide etc. with the help of chemical kinetics experiments.
- determine the strengths of halides in a mixture, valency of mercurous ions, formation constant, stoichiometry of the complex potentiometrically.
- determine dissociation constant, thermodynamic constants.

- experiments using pH meter and polarimeter

Examination Scheme

Chemical Kinetics
Potentiometry/pH metry : 09 Marks
Polarimetry : 08 Marks
Record : 04 Marks
Viva Voce : 05 Marks

Total : 34 Marks

1. Chemical Kinetics
   i. Determination of the effect of (a) Change of temperature (b) Change of concentration of reactant and catalyst and (c) Ionic strength of the media on the velocity constant of hydrolysis of an ester/ionic reaction.
   ii. Determination of the velocity constant of hydrolysis of an ester/ionic reaction in micellar media.
   iii. Determination of the velocity constant for the oxidation of iodide ions by hydrogen peroxide study the kinetics as an iodine clock reaction.
   iv. Flowing clock reactions (Ref: Experiments in Physical

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Chemistry by Showmaker)

v. Determination of the primary salt effect on the kinetics of ionic reaction and testing of the Bronsted relationship (iodide ion is oxidised by persulphate ion).

vi. Oscillatory reaction.

2. Potentiometry/pH metry

i. Determination of strengths of halides in a mixture potentiometrically.

ii. Determination of the valency of mercurous ions potentiometrically.

iii. Determination of the strength of strong and weak acids in a given mixture using a potentiometer/pH meter.

iv. Determination of temperature dependence of EMF of a cell.

v. Determination of the formation constant of silver-ammonia complex and stoichiometry of the complex potentiometrically.

vi. Acid-base titration in a non-aqueous media using a pH meter.

vii. Determination of activity and activity coefficient of electrolytes.

viii. Determination of the dissociation constant of acetic acid in DMSO. DMF, acetone and dioxane by titrating it with KOH.

ix. Determination of the dissociation constant of monobasic/dibasic acid by Albert-Sderjeant method.

x. Determination of thermodynamic constants, DG, DS, and DH for the reaction by e.m.f. method. $Zn + H_2SO_4 \rightarrow ZnSO_4 + 2\ H$

3. Polarimetry

i. Determination of rate constant for hydrolysis/inversion of sugar using a polarimeter.

ii. Enzyme kinetics-inversion of sucrose.

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Class	**:**	**M.Sc.**
Semester	:	**II**
Subject	**:**	**Chemistry**
Paper	:	**I**
Title of paper	:	**Inorganic Chemistry- II**
Course Code	:	**CHE-**707
Compulsory / Optional	:	**Compulsory**
Max. Marks	**:**	85 **+ CCE** 15

Course Outcome

After completion of this course, the students understand:

CO1 - spectroscopic ground states, correlation, Orgel and Tanabe-Sugano diagrams for transition metal complexes (d^1-d^9 states)

CO2 - magnetic properties of transition metal complexes

CO3 - metal π-complexes like metal carbonyl, their structure and bonding

CO4 - metal clusters that is higher boranes, carboranes, metalloboranes and metallo-carboranes

CO5 - optical rotatory dispersion and circular dichroism

Particulars

Unit I Electronic Spectral Studies of Transition Metal Complexes:
Spectroscopic ground states, correlation. Orgel and Tanabe-Sugano diagrams for transition metal complexes (d^1-d^9 states), Selection rule for electronicspectroscopy. Intensity of various type electronic transitions. Calculations of 10Dq,and β parameters, charge transfer spectra.

Unit II Magnetic Properties of Transition Metal Complexes Anomalous magnetic moments, Quenching of orbital contribution. Orbital contribution to magnetic moment, magnetic exchange coupling and spin crossover.

Unit III Metal π-Complexes:-Metal carbonyl, structure and bonding, vibrational spectra of metal carbonyls for bonding and structural elucidation, important reactions of metal carbonyls; preparation, bonding structure and important reaction of transition metal nitrosyl, dinitrogen and dioxgen complexes; tertiary phosphine as ligand.

Unit IV Metal Clusters-: Higher boranes, carboranes, metalloboranes and metallo-carboranes, compounds with metal metal multiple bonds

Unit V Optical Rotatory Dispersion and Circular Dichroism Linearly and circularly polarized lights; optical rotatory power and circular birefringence, elipticity and circular dichroism; ORD and Cotton effect, Faraday and Kerr effects; Assignment of electronic transitions; applications of ORD and CD for the determination of (i) absolute configuration of complexes and (ii) isomerism due to non-planarity of chelate rings.

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Class	**:**	**M.Sc.**
Semester	:	**II**
Subject	**:**	**Chemistry**
Paper	:	**II**
Title of paper	:	**Organic Chemistry- II**
Course Code	:	**CHE-**708
Compulsory / Optional	:	**Compulsory**
Max. Marks	**:**	85 **+ CCE** 15

Course Outcomes

After completion of this course, the students understand:

CO1 – mechanism of aromatic electrophilic and ucleophillic substitution

CO2 – free radical reactions and rearrangements

CO3 – mechanistic and stereochemical aspects of addition reactions

CO4 – addition to carbon-hetero multiple bonds and elimination reactions

CO5 – pericyclic reactions and sigmatropic rearrangements.

Particulars

Unit I Aromatic Electrophilic Substitution The arenium ion mechanism, orientation and reactivity, energy profile diagrams. The ortho/para ratio, ipso attack, orientation in other ring systems. Quantitative treatment of reactivity in substrates and electrophiles. Diazonium coupling, Vilsmeir reactiion, Gatterman-Koch reaction Aromatic Nucleophilic Substitution The SNAr SN1, benzyne and SN1 mechanism, Reactivity effect of substrate structure, leaving group and attacking nucleophile. The Von Richter, Sommelet-Hauser, and Smiles rearrangements.

Unit II Free Radical Reactions Types of free radical reactions, free radical substitution mechanism, mechanism at an aromatic substrate, neighbouring group assistance. Reactivity for aliphatic and aromatic substrates at a bridgehead. Reactivity in the attacking radicals. The effect of solvents on reactivity. Allylic halogenation (NBS), oxidation of aldehydes to carboyxlic acids, auto-oxidation, coupling of alkynes and arylation of aromatic compounds by diazonium salts, Sandmeyer reaction. Free radical rearrangement. Hunsdiecker reaction.

Unit III Addition Reactions Mechanistic and stereochemical aspects of addition reactions involving electrophiles, nucleophiles and free radicals, regio-and chemoselectivity, orientation and reactivity. Addition to cyclopropane ring. Hydrogenation of double and triple bounds, hydrogenation of aromatic rings. Hydroboration, Michael reaction, sharpless asymmetric epoxidation.

Unit IV Addition to Carbon-Hetero Multiple Bonds Mechanism of metal hydride reduction of saturated and unsaturated carbonyl compounds, acid esters and nitriles. Addition of Grignard reagents, organozinc and organolithium reagents to carbonyl and usaturated carbonyl compounds. Witting reaction. Mechanism of condensation reactions involving enolates-Aldol, Knoevenagel, Claisen, Mannich, Benzoin, Perkin and Stobbe reactions. Hydrolysis of esters and amides, ammonolysis of esters. Elimination Reactions The E2, E1 and E1 cB mechanisms and their spectrum. Orientation of the double bond. Reactitivity-effects of substrate structures, attacking base, the leavigng group and the medium. Mechanism and orientation in pyrolytic elimination.

Unit V Pericyclic Reactions Molecular orbital symmetry, Frontier orbitals of ethylene, 1,3-butadiene, 1,3,5-hexatriene and allyl system. Classification of periycyclic reactions. Woodward-Hoffmann correlation diagrams. FMO and PMO approach. Electrocyclic reactions-conrotatory and disrotatory motions, 4n 4n+2 and allyl systems. Cycloadditions-antarafacial and suprafacial additions, 4n and 4n+2 systems, 2+2 addition of ketenes, 1,3 dipolar cycloadditions and cheleotrpic reactions. Sigmatropic rearrangements-suprafacial and antarafacial shifts of H, sigmatropic involving carbon moieties, 3,3- and 5,5 sigmatropic rearrangements. Claise n, Cope and aza-Cope rearrangements. Fluxional tautomerism. Ene reaction.

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Class	:	**M.Sc.**
Semester	:	**II**
Subject	:	**Chemistry**
Paper	:	**III**
Title of paper	:	**Physical Chemistry- II**
Course Code	:	**CHE-709**
Compulsory / Optional	:	**Compulsory**
Max. Marks	:	**85 + CCE 15**

Course Outcomes

After completion of this course, the students understand:

CO1 – chemical dynamics, Arrhenius equation and activated complex theory

CO2 - surface tension, adsorption and related topics

CO3 - macromolecules

CO4 - non equilibrium thermodynamics, importance of entropy production and entropy mechanism

CO5 - electrochemistry of solutions

Particulars

Unit I Chemical Dynamics Methods of determining rate laws, collision theory of reaction rates, steric factor, activated complex theory, Arrhenius equation and the activated complex theory; ionic reactions, kinetic salt effects, steady state kinetics, kinetic and thermodynamic control of reactions, treatment of unimolecular reactions. Dyamic chain (hydrogen-bromine reaction, pyrolysis of acetaldehyde, decomposition of ethane), photochemical (hydrogen-bromine and hydrogen-chlorine reactions) and homogenous catalysis, kinetics of enzyme reactions, general features fo fast reactions, study of fast reactions by flow method, relaxation method, flash photolysis ad the nuclear magnetic resonance method, dynamics of unimolecular reactiosn (Lindemann Hinshelwood and Rice-Ramsperger-Kassel-Marcus (RRKM) theories for unimolecular reactions).

Unit II Surface Chemistry Adsorption Surface tension, capillary action, pressure difference across curved surface (Laplace equation), vapour pressure of droplets (Kelvin equation), Gibbs adsorption isotherm, estimation of surface area (BET equation), Surface films on liquids (Electro-kinetic phenomenon).
Micelles Surface active agents, classification of surface active agents, micellization, hydrophobic interaction, critical micellar concentration (CMC), factors affecting the CMC of surfactants, counter ion binding to micelles, thermodynamics of micellization-phase separation and mass action models, solublization, micro emulsion, reverse micelles.

Unit III Macromolecules Polymer-definition, types of polymers, electrically conducting, fire resistant, liquid crystal polymers, kinetics of polymerization, mechanism of polymerization. Molecular mass, number and mass average molecular mass, molecular mass determination (Osmometry, viscometry, diffusion and light scattering methods), sedimentation, chain configuration of macromolecules, calculation of average dimension of various chain structures.

Unit IV Non Equilibrium Theromodynamics Thermodynamic criteria for non-equilibrium states, entropy production and entropy flow, entropy balance equations for different irreversible processes (e.g., heat flow, chemical reaction etc.) transformations of the generalized fluxes and forces, non equilibrium stationary states,

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phenomenological equations, microscopic reversibility and Onsager's reciprocity relations, electrokinetic phenomena, diffusion, electric conduction.

Unit V Electrochemistry Electrochemistry of solutions. Debye-Huckel-Onsager treatment and its extension, ion solvent interactions. Debye-Huckel-Jerum mode. Thermodynamics of electrified interface equations. Derivation of electro capillarity, Lippmann equations (surface excess), methods of determination. Structure of electrified interfaces.

Overpotentials, exchange current density, derivation of Butler Volmer equation, Tafel plot. Quantum aspects of charge transfer at electrodes-solution interfaces, quantization of charge transfer, tunneling. Semiconductor interfaces-theory of double layer at semiconductor, electrolyte solution interfaces, structure of double layer interfaces. Effect of light at semiconductor solution interface. Polarography theory, Ilkovic equation; half wave potential and its significance.

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Class	:	M.Sc.
Semester	:	II
Subject	:	Chemistry
Paper	:	IV
Title of paper	:	Spectroscopy II and Diffraction Methods
Course Code	:	CHE-710
Compulsory / Optional	:	Compulsory
Max. Marks	:	85 + CCE 15

Course Outcomes

After completion of this course, the students understand:

CO1 - Nuclear Magnetic Resonance spectroscopy, chemical shift, spin- spin interaction, spin decoupling and FT NMR

CO2 – various concepts and applications of Nuclear Quadrupole Resonance Spectroscopy

CO3 - basic principles of Electron Spin Resonance Spectroscopy, its various concepts and applications

CO4 - X-ray diffraction, Bragg's condition, various methods of X-ray Structure, analysis of crystals, identification of unit cell

CO5 - concept of electron diffraction and neutron diffraction.

Particulars

Unit I Nuclear Magnetic Resonance Spectroscopy-Nuclear spin, nuclear resonance, saturation, shielding of magnetic nuclei, chemical shift and its measurements, factors, influencing chemical shift, deshielding, spin -spin interactions, factors influencing coupling constant "j" Classification (AXB, AMX, ABC, A2B2 etc.). spin decoupling; basic ideas about instrument, NMR studies of nuclei other than protin-13C, 19F and 31P. FT NMR, advantages of FT NMR.

Unit II Nuclear Quadrupole Resonance Spectroscopy--Quadrupolenuclei, quadrupole moments, electric field gradient, coupling constant, splitting. Applications.

Unit III Electron Spin Resonance Spectroscopy-Basic principles, zero field splitting and Kramer's degeneracy, factors affecting the 'g' value. Isotropic and anisotropic hyperfine coupling constants, spin Hamiltonian, spin densities and Mc Connell relationship, measurement techniques, applications.

Unit IV X-ray Diffraction-Bragg condition, Miller indices, Laue Method, Bragg method, Debye Scherrer method of X-ray structural analysis of crystals, index reflections, identification of unit cells from systematic absences in diffraction pattern, Structure of simple lattices and X-ray intensities, structure factor and its relation to intensity and electron density, phase problem. Description of the procedure for an X-ray structure analysis, absolute configuration of molecules.

Unit V Electron Diffraction-Scattering intensity vs. scattering angle, Wierl equation, measurement technique, elucidation of structure of simple gas phase molecules. Low energy electron diffraction and structure of surfaces. Neutron Diffraction -Scattering of neutrons by solids measurement techniques, Elucidation of structure of magnetically ordered unit cells.

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Class	:	M.Sc.
Semester	:	II
Subject	:	Chemistry
Paper	:	V
Title of paper	:	Computers for Chemists
Course Code	:	CHE-711
Compulsory / Optional	:	Compulsory
Max. Marks	:	85 + CCE 15

This is a theory cum-laboratory course with more emphasis on laboratory work

Course Outcomes

After pursuing this course, the students understand:
CO1 - basic structure and functioning of computer
CO2 – computer language and programming in FORTRAN/C/BASIC
CO3 – programming in chemistry
CO4 - use of computer programs
CO5 - applications of internet for chemistry with search engines

Particulars

Unit I Introduction to computers and ComputingBasic structure and functioning of computer with a PC as illustrative example. Memory I/O devices. Secondary storage Computer languages. Operating systems with DOS as an example Introduction to UNIX and WINDOWS. Principles of programming Alogrithms and flow-charts.

Unit II Computer Programming in FORTRAN/C/BASIC (The language features are listed here with reference to FORTRAN. The instructor may choose another language such as BASIC or C the features may be replaced appropriately). Elements of the computer language. Constants and variables. Operations and symbols Expressions. Arithmetic assignment statement. Input and output Format statement. Termination statements. Branching statements as IF or GO TO statement. LOGICAL variables. Double precession variables. Subscripted variables and DIMENSION. DO statement FUNCTION AND SUBROUTINE. COMMON and DATA statement (Student learn the programming logic and these language feature by hands on experience on a personal computer from the beginning of this topic.)

Unit III Programming in Chemistry Developing of small computer codes using any one of the languages ORTRAN/C/BASIC involving simple formulae in Chemistry, such as Van der Waals equation. Chemical kinetics (determination of Rate constant) Radioactive decay (Half Life and Average Life). Determination Normality, Molarity and Molality of solutions. Evaluation Electronegativity of atom and Lattice Energy from experimental determination of molecular weight and percentage of element organic compounds using data from experimental metal representation of molecules in terms of elementary structural features such as bond lengths, bond angles.

Unit IV Use of Computer programmes Operation of PC. Data Processing. Running of standard Programs and Packages such as MS WORD, MS EXCEL -special emphasis on calculations and chart formations. X-Y plot. Simpson's Numerical Integration method. Programmes with data preferably from physical chemistry laboratory.

Unit V Internet Application of Internet for Chemistry with search engines, various types of files like PDF, JPG, RTF and Bitmap. Scanning, OMR, Web camera.

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Class	:	M.Sc.
Semester	:	III
Subject	:	Chemistry
Paper	:	Pratical
Title of paper	:	A Inorganic Chemistry
Course Code	:	PR-CHE-717
Compulsory / Optional	:	Compulsory
Max. Marks	:	33

(Duration: 6-8 hrs in each branch)
Practical examination shall be conducted separately for each branch.

Course Outcomes

After pursuing this course, the students can:

- determine quantitatively three component mixtures volumetrically and gravimetrically
- perform chromatographic techniques like paper chromatography and thin layer chromatography for the separation of metal ions.

Examination scheme

1.	Quantitative determinations of a three component mixture	: 12 Marks
2.	Chromatographic separations	: 12 Marks
	Record	:04 Marks
	Viva Voce	:05 Marks
	Total	:33 Marks

Experiments

1 . Quantitative determinations of a three component mixture:
One volumetrically and two gravimetrically

a . Cu^{+2}, Ni^{+2}, Zn^{+2}
b . Cu^{+2}, Ni^{+2}, Ag^{+1}

2 . Chromatographic separations
a . Cadmium and Zinc.
b . Zinc and Magnesium.
c . Thin-Layer/ paper chromatogtaphy-separation of nickel, manganese, cobalt and zinc.
Determination of R_f values.

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Class	:	M.Sc.
Semester	:	III
Subject	:	Chemistry
Paper	:	Pratical
Title of paper	:	B Organic Chemistry
Course Code	:	PR-CHE-718
Compulsory / Optional	:	Compulsory
Max. Marks	:	33

(Duration: 6-8 hrs in each branch)
Practical examination shall be conducted separately for each branch.

Course Outcomes

After pursuing this course, the students can:

- do the estimation of elements and functional groups in organic compounds?
- perform the technique of paper chromatography

Examination scheme

1. Estimations	: 12Marks
2. Paper Chromatography	: 12 Marks
Record	:04 Marks
Viva Voce	:05 Marks
Total	:33 Marks

Experiments

1 . Estimations
1 . Estimation of element: Estimation of Sulphur, Nitrogen, and Halogens.
2 . Estimation of Functional group and simple organic compound -estimation of Carboxylic group, Aldehyde group, Ketonic group, Carbohydrate group etc.

2. Paper Chromatography
Separation and identification of the sugars present in the given sample of glucose, fructose and sucrose by paper chromatography and determination of $R_f$values.

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Class	:	M.Sc.
Semester	:	III
Subject	:	Chemistry
Paper	:	Pratical
Title of paper	:	C Physical Chemistry
Course Code	:	PR-CHE-719
Compulsory / Optional	:	Compulsory
Max. Marks	:	34

(Duration: 6-8 hrs in each branch)
Practical examination shall be conducted separately for each branch.

Course Outcomes

After pursuing this course, the students can:

- perform various chemical kinetics practicals
- determine pKa of an indicator (methyl red), study of stoichiometry and stability constant of complex ion in solution, perform oxidation of alcohol by Ce(IV) etc. spectroscopically

Examination scheme

1.	Spectroscopy	: 13 Marks
2.	Chemical Kinetics	: 12 Marks
	Record	:04 Marks
	Viva Voce	:05 Marks
	Total	: 34 Marks

Spectroscopy& Chemical Kinetics

i. Determination of pKa of an indicator (e.g. methyl red) in (a) aqueous and (b) micellar Media.
ii. Determination of stoichiometry and stability constant of Ferricisthiocoyanation complex in solution.
iii. Determination of rate constant of alkaline bleaching powder of malachite green and effect of ionic strength on the rate of reaction.
iv. Determination of energy and enthalpy of activation in the reaction of $KMnO_4$and Benzyl alcohol in the acidic medium.
v. Determination of energy of activation and entropy of activation from a single kinetic run.
vi. Kinetics of an enzyme micellar catalyzed reactions.
vii. Kinetics of reaction between acetone and iodine spectrophotometrically.
viii. Spectrometric study of oxidation of alcohol by Ce(IV)
ix. Oxidation of alcohols by chromic acid – a kinetic study.
x. Determination of CMC spectrophotometrically

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Class	:	M.Sc.
Semester	:	III
Subject	:	Chemistry
Paper	:	I
Title of paper	:	**Application of Spectroscopy**-I
Course Code	:	CHE-712
Compulsory / Optional	:	Compulsory
Max. Marks	:	85 + CCE 15

Course Outcomes

After completion of this course, the students understand:

CO1 - d - d transitions taking place in octahedral, tetrahedral and square planar metal complexes

CO2 - mode of bonding of ambidentate ligands and applications of Resonance Raman spectroscopy

CO3 - NMR spectroscopy., chemical shift, shielding, deshielding, spin - spin interaction and an idea of chemical shift values of different types of organic compounds

CO4 - chemical exchange effect of deuteration, complex spin- spin interaction and NOE

CO5 - Mossbauer Spectroscopy, basic principles, technique and spectral parameters

Particulars

Unit-1	**Electronic Spectroscopy-Electronic Spectral Studies for d^1 – d^9systems in octahedral, tetrahedral and square planer complexes**
Unit-2	**Vibrational Spectroscopy** -Symmetry and shapes of AB_2, AB_3, AB_4, AB_5 and AB_6, mode of bonding of ambidentate ligands, nitrosyl, ethylenediamine and diketonato complexes, application of resonance Raman spectroscopy and its applications.
Unit-3	**Nuclear Magnetic Resonance Spectroscopy-I-**General introduction and definition, chemical shift, spin-spin interaction, shielding and deshielding mechanism, mechanism of measurement of chemical shift values and correlation for protons bonded to carbon (aliphatic, olefinic, aldehydic and aromatic) and other nuclei (alcohols, phenols, enols, carboxylic acids, amines, amides &mercapto).
Unit-4	**Nuclear Magnetic Resonance Spectroscopy-II-**Chemical exchange, effect of deuteration, Complex spin spin interaction between two, three, four and five nuclei (I order spectra) Stereochemistry, hindered rotation, Karplus curve-variation of coupling constant with disordered angle. NMR shift reagents, solvent effects. nuclear overhauser effect (NOE).
Unit-5	**Mössbauer Spectroscopy** -Basic principles, spectral parameters and spectrum display. Application of the technique to the studies of (1) bonding and structures of Fe^{+2} and Fe^{+3} compounds including those of intermediate spin, (2) Sn^{+2} and Sn^{+4} compounds nature of M-L bond, coordination number, structure and (3) detection of oxidation state and inequivalent MB atoms.

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Class	:	M.Sc.
Semester	:	III
Subject	:	Chemistry
Paper	:	II
Title of paper	:	**Photochemistry**
Course Code	:	CHE-713
Compulsory / Optional	:	Compulsory
Max. Marks	:	85 + CCE 15

Course Outcomes

After completion of this course, the students understand:

CO1 - photochemical reactions, excitations, fate of excited molecule, transfer of excitation energy

CO2 - determination of reaction mechanism

CO3 - photochemistry of alkenes and aromatic compounds

CO4 - photochemistry of carbonyl compounds

CO5 - miscellaneous photochemical reactions like formation of smog, photochemistry of vision

Particulars

Unit-1	Photochemical Reactions Interaction of electromagnetic radiation with matter, types of excitations, fate of excited molecule, quantum yield, transfer of excitation energy, actinometry.
Unit-2	Determination of Reaction Mechanism Classification, rate constants and life times of reactive energy state, determination of rate constants of reactions. Effect of light intensity on the rate of photochemical reactions. Types of photochemical reactions-photo dissociation, gas-phase photolysis.
Unit-3	Photochemistry of Alkenes Intramolecular reactions of the olefinic bond-geometrical isomerism, cyclisation reactions, rearrangement of 1,4- and 1,5-dienes. Photochemistry of Aromatic Compounds Isomerisations, additions and substitutions.
Unit-4	Photochemistry of Carbonyl Compounds Intramolecular reactions of carbonyl compounds-saturated, cyclic and acyclic, β,γ unsaturated and α, β unsaturated compounds, cyclohexadienones. Intermolecular cyloaddition reactions-dimerisations and oxetane formation.
Unit-5	Miscellaneous Photochemical Reactions Photo-Fries reactions of annelides, Photo-Fries rearrangement. Barton reaction. Singlet molecular oxygen and its reactions. Photochemical formation of smog. Photodegradation of polymers. Photochemistry of vision.

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Class	:	M.Sc.
Semester	:	III
Subject	:	Chemistry
Paper	:	III
Title of paper	:	Environmental Chemistry
Course Code	:	CHE-714
Compulsory / Optional	:	Compulsory
Max. Marks	:	85 + CCE 15

Course Outcomes

After pursuing this course, the students understand:

CO1 - atmosphere, atmospheric chemistry, tropospheric chemistry, biogeochemical cycles
CO2 - air pollution, greenhouse effect, acid rain and stratospheric ozone depletion
CO3 - aquatic chemistry, water pollution
CO4 - environmental toxicology, toxic heavy metals, toxic organic compounds, polychlorinated biphenyls, polynuclear aromatic hydrocarbons
CO5 - composition of soil, soil pollution and some environmental disasters

Particulars

Unit-1	**Atmosphere** Atmospheric layers, Vertical temperature profile, heat/radiation budget of the earth atmosphere systems. Properties of troposphere, thermodynamic derivation of lapse rate. Temperature inversion. Calculation of Global mean temperature of the atmosphere. Pressure variation in atmosphere and scale height. Biogeochemical cycles of carbon, nitrogen, sulphur, phosphorus, oxygen. Residence times. **Atmospheric Chemistry** Sources of trace atmospheric constituents: nitrogen oxides, sulphurdioxide and other sulphur compounds, carbon oxides, chlorofluorocarbons and other halogen compounds, methane and other hydrocarbons. **Tropospheric Photochemistry** Mechanism of Photochemical decomposition of NO_2 and formation of ozone. Formation of oxygen atoms, hydroxyl, hydroperoxy and organic radicals and hydrogen peroxide. Reactions of hydroxyl radicals with methane and other organic compounds. Reaction of OH radicals with SO_2 and NO_2. Formation of Nitrate radical and its reactions. Photochemical smog meteorological conditions and chemistry of its formation.
Unit-2	**Air Pollution** Air pollutants and their classifications. Aerosols-sources, size distribution and effect on visibility, climate and health. **Acid Rain**

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	Definition, Acid rain precursors and their aqueous and gas phase atmospheric oxidation reactions. Damaging effects on aquatic life, plants, buildings and health. Monitoring of SO_2 and NO_2. Acid rain control strategies. **Stratospheric Ozone Depletion** Mechanism of Ozone formation, Mechanism of catalytic ozone depletion, Discovery of Antarctic Ozone hole and Role of chemistry and meteorology. Control Strategies. **Green House Effect** Terrestrial and solar radiation spectra, Major green house gases and their sources and Global warming potentials. Climate change and consequences. **Urban Air Pollution** Exhaust emissions, damaging effects of carbon monoxide. Monitoring of CO. Control strategies.
Unit-3	**Aquatic Chemistry and Water Pollution** Redox chemistry in natural waters. Dissolved oxygen, biological oxygen demand, chemical oxygen demand, determination of DO, BOD and COD. Aerobic and anaerobic reactions of organic sulphur and nitrogen compounds in water, acid-base chemistry of fresh water and sea water. Aluminum, nitrate and fluoride in water. Petrification. Sources of water pollution. Treatment of waste and sewage. Purification of drinking water, techniques of purification and disinfection.
Unit-4	**Environmental Toxicology** **Toxic heavy metals :** Mercury, lead, arsenic and cadmium. Causes of toxicity. Bioaccumulation, sources of heavy metals. Chemical speciation of Hg, Pb, As, and Cd. Biochemical and damaging effects. **Toxic Organic Compound :** Pesticides, classification, properties and uses of organochlorine and ionospheres pesticides detection and damaging effects. **Polychlorinated biphenyls :** Properties, use and environmental continuation and effects. **Polynuclear Aromatic Hydrocarbons :** Source, structures and as pollutants.
Unit-5	**Soil and Environmental Disaster** Soil composition, micro and macronutrients, soil pollution by fertilizers, plastic andmetals. Methods of re-mediation of soil. Bhopal gas tragedy, Chernobyl, three-mile island, Minimtata Disease, Sevoso (Italy), London Smog.

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Class	:	M.Sc.
Semester	:	III
Subject	:	Chemistry
Paper	:	OPT-I
Title of paper	:	Polymers
Course Code	:	CHE-715
Compulsory / Optional	:	Optional
Max. Marks	:	85 + CCE 15

Course Outcomes

After pursuing this course, the students understand:

CO1 - basic concepts of polymers, polymerization conditions, polymer reactions

CO2 - polymer characterization, polymerization in homogeneous and heterogeneous systems

CO3 - analysis and testing of polymers

CO4 -concepts of inorganic polymers

CO5 - structure, properties, and applications of different types of polymers

Particulars

Unit-1	**Basics** Importance of polymers. Basic concepts: Monomers, repeat units, degree of polymerization Linear, branched and network polymers. Classification of polymers. Polymerization: condensation, addition/radical chain-ionic and co-ordination and copolymerization. Polymerization conditions and polymer reactions. Polymerization in homogeneous and heterogeneous systems.
Unit-2	**Polymer Characterization** Polydispersion-average molecular weight concept. Number, weight and viscosity average molecular weights. Polydispersity and molecular weight distribution. The practical significance of molecular weight. Measurement of molecular-weights. End-group, viscosity, light scattering, osmotic and ultracentrifugation methods.
Unit-3	Analysis and testing of polymers Chemical analysis of polymers, spectroscopic methods, X-ray diffraction study. Microscopy. Thermal analysis and physical testing-tensile strength, fatigue, impact, tear resistance, Hardness and abrasion resistance.
Unit-4	**Inorganic Polymers** A general survey and scope of Inorganic Polymers, special characteristics, classification, homo and hetero atomic polymers. Structure, Properties and Applications of a. Polymers based on boron-borazines, boranes and carboranes. b. Polymers based on Silicon, silicone's polymetalloxanes and polymetallosiloxanes, silazanes.
Unit-5	Structure, Properties and Applications of Polymers a. Polymers based on Phosphorous-Phosphazenes, Polyphosphates b. Polymers based on Sulphur-Tetrasulphur tetranitride and related compounds. c. Co-ordination and metal chelate polymers.

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Class	:	M.Sc.
Semester	:	III
Subject	:	Chemistry
Paper	:	OPT-II
Title of paper	:	IndustrialChemistry-Heavy Chemicals & Petroleum
Course Code	:	CHE-715
Compulsory / Optional	:	Optional
Max. Marks	:	85 + CCE 15

Course Outcomes

After pursuing this course, the students understand:
CO1 - water pollutants, thermal pollution, various methods of water purification
CO2 - large scale production of different gases and heavy chemicals
CO3 - coal, its origin, composition etc. and economic importance
CO4 - petroleum, its origin, refining, composition etc. and its economic importance
CO5 - fats and oils, hydrogenation of unsaturated oils, manufacture of vanaspati and margarine

Particulars

Unit-1	Water, Gases and Heavy Chemicals Water: Water pollutants, their classes with examples. Biochemical Oxygen Demand, thermal pollution, pollution by fertilizers, detergents, pesticides and industrial wastes. Water Purification :Classical and modern Methods – Ion exchange , electrodialysis, Reverse osmosis, Softening of Hard water.Chlorination and Fluoridation.
Unit-2	Gases: Chemistry large –scale production, storage, hazards and use of the following industrial gases: Hydrogen, oxygen, nitrogen, carbon dioxide, chlorine, fluorine, sulphur dioxide, phosgene, acetylene, argon, neon and helium. Heavy Chemicals: Manufacture, Physical properties, Analysis, Hazards and application of the following chemicals: HCI,H_2SO_4,HNO_3,H_3FO_4,polyphosphoricacid,$NaHCO_3$, Na_2CO_3,$NaOH$,$NaCl$,$Na_2S_2O_3$,Bleaching Powder,Bromine.
Unit-3	Coal & Petroleum Coal: Origin and economic importance of coal. Coal composition, coal carbonization, coal gasification, Coal Gas, Water Gas, Producer Gas, coal tar industry and manufacture of coal tar based chemicals and their importance. Role of carcinogens, Non–fuel uses of coal and CI Chemistry based on MeOH, CO, CO_2,CH_4 and CH_2O.
Unit-4	Petroleum: Origin and composition, Refining, Reforming Fractionation; Cracking; knocking and Octane number, kerosene and Napthe; Liquified petroleum gas (L.P.G.) Synthetic Gas, Synthetic Petrol, Petrochemicals, manufacture of ethylene, propylene, Butadiene, xylenes, etc. Economic importance with particular reference to India.
Unit-5	Fats & Oils Fats & Oil Natural Fats, Edible and Industrial Oils of vegetable origin, common fatty acids and glycerides, hydrogenation of unsaturated oils, manufacture of Vanaspati and margarine.

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Class	: M.Sc.
Semester	: III
Subject	: Chemistry
Title of Paper	: **Organotransition Metal Chemistry**
Paper No.	: **OPT-3**
Course Code:	CHE (715)
Compulsory / Optional	: Optional
Maximum Marks	: 85 + CCE 15
	Particulars

Unit-1	**Alkyls and Aryls of Transition Metals** Types, routes of synthesis, stability and decomposition pathways, organo copper in organic synthesis. **Compounds of Transition Metal-Carbon Multiple Bonds** Alkylidenes, alkylidynes, low valent carbenes and carbynes-synthesis, nature of bond, structural characteristics, nucleophilic and electrophilic reactions on the ligands, role in organic synthesis.
Unit-2	**Transition Metal π-Complexes** Transition metal π-Complexes with unsaturated organic molecules, alkenes, alkynes, allyl, diene, dienyl, arene and trienyl complexes, preparation, properties, nature of bonding and structural features. Important reactions relating to nucleophilic and electrophilic attack on ligands and to organic synthesis.
Unit-3	**Transition organometalic compounds**: Transition metal compounds with bonds to hydrogen, boron, silicon
Unit-4	**Homogeneous Catalysis** Stoichiometric reactions for catalysis, homogeneous catalytic hydrogenation, Zeigler-Natta polymerization of olefins, catalytic reactions involving carbon monoxide such as hydrocarbonylation of olefins (oxoreaction), explanation reactions, activation of C-H bond.
Unit-5	**Fluxional Organometallic Compounds** Flexionality and dynamic equilibrium in compounds such as η^2 olefine, η^3-allyl and dienyl complexes.

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Class	: M.Sc.
Semester	: III
Subject	: Chemistry
Title of paper	**: Heterocyclic Chemistry**
Paper No.	: **OPT-4**
Compulsory/ Optional	: Optional
Max. Marks	: 85 + CCE 15

Particulars

Unit-1	**Nomenclature of Heterocycles** Replacement and systematic nomenclature (HantzsMCH-Widman system) for monocyclic fused and bridged heterocycles. **Aromatic Heterocycles** General chemical behaviour of aromatic heterocycles, classification (structural type), criteria of aromaticity (bond lengths, ring current and chemical shifts in 1H NMR-spectra. Empirical resonance energy, delocalization energy and Dewar resonance energy, diamagnetic susceptibility exaltations). Heteroaromatic reactivity and tautomerism in aromatic heterocycles.
Unit-2	**Non-aromatic Heterocycles** Strain-bond angle and torsional strains and their consequences in small ring heterocycles. Conformation of six-membered heterocycles with reference to molecular geometry, barrier to ring inversion, pyramidal inversion and 1,3-diaxial interaction. Atereo-electronic effects anomeric and related effects, Attractive interactions-hydrogen bonding and intermolecular nucleophilic electrophilic interactions. Heterocyclic synthesis-princples of heterocyclic synthesis involing cyclization reactions and cycloaddition reactions.
Unit-3	**Small Ring Heterocycles** Three-membered and four-membered heterocycles-synthesis and reactions of azirodines, oxiranes, thiranes, azetidines, oxetanes and thietanes. **Benzo-Fused Five-Membered Heterocycles** Synthesis and reactions including medicinal applications of benzopyrroles, bezofurans and benzothiophenes.
Unit-4	**Meso-ionic Heterocycles** General classification, chemistry of some important meso-ionic heterocycles of type-A and B and their applications. **Six-Membered Heterocycles with one Heteroatom** Synthesis and reactions of pyrylium salts and pyrones and their comparison with pyridinium & thiopyrylium salts and phridones. Synthesis and reactions of quionlizinium and benzopyrylium salts, coumarins and chromones.
Unit-5	**Six Membered Heterocycles with Two or More Heteroatoms:** Synthesis and reactions of diazones, triazines, tetrazines and thiazines. Seven-and Large-Membered Heterocycles: Synthesis and reactions of azepines, oxepines, thiepines, diazepines, thiazepines, azocines, diazocines, dioxocines and dithiocines. **Heterocyclic Systems Containing P, As, Sb and B** Heterocyclic rings containing phosphorus : Introduction, nomenclature, synthesis and characteristics of

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	5- and 6-membered ring systems phosphorinaes, phosphorines, phospholanes and phospholes. Heterocyclic rings containing As and Sb : Introduction, synthesis and characteristics of 5- and 6-membered ring system. Heterocyclic rings containing B : Introduction, synthesis reactivity and spectral characteristics of 3- 5- and 6- membered ring system.

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Class	: M.Sc.
Semester	: III
Subject	: Chemistry
Title of Paper	: **Physical Organic Chemistry**
Paper No.	: **OPT-5**
Compulsory / Optional	: Optional
Maximum Marks	: 85 + CCE 15

Particulars

Unit-1	**Concepts in Molecular Orbital (MO) and Valence Bond (VB) Theory** Introduction to Huckel molecular orbital (MO) method as a mean to explain modern theoretical methods. Advanced techniques in PMO and FMO theory. Molecular mechanics, semi empirical methods and ab initio and density functional methods. Scope and limitations of several computational programmes.
Unit-2	**Quantitative MO theory :** Huckel molecular orbital (HMO - method as applied to ethene, allyl and butadiene). Qualitative MO theory ionisation potential. Electron affinities. MO energy levels. Orbital symmetry. Orbital interaction diagrams. MO of simple organic systems such as ethene, allyl, butadiene, methane and methyl group. Conjugation and hyper-conjugation. Aromaticity. **Valence bond (B) configuration mixing diagrams**. Relationship between VB configuration mixing and resonance theory. Reaction profiles. Potential energy diagrams. Curve-crossing model-nature of activation barrier in chemical reactions.
Unit-3	**Principles of Reactivity** Mechanistic significance of entropy, enthalpy and Gibb's free energy. Arrrhenius equation. Transition state theory. Uses of activation parameters, Hammond's postulate, Bell-Evans-Polanyi Principle. Potential energy surface model. Marcus theory of electron transfer. Reactivity and selectivity principles. **Kinetic Isotope Effect** Theory of isotope effects. Primary and secondary kinetic isotope effects. Heavy atom isotope effects. Tunneling effect. Solvent effects. **Structural Effects on Reactivity** Linear free energy relationships (LFER). The Hammett equation, substituent constants, theories of substituent effects. Interpretation of δ-values. Reaction constants. Deviations from Hammett equation. Dualparameter correlatins, inductive substituent constant. The Taft model, s1 and sR scales.
Unit-4	**Acids, Bases, Electrophiles, Nucleophiles and Catalysis** Acid-base dissociation, Electronic and structural effects, acidity and basicity. Acidity functions and their applicatins. hard and soft acids and bases. Nucleophilicity scales. Nucleofugacity. The α-effect. Ambivalent nucleophiles. Acid-base catalysis-specific and general catalysis. Bronsted catalysis, Nucleophilic and electrophilic catalysis. Catalysis by noncovalent binding-micellar catalysis. **Steric and Conformation Properties** Various type of steric strain and their influence on reactivity. Steric acceleration. Molecular measurements of steric effects upon rates. Steric LFET, Conformational barrier to bond rotation-

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	spectroscopic detection of individual conformers. Acyclic and monocyclic systems. Rotation around partial double bonds. Winstein-Holness and Curtin-Hammett principle.
Unit-5	**Nucleophilic and Electrophilic Reactivity** Structural and electronic effects on SN^1 and SN^2 reactivity. Solvent effect, Kinetic isotope effects. Intramolecular assistance. Electron transfer nature of SN^2 reaction. Nucleophilicity and SN^2 reactivity based on curved crossing mode. Relationship between polar and electron transfer reactions, SR_N^1 mechanism. Electrophilic reactivity, general mechanism. Kinetic of S_E^2 Ar reaction. Structural effects on rates and selectivity. Curve-crossing approach to electrophilic reactivity. **Supramolecular Chemistry** Properties of covalent bonds-bond length, inter-bond angles, force constant, bond and molecular dipole moments. Molecular and bond polarizability, bond dissociation enthalpy, entropy. intermolecular forces, hydrophobic effects. Electrostatic, induction, dispersion and resonance energy, magnetic interactions, magnitude of interaction energy, forces between macroscopic bodies, medium effects. Hydrogen bond.

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Class	: M.Sc.
Semester	: III
Subject	: Chemistry
Title of Paper	: **Chemistry of Materials**
Paper No.	: **OPT-6**
Compulsory / Optional	: Optional
Maximum Marks	: 85 + CCE 15

Particulars

Unit-1	**A. Multiphase materials** Ferrous alloys; Fe-C phase transformations in ferrous alloys; stainless steels, non ferrous alloys, properties of ferrous and non-ferrous alloys and their applications. **B. Glasses, Ceramics, Composites and Nanomaterials** Glassy state, glass formers and glass modifiers, applications. Ceramic structures, mechanical properties, clay products. Refractories, characterizations, properties and applications. Microscopic composites; dispersion-strengthened and particle-reinforced, firbre-reinforced composites, macroscopic composites. Nanocrystalline phase, preparation procedures, special properties, applications.
Unit-2	**A. Thin Films and Langmuir-Blodgett Films** Preparation techniques; evaporation/sputtering, chemical processes, MOCVD, sol-gel etc. Languir-Blodgett (LB) film, growth techniques, photolithography, properties and applications of thin and LB films. **B. Liquid Crystals** Mesmorphic behaviour, thermotropic liquid crystals, positional order, bond orientational order, nematic and smectic mesophases; smectic-nematic transition and clearing temperature-homeotropic, planer and schlieren textures, twisted nematics, chiral nematics, molecular arrangement in smectic A and smectic C phases, optical properties of liquid crystals. Dielectric susceptibility and dielectric constants. Lyotropic phases and their description of ordering in liquid crystals.
Unit-3	**A. Polymeric Materials** Molecuar shape, structure and configuration, crystallinity, stress-strain behaviour, thermal behaviour, polymer types and their applications, conducting and ferro-electric polymers. **B. Ionic Conductors** Types of ionic conductgors, mechanism of ionic conduction, interstitial jumps (Frenkil); vacancy mechanism, diffusion superionic conductors; phase transitions and mechanism of conduction in superionic conductors, examples and applications of ionic conductors.
Unit-4	**High T_c Materials** Defect perovskites, high T_c superconductivity in cuprates, preparation and characterization of 1-2-3 and 2-1-4 materials, normal state properties; anisotropy; temperature dependence of electrical resistance; optical phonon modes, superconducting state; heat capacity; coherence

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	length, elastic constants, position lifetimes, microwave absorption-pairing and multigap structure in high T_c materials, applications of high T_c materials.
Unit-5	**A. Materials of Solid State Devices** Rectifiers, transistors, capacitors-IV-V compounds, low-dimentional quantum structures; optical properties. **B. Organic Solids, Fullerenes, Muleuclar Devices** Conducting organics, organic superconductors, magnetism in organic materials. Fullerenes-doped, fullerenes as superconductors. Moleuclar rectifiers and transistors, artificial phytosynthetic devices, optical storage memory and switches-sensors. Nonlinear optical materials; nonlinear optical effects, second and third order-molecular hyperpolarisability an second order electric susceptibility – materials for second and third harmonic generation.

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Class	: M.Sc.
Semester	: III
Subject	: Chemistry
Title of Paper	: **Green Chemistry**
Paper No.	: **OPT-7**
Compulsory / Optional	: Optional
Maximum Marks	: 85 + CCE 15

Particulars

Unit-1	Introduction of Green Chemistry, need of green chemistry, limitations/ obstacles in their pursuits of the goals of green chemistry, Twelve Principals of green chemistry-their explanations and examples, Designing a green synthesis using these principles, prevention of waste bi product, Atom Economy-maximum incorporation of the materials used in the process into final products.
Unit-2	Organic Synthesis on benign Green Solvents- Use of different solvents (benign) for synthesis. Organic Synthesis in Water-Introduction, Different synthesis in water such as Pinacol Coupling, Aldol Condensation, Mannich type reactions, pericyclic reaction, Benzoin condensation, Oxidations, Reductions, Wurtzs reaction, Organic Synthesis in Supercritical Carbon-dioxide-Historical development, use of Supercritical Carbon-dioxide (SC-CO2) for dry cleaning, use of Supercritical Carbon-dioxide in some organic reactions-Diels-Alder reaction, Friedel-Craft reaction, Hydrogenation, Coupling reaction, Free Radical bromination. Organic Synthesis using ionic liquids-Types of ionc liquids, Preparation of ionic liquids, Synthetic applications, Organic Synthesis using Polyethylene Glycol and its solutions: Introduction, Characteristics of the solvent and its applications in different organic reactions.
Unit –3	Organic Synthesis using Green Reagents- Use of different green reagents such as Oxygen, Singlet Oxygen, Ozone, Hydrogen peroxide, Di-oxiranes, Per-oxy acids, polymer supported reagents. Organic synthesis using phase transfer catalysis- mechanism of phase transfer catalysis (PTC), types of phase transfer catalysis, advantages and applications of phase transfer catalysis. Organic synthesis using crown ethers and bio- catalysts.
Unit- 4	Uses of Alternate Energy Process in the Chemical Synthesis- (a) Microwave Assisted Organic Synthesis- Introduction, Microwave assisted reactions in water-Hoffman elimination, hydrolysis of benzyl chloride, benzamide and methyl benzoate, oxidation of toluene, Microwave assisted reactions in Organic Solvents- Diels-Alder reaction, Fries Rearrangement, Aromatic Substitution, Esterification. (b) Ultrasound Assisted Organic Synthesis- Introduction, Homogenous Sonochemical Reactions-Addition Reactions, Oxidations, Organometallic Reactions, Heterogenous liquid-liquid reactions-Esterification and Saponification.
Unit-5	Organic Synthesis in Solid State- Solid state reactions at room temperature- Aldol Condensation, Grignards Reactions, Reformatsky Reaction, Solid State Reactions.

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	Some Oxidation Reaction Solid State Reactions using Solid support- Protection-deprotection Reactions, Oxidations, Reductions, Isomerisations. Photo Induced Organic Synthesis- Introduction, Photochemical reactions-industrial application of Photochemistry-The Barton Reactions, Photochemical synthesis of Vitamin D and related compounds, Photo-Oxygenation, Photonitrosation.

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Class	:	M.Sc.
Semester	:	IV
Subject	:	Chemistry
Paper	:	Pratical
Title of paper	:	A. Inorganic Chemistry
Course Code	:	PR-CHE-725
Compulsory / Optional	:	Compulsory
Max. Marks	:	33

(Duration: 6-8 hrs in each branch)
Practical examination shall be conducted separately for each branch.

Course Outcomes

After completion of this course, the students can:

- prepare inorganic compounds and do their spectral studies
- do spectrophotometric determinations
- flame photometric determinations of sodium potassium lithium, calcium, strontium etc.

Examination Scheme

Preparation	:12 Marks
Spectrophotometric Determinations	:
Flame Photometric Determinations	: 12 Marks
Record	:04 Marks
Viva Voce	:05 Marks
Total	:33 Marks

Preparation

Preparation of selected inorganic compounds and their study by IR, electronic spectra, and magnetic susceptibility measurements. Handling of air and moisture sensitive compounds involving vacuum lines. Selection can be made from the following :

1. Sodium amide. Inorg. Synth., 1946, 2, 128.
2. Atomic absorption analysis of Mg and Ca.
3. Synthesis of trichlorodiphenylantimony (V) hydrate. Inorg. Synths., 1985, 23, 194
4. Sodium tetrathionate $Na_2S_4O_6$.
5. Metal complex of dimethyl sulfoxide : $CuCl_2$.2DMSO J.Chem. Educ., 1982, 59, 57.
6. Synthesis of metal acethylacetonate : Inorg. Synths, 1957, 5, 130, 1963, 1, 183.
7. Cis and Trns $[Co(en)_2CI_2]^+$.
8. Determination of Cr (III) complex. $[Cr(H_2O)_6]NO_3$.3HO,. Inorg. synths., 1972, 13, 184.
9. Preparation and use of Ferrocene. J. Chem. Edu. 1966, 43, 73; 1976, 53, 730.
10. Preparation of [Co(phenathroline-5,6 quinone)].

Spectrophotometric Determinations / Spectroscopic identification of recorded spectra like IR, NMR, ESR and Mass

a. Manganese/Chromium in steel sample.
b. Nickel by extractive spectrophotometric method.
c. Fluoride/nitrite/phosphate.
d. Copper-Ethylene diamine complex : Slope-ratio method.

Flame Photometric Determinations

a. Sodium and potassium when present together.
b. Lithium/calcium/barium/strontium.
c. Cadmium and magnesium in tap water.

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Class	:	M.Sc.
Semester	:	IV
Subject	:	Chemistry
Paper	:	Pratical
Title of paper	:	B Organic Chemistry
Course Code	:	PR-CHE-726
Compulsory / Optional	:	Compulsory
Max. Marks	:	33

(Duration: 6-8 hrs in each branch)
Practical examination shall be conducted separately for each branch.

Course Outcomes

After completion of this course, the students can:

- prepare organic compounds by multi-step synthesis and purification of products by chromatographic techniques
- identify organic compounds by analyzing spectral data
- isolate some natural products and estimate some compounds spectrophotometrically

Examination Scheme

Multi-step Synthesis of Organic Compounds	:12 Marks
Spectroscopy/Spectrophotometric Determinations	: 12 Marks
Record	:04 Marks
Viva Voce	:05 Marks
Total	:33 Marks

Multi-step Synthesis of Organic Compounds
The exercise should illustrate the use of organic reagents and may involve purification of the products by chromatographic techniques.

1. Photochemical reaction Benzophenone →Benzpinacol→Benzpinacolone
2. Beckmann rearrangement : Benzanilide from benzene Benzene→ Benzophenone →Benzphenone oxime →Benzanilide
3. Benzilic acid rearrangement : Benzilic acid from benzoin Benzoin→Benzil→Benzilic acid
4. Synthesis of heterocyclic compounds
5. Skraup synthesis : Preparation of quinoline from aniline
6. Fisher Indole synthesis : Preparation of 2-phenylindole from phenylhydrazine.
7. Enzymatic synthesis
8. Enzymatic reduction : reduction of ethyl acetoacetate using Baker's yeast to yield enantiomeric excess of S (+) ehtyl-3-hydroxybutanoate and determine its optical purity.
9. Biosynthesis of ethanol from sucrose.
10. Synthesis using microwave Alkylation of diethyl malonate with benzyl chloride.
11. Synthesis using phase transfer catalyst. Alkylation of diethyl malonate or ethyl acetoacetate with an alkylhalide.

Spectroscopy
Identification of organic compounds by the analysis of their spectral data (UV, IR, PMR, CMR & MS)
Spectrophotometric (UV/VIS) Estimations/isolation of the following (any one compound)
Spectroscopic estimation

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1. Amino acids
2. Proteins
3. Carbohydrates
4. Ascorbic acid
5. Aspirin
6. Caffeine

Isolation

1. Casein from milk
2. Lycopine from tomato
3. Piperine from black pepper
4. Caffeine from tea leaves
5. Lactose from milk

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Class	:	M.Sc.
Semester	:	IV
Subject	:	Chemistry
Paper	:	Pratical
Title of paper	:	C Physical Chemistry
Course Code	:	PR-CHE-727
Compulsory / Optional	:	Compulsory
Max. Marks	:	34

(Duration: 6-8 hrs in each branch)
Practical examination shall be conducted separately for each branch.

Course Outcomes

After completion of this course, the students can:

- perform experiments of spectroscopy, chemical kinetics, thermodynamics and polarography

Examination Scheme

Experiment No. 1	:13 Marks
Experiment No. 2	: 12 Marks
Record	:04 Marks
Viva Voce	:05 Marks
Total	:34 Marks

Experiments

Spectroscopy

Determination of PKa of an indicator (e.g. methyl red) in (a) aqueous and (b) micellar media.

i. Determination of stoichiometry and stability constant of Ferricisothicoyanation complex ion in solution.
ii. Determination of rate constant of alkaline bleaching of Malachite green and effect of ionic strength on the rate of reaction.

Chemical Kinetics

i. Determination of rate constant and formation constant of an intermediate complex in the reaction of Ce(IV) and Hypophosphorous acid at ambient temperature.
ii. Determination of energy and enthalpy of activation in the reaction of KMnO4 and benzyl alcohol in acid medium.
iii. Determination of energy of activation of and entropy of activation from a single kinetic run.
iv. Kinetics of an enzyme catalyzed reaction.

Thermodynamics

i. Determination of partial molar volume of solute (e.g. KCl) and solvent in a binary mixture.
ii. Determination of the temperature dependence of the solubility of a compound in two solvents having similar intromolecular in tetractions (benzoic acid in water and in DMSO water mixture and calculate the partial molar heat of solution.
iii. **Polarography**

Identification and estimation of metal ions such as Cd^{+2}, Pb^{+2}, Zn^{+2}, and i^{+2} etc. polarographically.

i. Study of a metal ligand complex polarographically (using Lingane's Method).

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Class	:	M.Sc.
Semester	:	IV
Subject	:	Chemistry
Paper	:	I
Title of paper	:	**Application of Spectroscopy**-II
Course Code	:	CHE-720
Compulsory / Optional	:	Compulsory
Max. Marks	:	85 + CCE 15

Course Outcomes

After pursuing this course, the students understand:
CO1 - various electronic transitions Beer Lambert law, Fieser Woodward rule, students develop the skill to interpret the spectra
CO2 - Infrared Spectroscopy, characteristic frequencies of different organic compounds, effect of hydrogen bonding and solvent effect, students develop the skill to interpret the spectra
CO3 - contact and Pseudo contact shifts in NMR and applications of NMR
CO4 -C-13 NMR spectroscopy, its various concepts and two-dimensional NMR spectroscopy
CO5 - mass spectrometry, introduction, various methods of ion production, mass spectra of common functional groups, McLafferty rearrangement, Nitrogen rule, students develop the skill of structure elucidation with the knowledge of various spectra

Particulars

Unit-1	**Ultraviolet and Visible Spectroscopy** Various electronic transitions (185-800 nm) Beer-Lambert law, Effect of solvent on electronic transitions, ultraviolet bands for carbonyl compounds, unsaturated carbonyl compounds, dienes, conjugated polyenes, Fieser Woodward rules for conjugated dienes and carbonyl compounds, ultraviolet spectra of aromatic compounds. Steric effect in biphenyls.
Unit-2	**Infrared Spectroscopy** Characteristic vibrational frequencies of alkanes, alkenes, alkynes, aromatic compounds, alcohols, ethers, phenols and amines. Detailed study of vibrational frequencies of carbonyl compounds (ketones, aldehydes, esters, amides, acids, anhydrides, lactones, lactams and conjugated carbonyl compounds). Effect of hydrogen bonding and solvent effect on vibrational frequencies, overtones, combination bands and fermi resonance.
Unit - 3	**Nuclear Magnetic Resonance of Paramagnetic Substances in Solution** The contact and Pseudo contact shifts, factors affecting nuclear relaxation, some applications including biochemical systems, an overview of NMR of metal nuclide with emphasis on ^{195}Pt and ^{119}Sn NMR.
Unit-4	**Carbon-13 NMR Spectroscopy** General considerations, chemical shift (aliphatic olefinic, alkyne, aromatic, heteroaromatic and carboynl carbon), coupling constants. Two dimension NMR spectroscopy-COSY, NOESY, DEPT, HMBC and HMQC techniques.
Unit-5	**Mass Spectrometry** Introduction, ion production E1, C1 FD, ESI and FAB, factors affecting fragmentation, ion analysis, ion abundance Mass spectral fragmentation of organic compounds, common functional groups, molecular ion peak, metastable peak. Me Lafferty rearrangement. Nitrogen rule. High resolution mass spectrometry. Structure elucidation of simple molecules using UV – Visible, IR, NMR and mass spectral techniques.

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Class	:	M.Sc.
Semester	:	IV
Subject	:	Chemistry
Paper	:	II
Title of paper	:	**Solid state Chemistry**
Course Code	:	CHE-721
Compulsory / Optional	:	Compulsory
Max. Marks	:	85 + CCE 15

Course Outcomes

After completion of this course, the students understand:

CO1 - solid state reactions, their general principles and experimental procedure
CO2 - crystal defects and non-stoichiometry
CO3 - electronic properties and band theory, metal insulators, semiconductors, application of optical and electron microscopy and magnetic properties
CO4 - organic solids, importance of organic metals and new superconductors
CO5 - liquid crystals, different types of liquid crystals and liquid crystal display

Particulars

Unit-1	**Solid State Reactions**-General principles, experimental procedure, co-precipitation as a precursory to solid tate reactions, kinetics of solid state reactions.
Unit-2	**Crystal Defects and Non-Stoichiometry** Perfect and imperfect crystals, intrinsic and extrinsic defects-point defects, line and plane defects, vacancies-Schottky detects and Frenkel defects. Thermodynamics of Schottky and Frenkel defect formation, colourcentres, non-stoichiometry and defects.
Unit-3	**Electronic Properties and Band Theory** Metals insulators and semiconductors, electronic structure of solidsband theory band structure of metals, insulators and semiconductors, Intrinsic and extrinsic semiconductors, doping semiconductors, p-n junctions, super conductors. Optical properties-Application of optical and electron microscopy. Magnetic Properties-Classification of materials : Effect of temperature calculation of magnetic moment, mechanism of ferro and anti ferromagnetic ordering super exchange.
Unit-4	**Organic Solids**-Electrically conducting solids. organic charge transfer complex, organic metals, new superconductors.
Unit-5	Liquid Crystals-Types of liquid crystals: Nematic, Smectic, Ferroelectric, Antiferroelectric, Various theories of LC, Liquid crystal display, New materials.

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Class	:	M.Sc.
Semester	:	IV
Subject	:	Chemistry
Paper	:	III
Title of paper	:	Biochemistry
Course Code	:	CHE-722
Compulsory / Optional	:	Compulsory
Max. Marks	:	85 + CCE 15

Course Outcomes

After completion of this course, the students understand:

CO1 - role of metal ions in biological systems; bulk and trace metals, DNA polymerisation, glucose storage, metal complexes in transmission of energy; transport and storage of dioxygen

CO2 - electron transfer processes, biological and chemical nitrogen fixation

CO3 - enzymes, mechanism of enzyme action and kinetics of enzyme-catalysed reactions

CO4 - co-enzyme chemistry, enzyme models, biotechnological applications of enzymes. This helps students in setting their own units or career as a chemist.

CO5 - biological cell and its constituents, bioenergetics, biopolymer interactions, cell membrane and transport of ions

Particulars

Unit-1	Metal Ions in Biological Systems Bulk and trace metals with special reference to Na, K, Mg, Ca, Fe, Cu, Zn, Co, and K^+/Na^+ pump. Bioenergetics and ATP Cycle DNA polymerisation, glucose storage, metal complexes in transmission of energy; chlorophyll's, photosystem I and photosystem II in cleavage of water. Transport and Storage of Dioxygen Haem proteins and oxygen uptake structure and function of haemoglobin's, mygolobin, haemocyaninsand hemerythrin, model synthetic complexes of iron, cobalt and copper.
Unit-2	Electron Transfer in Biology Structure and function of metal of proteins in electron transport processes cytochrome's and iron-sulphur proteins, synthetic models. Nitrogen fixation Biological nitrogen fixation, and its mechanism, nitrogenase, Chemical nitrogen fixation.
Unit-3	Enzymes Introduction and historical perspective, chemical and biological catalysis, remarkable properties of enzymes like catalytic power, specificity and regulation. Nomenclature and classification, extraction and purification. Fischer's lock and key and Koshalnd's induced fit hypothesis, concept and identification of active site by the use of inhibitors, affinity labeling and enzyme modification by site-directed mutagenesis. Enzyme kinetics, Michael's-Menten and Lineweaver Burk plots, reversible and irreversible inhibition. Mechanism of Enzyme Action

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	Transition-state theory, orientation and Steric effect, acid-base catalysis, covalent catalysis, strain or distortion. Examples of some typical enzyme mechanisms for chemotrypsin, ribonuclease, lysozyme and carboxypeptidase. Kinds of Reactions Catalysed by Enzymes Nucleophilic displacement on a phosphorus atom, multiple displacement reactions and the coupling of ATP cleavage to endergonic processes. Transfer of sulphate, addition and elimination reactions, enolic intermediates in isomerisation reactions, b-Cleavage and condensation, some isomerization and rearrangement reactions. Enzyme catalyzed carboxylation and decarboxylation.
Unit-4	Co-Enzyme Chemistry Cofactors as derived from vitamins, coenzymes, prosthetic groups, apoenzymes. Structure and biological functions of coenzyme A, thiamine pyrophosphate, pyridoxal phosphate, NAD+, NADP+, FMN, FAD, lipoic acid, vitamin B12. Mechanisms of reactions catalyzed by the above cofactors. Enzyme Models Host-guest chemistry, chiral recognition and catalysis, molecular recognition, molecular asymmetry and prochirality Biometric chemistry, crown ether, cryptates. Cyclodextrins, cyclodextrion-based enzyme models, clixarenes, ionospheres, micelles synthetic enzymes or synzymes. Biotechnological Applications of Enzymes large-scale prodcution and purification of enzymes, techniques and methods of immobilization of enzymes, effect of immobilization on enzyme activity, application ofimmobilized enzymes, use of enzymes in food and drink industry-brewing and cheese-making, syrups from cron starch, enzymes as targets for drug design. Clinical uses of enzymes, enzyme therapy, enzymes and recombinant DNA Technology.
Unit-5	Biological Cell and its Constituents Biological cell, structure and functions of proteins, enzymes, DNA and RNA in living systems. Helix coils transition. Bioenergetics Standard free energy change in biochemical reactions, exergonic, endergonic. Hydrolysis of ATP, synthesis of ATP from ADP. Biopolymer Interactions Forces involved in biopolymer interactions. Electrostatic charges and molecular expansion, hydrophobic forces, dispersion force interactions. Multiple equilibrium and various types of binding processes in biological systems. Hydrogen ion titration curves. Cell Membrane and Transport of Ions Structure and functions of cell membrane, ion transport through cell membrane, irreversible thermodynamic treatment of membrane transport. Nerve conduction.

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Class	:	M.Sc.
Semester	:	IV
Subject	:	Chemistry
Paper	:	OPT-1
Title of paper	:	Analytical Chemistry
Course Code	:	CHE-723
Compulsory / Optional	:	Optional
Max. Marks	:	85 + CCE 15

Course Outcomes

After completion of this course, the students understand:

CO1 - concept of analytical chemistry, cleaning, calibration of glassware, errors, and evaluation, types of errors in experimental data and uses of statistics
CO2 - analysis of adulterants present in food
CO3 - water pollution and methods for the analysis of different types of water pollutants
CO4 - analytical methods employed in the analysis of soil, fuel, body fluids and drugs
CO5 - clinical chemistry and drug analysis

Particulars

Unit-1	**Introduction** Role of analytical chemistry Classification of analytical methods classical and instrumental. Types of instrumental analysis. Selecting an analytical method. Neatness and cleanliness. laboratory operations and practices. Analytical balance. Techniques of weighing, errors. Volumetric glassware cleaning and calibration of glassware. Sample Volumetric glassware cleaning and Calibration of glassware. Sample preparation-dissolution and decompositions. Gravimetric techniques. Selecting and handling or reagents. Laboratory notebooks. Safety in the analytical laboratory. **Errors and Evaluation** Definition of terms in mean and median. Precision-standard deviation, relative standard deviation. Accuracy-absolute error, relative error. Types of error in experimental data determinate (systematic), indeterminate (or random) and gross. Sources of error and the effects upon the analytical results. Methods for reporting analytical data. Statistical evaluation of data-indeterminate errors. The uses of statistics.
Unit-2	**Food analysis** Moisture, ash, crude protein, fat crude fiber, carbohydrates, calcium, potassium, sodium and phosphate. Food adulteration-common adulterants in food, contamination of foods stuffs. Microscopic examination of foods for adulterants. Pesticide analysis in food prodcuts.

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	Extraction and purification of sample. HPLC. Gas chromatography for organophosphates. Thin-layer chromatography for identification of chlorinated pesticides in food products.
Unit-3	**Analysis of Water Pollution** Origin of Waste water, types, water pollutants and their effects. Sources of water pollution-domestic, industrial, agricultural soil and radioactive wastes as sources of pollution. Objectives of analysis-parameter for analysis-colour, turbidity, total solids, conductivity, acidity, alakalinity, hardness, chloride, sulphate, fluoride, silica, phosphates adn different forms of nitrogen, Heavy metal pollution-public health significance of cadmium, chromium, copper, lead, zinc, managanese, mercurry and arsenic. General survey of instrumental technique for the analysis of heavy metals in aqueous systems. Measurements of DO, BOD, and COD. Pesticides as water pollutants and analysis. Water pollution laws and standards.
Unit-4	**Analysis of soil, Fuel, Body Fluids and Drugs** (a) Analysis of Soil, moisture pH total nitrogen, phosphorus, silica, lime, magnesia, manganese, sulphur and alkali salts. Fuel analysis : liquid and gas. Ultimate and proximate analysis-heating values-grading of coal. Liquid fuels-flash point, aniline point, octane number and carbon residue. Gaseous fuels-produced gas and water gas-calorific value.
Unit-5	(a) Clinical Chemistry : Composition of blood-collection and preservation of samples. Clinical analysis. Serum electrolytes, blood glucose, blood urea nitrogen, uric acid, albumin, globulins, barbiturates, acid and alkaline phosphates. Immunoassay : principles of radio immunoassay (RIA) and applications. The blood gas analysis trace elements n the body (b) Drug analysis : Narcotics and dangerous drug. Classification of drugs. Screening by gas and thin-layer chromatography and spectrophotometeric measurements.

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Class	:	M.Sc.
Semester	:	IV
Subject	:	Chemistry
Paper	:	OPT-2
Title of paper &Glass industries	:	Industrial Chemistry- Pesticides
Course Code	:	CHE-723
Compulsory / Optional	:	Optional
Max. Marks	:	85 + CCE 15

Course Outcomes

After completion of this course, the students understand:

CO1 - preparation and uses of toilet and washing soaps, synthetic detergents

CO2 - manufacture of fertilizers, types, composition, properties, testing and manufacture of glass and also understand ceramics and their types

CO3 - different types of cements, manufacture of cement, ferrous industry and silicones

CO4 - pesticides and food additives

CO5 -chemistry and synthesis of common pesticides

Particulars

Unit-1	Cleansing Agents Cleansing agents: Toilet and washing soaps; preparation and uses, Synthetic detergents; alkyl aryl sulfonates, fatty alcohol surfaces, ethanolamines, nonionic detergents.
Unit-2	Fertilizers and inorganic materials Fertilizers: Fertilizers Industries in India, Manufacture of Ammonium salts, Urea, Nitrates, Phosphates and Superphosphates, Nitrogen fixation Glass: Types, their composition and properties testing glass. Manufacture of Glass Fibres. Optical Glass, Coloured Glasses, Lead Glass and Neutron Absorbing Glass Ceramics: Important clays and feldspar. Glazing and vitrification, Glass ceremics
Unit-3	Cement: Types and their manufacture, setting process Ferrous Industry: Manufacture of steel and other important alloys Silicon: Pre silicon, Electronics Industry
Unit-4	Pesticides and Food additivies Pesticides and Food additivies: Classification,important catogories of insecticides, fungicides, herbicides and rodenticides: Mode of action
Unit-5	Chemistry and synthesis of common pesticides : Such and Tabun, sarin, Daygon, DDYP, paraquat.

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Class	: M.Sc.
Semester	: IV
Subject	: Chemistry
Title of Paper	: **Organic Synthesis**
Paper No.	: **OPT-3**
Compulsory / Optional	: Optional
Maximum Marks	: 85 + CCE 15

Particulars

Unit-1	**Disconnection Approach** An introduction to synthons and synthetic equivalents. Disconnection approach, functional group inter-conversions, the importance of the order of events in organic synthesis, one group C-X and two group C-X disconnections, chemoselectivity, reversal of polarity, cyclisation reaction, amine synthesis. Protection of groups, chemo, region and stereo selectivity.
Unit-2	**One Group C-C Disconnections** Alcohols and carbonyl compounds, regioselectivity, alkene synthesis, use of acetylenes and aliphatic nitro compounds in organic synthesis. **Two Group C-C Disconnections** Diels-Alder Reaction, 1,3-difunctionalised compounds, α,β-unsaturated carbonyl compounds, control in carbonyl condensations, 1,5-difunctionalised compounds. Micheal addition and Robinson annelation.
Unit-3	**Oxidation** Introduction, Different oxidative processes. Hydrocarbons-alkenes, aromatic rings, saturated C-H groups (activated and unactivated) Alcohols, diols, aldehyde's, ketones, ketals and carboxylic acids. Amines, hydrazines, and sulphides. Oxidations with ruthenium tetraoxide, iodobenzene diacetate and thallium(III) nitrate. **Reduction** Introduction, Different reductive processes. Alkanes, alkenes, alkynes, and aromatic rings. Carbonyl compounds-aldehydes, ketones, acids aPnd their derivatives. Epoxides. Nitro, nitroso, azo and oxime groups. Expoxide, Nitro, Nitroso, azo and oxime groups. Hydrogenolysis.
Unit-4	**Organometallic Reagents** Principle, preparations, properties and applications of the following in organic synthesis with mechanistic details. Group I and II metal organic compounds Li, Mg, Hg, Cd, Zn and Ce Compounds.
Unit-5	**Synthesis of some complex molecules** Application of the above in the synthesis of following compounds: Camphor, longifoline, cartisone, reserpine, vitamin D, juvabione, aphidicolin and fredericamycin A.

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Class	: M.Sc.
Semester	: IV
Subject	: Chemistry
Title of Paper	: **Chemistry of Natural Products**
Paper No.	: **OPT-4**
Compulsory / Optional	: Optional
Maximum Marks	: 85 + CCE 15

Particulars

Unit-1	**Terpenoids and Carotenoids** Calcifications, nomenclature, occurrence, isolation, general methods of structure determination, isoprene rule. Structure determination, stereochemistry, biosynthesis and synthesis of the following representative molecules : Citral, Geraniol α-Terpeneol, Menthol, Farnesol, Zingiberene, Santonin, Phytol, Abietic acid and β-Carotene.
Unit-2	**Alkaloids** Definition, nomenclature and physiological action, occurrence, isolation, general methods of structure elucidation, degradation, classification based on nitrogen heterocyclic ring, role of alkaloids in plants. Structure, stereochemistry, synthesis and biosynthesis of the following : Ephedrine , (+)- Coniine, Nicotine, Atropine, Quinine and Morphine.
Unit-3	**Steroids** Occurrence, nomenclature, basic skeleton, Diel's hydrocarbon and stereochemistry, Isolation, Structure determination and synthesis of Cholesterol, Bile acids, Androsterone, Testosterone, Estrone, Progesterone, Aldosterone, Biosynthesis of Steroids.
Unit-4	**Plant Pigments** Occurrence, nomenclature and general methods of structure determination. Isolation and synthesis of Apigenin, Luteolin, Quercetin, Myrcetin, Quercetin 3-glucoside, Vitexin, Diadzein, Aureusin, Cyanidin-7arabinoside, Cyanidin, Hirsutidin, Biosynthesis of flavonoids: Acetate pathway and Shikimic acid pathway. **Prophyrins**-Structure and synthesis of Haemoglobin and Chlorophyll.
Unit-5	**Prostaglandin-**Occurrence, nomenclature, classification, biogenesis and physiological effects. Synthesis of PGE2 and PGF2a. **Pyrethroids and Rotenones -**Synthesis and reactions of Pyrethroids and Rotenones. (For structure elucidation, emphasis is to be placed on the use of spectral parameters wherever possible).

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SANT HIRDARAM NAGAR
BHOPAL-462030

SADHU VASWANI AUTONOMOUS COLLEGE
Sant Hirdaram Nagar, Bhopal
Syllabus recommended by Board of studies of Industrial Chemistry
Session 2016-17 to 2020-21

Class	: M.Sc.
Semester	: IV
Subject	: Chemistry
Title of Paper	: **Electrochemistry**
Paper No.	: **OPT-5**
Compulsory / Optional	: Optional
Maximum Marks	: 85 + CCE 15

Particulars

Unit-1	**1**. Conversion and Storage of Electrochemical Energy Present Status of energy consumption : **Pollution problem. History of fuel cells, Direct energy conversion by** electrochemical means. Maximum intrinsic efficiency of an electrochemical converter. Physical interpretation of the Carnot efficiency factor in electrochemical energy converters. Power outputs. Electrochemical Generators (Fuel Cells) : Hydrogen oxygen cells, Hydrogen Air cell, Hydrocarbon air cell, Alkane fuel cell, Phosphoric and fuel cell, direct NaOH fuel cells, applications of fuel cells. Electrochemical Energy Storage : Properties of Electrochemical energy storage : Measure of battery performance, Charging and discharging of a battery, Storage Density, Energy Density. Classical Batteries : (i) Lead Acid (ii) Nickel-Cadmium, (iii) Zinc manganese dioxide. Modern Batteries : (i) Zinc-Air (ii) Nickel-Metal Hydride, (iii) Lithium Battery, Future Electricity storers : Storage in (i) Hydrogen, (ii) Alkali Metals, (iii) Non **aqueous solutions.**
Unit-2	**Corrosion and Stability of Metals :** Civilization and Surface mechanism of the corrosion of the metals; Thermodynamics and the stability of metals, Potential -pH (or Pourbaix) Diaphragmsl; uses and abuses, Corrosion current and corrosion potential -Evans diagrams. Measurement of corrosion rate : (i) Weight Loss Method, (ii) Electrochemical Method. **Inhibiting Corrosion :** Cathodic and Anodic Protection. (i) Inhibition by addition of substrates to the electrolyte environment, (ii) by charging the corroding method from external source, anodic Protection, Organic inhibitors, The fuller Story Green inhibitors. **Passivation :** Structure of Passivation films, Mechanism of Passivation, Spontaneous Passivation Nature's method for stabilizing surfaces.
Unit-3	**Bioelectrochemistry** Bioelectrodics, Membrane Potentials, Simplistic theory, Modern theory, Electrical conductance in biological organism: Electronic, Protonic electrochemical mechanism of nervous systems, enzymes as electrodes.

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	Kinetic of Electrode Process Essentials of Electrode reaction. Current Density, Over potential, Tafel Equation, Butler Volmer equation. Standard rate constant (K0) and Transfer coefficient (a), Exchange Current. **Irreversible Electrode processes :** Criteria of irreversibility, informatino from irreversible wave.
Unit-4	**Methods of determining kinetic parameters for quasi-rversible and irreversible waves :** Koutecky's methods, Meits Israel Method, Gellings method **Electrocatalysis:** Chemical catalysts and Electrochemical catalysts with special reference to purostates, porphyrin oxides of rare earths. Electrocatalysis in simple redox reactions, in reaction involving adsorbed species. Influence of various parameters.
Unit-5	**Potential Sweep Method** Linear sweep Voltammetry, Cyclic Voltammetry, theory and applications. Diagnostic criteria of cycli voltammetry. Controlled current microelectrode techniques : comparison with controlled potentials methods, chronopotentiometry, theory ad applications. **Bulk Electrolysis Methods** Controlled potential coulometry, Controlled Coulometry, Electroorganic synthesis and its important applications. Stripping analysis : anodic and Cathodic modes, Pre electrolysis and Stripping steps, applications of Stripping Analysis.

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Session 2016-17 to 2020-21

Class	: M.Sc.
Semester	: IV
Subject	: Chemistry
Title of Paper	: **Medicinal Chemistry**
Paper No.	: **OPT-6**
Compulsory / Optional	: Optional
Maximum Marks	: 85 + CCE 15

Particulars

Unit-1	**Structure and activity :** Relationship between chemical structure and biological activity (SAR). Receptor Site Theory. Approaches to drug design. Introduction to combinatorial synthesis in drug discovery. Factors affecting bioactivity. QSAR-Free-Wilson analysis, Hansch analysis, relationship between Free-Wilson analysis and Hansch analysis.
Unit-2	**Pharmacodynamics:** Introduction, elementary treatment of enzymes stimulation, enzyme inhibition, sulfonamides, membrane active drugs, drug metabolism, xenobiotics, biotransformation, significance of drug metabolism in medicinal chemistry.
Unit-3	**Antibiotics and antibacterials** Introduction, Antibiotic β-Lactam type - Penicillins, Cephalosporins, Antitubercular – Streptomycin, Broad spectrum antibiotics – Tetracyclines, Anticancer - Dactinomycin (Actinomycin D)
Unit-4	**Antifungal** – polyenes, Antibacterial – Ciprofloxacin, Norfloxacin, Antiviral – Acyclovir **Antimalarials:** Chemotherapy of malaria. SAR. Chloroquine, Chloroguanide and Mefloquine
Unit-5	**Non-steroidal Anti-inflammatory Drugs:** Diclofenac Sodium, Ibuprofen and Netopam **Antihistaminic and antiasthmatic agents:** Terfenadine, Cinnarizine, Salbutamol and Beclomethasone dipropionate.

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Syllabus recommended by Board of studies of Mathematics
Session 2016-17 to 2020-21

Class	:	M.SC
Semester	:	I
Subject	:	Mathematics
Paper	:	I
Title of Subject	:	Advance Abstract Algebra - I
Compulsory	:	Compulsory
Course Code	:	MATH-1001
Max. Marks	:	85

Course Outcomes

CO1- Define conjugal relation, normalize and prove Cauchy & by low problems with examples.

CO2- Define normal, subnormal series, & Zassenhaus, sheerer refinement, forded holder theorem with application and examples.

CO3- Define solvable group, Nilpotent group. And fields with application part and examples.

CO4- Prove fundamental theorem and define Galois theory with example

Particulars

UNIT I Another Counting Principle, Conjugacy relation, Normalizer, Class Equation, Cauchy Theorem, Sylow's Theorem, Double coset, Second & Third part of Sylow's theorem, Application of Sylow's theorem in finite groups.

UNIT II Series of Group: Normal and Subnormal series, Composition series, Zassenhaus lemma, Schreir refinement theorem, Tordan Holder theorem.

UNIT III Solvable Group and its properties, Commutator subgroup, Nilpotent Group and its properties.

UNIT IV Fields: Extension field, Finite extension, Algebraic element, Algebraic and transcendental extension, Roots of polynomials, Separable and inseparable extension, Perfect fields, Splitting fields.

UNIT V Automorphism of extension, Galois extension. Fundamental theorem of Galois theory, Solution of polynomial equations by radicals, Insolubility of general equation of degree 5 by radicals.

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Syllabus recommended by Board of studies of Mathematics
Session 2016-17 to 2020-21

Class	:	M.SC
Semester	:	I
Subject	:	Mathematics
Paper	:	II
Title of Subject	:	Real Analysis
Compulsory	:	Compulsory
Course Code	:	MATH-1002
Max. Marks	:	85

Course Outcomes

CO1- Define Integration and differentiation in the items of Riemann Satieties integral with examples.

CO2- Define the limit of a Sequence, series, uniforms convergence and continuity.

CO3- Test the convergence of a series using Ratio, Root and Comparison tests .

CO4- Define function of several variables and linear Transformation.

CO5- Define the derivatives of a function.

UNIT I Definition and existence of Riemann-Stieltjes integral and its Properties, Integration and differentiation.

UNIT II Integration of vector-valued functions, Rectifiable curves. Rearrangements of terms of a series. Riemann's theorem.

UNIT III Sequences and series of functions, point wise and uniform convergence. Cauchy criterion for uniform convergence, Weierstrass M-test. Uniform convergence and continuity, uniform convergence and Riemann-Stieltjes integration, uniform convergence and differentiation.

UNIT IV Functions of several variables, linear transformations, Derivatives in an open subset of R", Chain rule, Partial derivatives, Differentiation, Inverse function theorem.

UNIT V Implicit function theorem, Derivatives of higher order, Power Series, uniqueness theorem for power series, Abel's and Tauber's theorem,

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Class	:	M.SC
Semester	:	I
Subject	:	Mathematics
Paper	:	III
Title of Subject	:	Topology-1
Compulsory	:	Compulsory
Course Code	:	MATH-1003
Max. Marks	:	85

Course Outcomes

CO1- Define Countable/ Uncountable set and prove the Bernstein theorem, Contorts theorems.

CO2- Define Topological space and application part

CO3- Define first/second countable space, and Separable space and prove the lindelot's theorem.

CO4- Describe path/connected space.

UNIT I Countable and Uncountable sets. Infinite sets and the Axiom of Choice. Cardinal numbers and its arithmetic. Schroder Bernstein theorem, statement of Cantor's theorem and the Continuum hypothesis. Zorn's lemma. Well-ordering theorem.[G.F. Simmons and K.D. Joshi]

UNIT II Definition and examples of topological space. Closed sets. Closure. Dense subsets. Neighbourhoods, interior exterior and boundary. Accumulation points and derived sets. Bases and sub-bases, Subspace and relative topology. (G.F. Simmons]

UNIT III Alternate methods of defining a topology in terms of kuratowski Closure Operator and Neighbourhood Systems. Continuous functions and homomorphism.[G.F. Simmons, K.D. Joshi, J.R. Munkers]

UNIT IV First & second Countable space. Lindelof's theorem. Separable space. Second Countability and Separability. [G.F. Simmons]

UNIT V Path-connectedness, connected space. Connectedness on Real line. Components, Locally connected space.(K.D. Joshi]

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Class	:	M.SC
Semester	:	I
Subject	:	Mathematics
Paper	:	IV
Title of Subject	:	Complex Analysis
Compulsory	:	Compulsory
Course Code	:	MATH-1004
Max. Marks	:	85

Course Outcomes

CO1- Recognize the concept of complex integration, Cauchy gorses theorem.

CO2- Prove the Morris, lousily's Telesis, fundamental theorem of Algebra, theorems with examples.

CO3- Evaluate the integral using couch's integral formula and Residue theorems.

CO4- Describe Bilinear Transformation and application part.

UNIT I Complex integration, Cauchy - Goursattheorem, Cauchy Integral formula, Higher order derivatives.

UNIT II Morera'stheorem, Cauchy's inequality, Liouville'stheorem, The fundamental theorem of algebra, Taylor's theorem.

UNIT III The maximum modulus principal, Schwartz lemma, Laurent series, Isolated singularities, *M*eromorphic functions, The argument principle, Rouche'stheorem Inverse function theorem.

UNIT IV Residues, Cauchy's residue theorem, Evaluation of integrals, Branches of many valued functions with special reference to argz, log z, z^a.

UNIT V Bilinear transformations, their properties and classification, Definitions and examples of conformal mappings.

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Class	:	M.SC
Semester	:	I
Subject	:	Mathematics
Paper	:	V (1)
Title of Subject	:	Advance Discrete Mathematics
Compulsory	:	(optional-1)
Course Code	:	MATH-1005
Max. Marks	:	85

Course Outcomes

CO1- Define semi group and monodies, Monopod phish, Quotient semi group.

CO2- Define Lattices and application part.

CO3- Illustrate tautology, truth tables Normal forms.

CO4- Discuss the graphs, paths, circuit

CO5- Prove the Algorithms.

CO6- Define trace, Bipartite graphs planar graphs with examples.

UNIT I Semigroup and monoids, sub semigroupand submonoids, Homomorphism of semigroupsand monoids, Congruence relation and Quotient semigroups, Direct products, Basic Homomorphism Theorem.

UNIT II Lattices - Lattices as partially ordered sets, their properties, Lattices as Algebraic systems, sublattices, Bounded lattices, Distributive Lattices, Complemented lattices.

UNIT III Boolean algebra - Boolean algebra as lattices, various Boolean identities. Joint irreducible elements, minterms, maxterms, mintermBoolean forms, canonical forms, minimization of Boolean functions. Applications of Boolean Algebra to switching theory (Using AND, OR, &NOT gates the Karnaughmethod.

UNIT IV Graph Theory - Definition and types of graphs, Paths &circuits. Connected graphs. Euler Graphs, weighted graphs (undirected), Dijkstra'sAlgorithm Trees, Properties of trees, Rooted &Binary trees, spanning trees, minimal spanning tree.

UNIT V Complete Bipartite graphs, Cut-sets, properties of cut sets, properties of cut sets, Fundamental Cut-sets &circuits, Connectivity and Separability, Planar graphs, Kuratowski’stwo *g*raphs, Euler's formula for planar graphs.

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Class	:	M.SC
Semester	:	II
Subject	:	Mathematics
Paper	:	I
Title of Subject	:	Advance Abstract Algebra - II
Compulsory	:	Compulsory
Course Code	:	MATH-1006
Max. Marks	:	85

Course Outcomes

CO1- Discuss and Define Modules and application parts.
CO2- Prove the schism lemma, filberts Basic theorem, Nether Lakes theorem with examples.
CO3- Define Uniform\Primal modular.
CO4- Define Linear transformation, matrices & Reduction to Triangular form.

UNIT I	Introduction to Modules, Examples, Submodules quotient modules. Module. Homomorphism, isomorphishism, finitely generated modules, cyclic modules
UNIT II	Simple modules, semisimple modules, Free modules, Schur's lemma, Rank of a Modules.
UNIT III	Noetherian&Artinian modules and rings, Hilbert basis theorem. WedderburnArtintheorem.
UNIT IV	Uniform modules, Primary modules, Noether-Laskar theorem, Fundamental structure, Theorem of modules over a principal ideal domain.
UNIT V	Algebra of Linear Transformation, Characteristic roots, Matrices, Metrix of Linear Transformations, similarity of linear transformation, Invariant spaces, Reduction to triangular form Reduction to triangular form.

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Class	:	M.SC
Semester	:	II
Subject	:	Mathematics
Paper	:	II
Title of Subject	:	Lévesque Measure & Integration - II
Compulsory	:	Compulsory
Course Code	:	MATH-1007
Max. Marks	:	85

Course Outcomes

CO1- Define Lévesque outer measure, Boral and Lévesque measurability.

CO2- Discuss the function of Bounded variation.

CO3- Prove the Holder, Murkowski in equalities.

CO4- Explain Lp,

UNIT I Lebesgue outer measure. Measurable sets. Regularity. Measurable functions. Borel and Lebesgue measurability. Non-measurable sets.

UNIT II Integration of Non-negative functions. The General integral. Integration of Series, Reimann and Lebesgue Integrals.

UNIT III The Four derivatives. Functions of Bounded variation. Lebesgue Differentiation Theorem, Differentiation and Integration.

UNIT IV The L^p--space, Convex functions, Jensen's inequality. Holder and Minkowski inequalities. Completeness of L^p.

UNIT V Dual of space when $1<p<\infty$,convergence in measure, Uniform. Convergence and almos uniform convergence.

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Class	:	M.SC
Semester	:	II
Subject	:	Mathematics
Paper	:	III
Title of Subject	:	Topology - II
Compulsory	:	Compulsory
Course Code	:	MATH-1008
Max. Marks	:	85

Course Outcomes

CO1- Under stand the separation axiom, & prove orison's lemma & tierce extension theorem.
CO2- Define compactness with application part.
CO3- Prove the tychonoff's theorem.
CO4- Explain Hausdorffness and nets and ultra tilters.
CO5- Discuss the fundamental group and prove the fundamental theory of Algebra with examples.

UNIT I	Separation Axioms To, T_1, T_2, T_3, T_4. Their Characterizations and basic properties, Urysohn'slemma. TietzeExtension Theorem.[K.D. Joshi , G.F. Simmons]
UNIT II	Compactness. Continuous functions and compact sets. Basic properties of compactness. Compactness and finite intersection property. Sequentially and countablycompact sets. Local compactness. [G.F. Simmons]
UNIT III	Tychonoff product topology in terms of standard sub-base and its characterizations. Projection maps. Separation axioms and product space, Connectedness and product space (Tychonoff'sTheorem), Countabilityand product space. (G.F. Simmons]
UNIT IV	Net and filter's Topology and convergence of nets, Hausdorffness and nets, Compactness and nets. Filters and their convergence, Canonical way of converting nets to filters and vice-versa. Ultrafilters and Compactness. [K.D. Joshi]
UNIT V	The Fundamental group and covering space-Hhomotopyof paths, the fundamental group, covering space, The fundamental group of the circle and the fundamental theorem of Algebra. (J.R. Munkers)

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Session 2016-17 to 2020-21

Class	:	M.SC
Semester	:	II
Subject	:	Mathematics
Paper	:	IV
Title of Subject	:	Complex Analysis - II
Compulsory	:	Compulsory
Course Code	:	MATH-1009
Max. Marks	:	85

Course Outcomes

CO1- Prove the Maier strass factorization theorem, mitten- Loffler's theorem, Schwartz reflection principle.

CO2- Discuss harmonic function on a disc, tension's formula range of analytic function, univalent function.

CO3- Prove the bores, hard Amaral factorization Block's theory.

UNIT I Weierstrass factorization theorem. Gamma and its properties. Riemann Zeta function. Riemann's functional equation.

UNIT II Mittag-Leffler's theorem. Analytic continuation. Uniqueness of direct analytic continuation. Uniqueness of analytic continuation along a curve. Power series method of analytic continuation.

UNIT III Schwartz reflection principle. Harmonic function on a disc. Harnax inequality and theorem. Dirichlet problem. Green's function.

UNIT IV Cannonicalprodutes. Jenson's formula. Hadamard's three circles theorem. Order of an entire function. Exponent of convergence. Borels theorem Handamard's factorization theorem.

UNIT V The range of an analytic function. Bloch's theorem. The little Picard theorem. Schottky's theorem. Montel Caratheodary and great Picard theorem. Univalent function. Bieberbach conjecture and the 14-theorem.

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Class	:	M.SC
Semester	:	II
Subject	:	Mathematics
Paper	:	V
Title of Subject	:	Advanced Discrete mathematic -II
Compulsory	:	(optional-1)
Course Code	:	MATH-1010
Max. Marks	:	85

Course Outcomes

CO1- Define matrix representation of graphs.
CO2- Explain numeric functional application pant with examples.
CO3- Describe formal languages, Automate, Diagram & equivalent machines.
CO4- Prove the kleen’s theorem, pumping lemma and explain regular expressions and corresponding regular languages.

UNIT I	Matrix representation of graphs - Incidence matrix, Cut set matrix, Circuit Matrix and Adjacency matrix. Directed graphs Definition of types of directed graphs, Binary search trees.
UNIT II	Discrete Numeric functions, Asymptotic Behaviourof Numeric functions, Generating functions. Recurrence Relations, Linear Recurrence Relations with Constant coefficient, Homogeneous solutions, particulars solutions, Total Solutions.
UNIT III	Computability and Formal languages - Languages, Phrase structure grammars, Derivation, Sentential forms, Language generated by grammar. Regular, context-free and context sensitive grammars.
UNIT IV	Finite State Automata, Diagram &Language determined by an automaton, Finite State Acceptors, Deterministic and Non-Deterministic Finite Automata. Finite State Machines, their transition table &diagrams. Equivalent machines.
UNIT V	Reduced Machines, Kleen'stheorem (statement only), Pumping lemma, Moore and Mealy Machines, Turning Machines. Regular Expressions and corresponding regular languages (Definition only).

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Class	:	M.SC
Semester	:	III
Subject	:	Mathematics
Paper	:	I
Title of Subject	:	Functional Analysis –I
Compulsory	:	Compulsory
Course Code	:	MATH-1011
Max. Marks	:	85

Course Outcomes

CO1- Concepts of warmed linear space and outing space.

CO2- Discus the linear operator and Bounded linear operator and explain the differences.

CO3- Working with a orthogonal complements.

CO4- Define Hilbert space.

Unit-1 Normed liner spaces.Banch Spaces and examples, Properties of normed linear spaces, Basic properties of finite dimensional normed linear spaces

Unit-2 Normed linear subspace, equivalent norms, Riesz lemma and compactness.Qutient space of normed linear spaces and its completeness.

Unit-3 Linear operator, Bounded linear operator and continuous operators

Unit-4 Linear functional, bounded linear functional, Dual spaces with examples.

Unit-5 Hilbert space, orthogonal complements, orthonormal seasequences. Representatio of functional on Hilbert spaces.

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Class	:	M.SC
Semester	:	III
Subject	:	Mathematics
Paper	:	II
Title of Subject	:	Advanced Graph Theory –I
Compulsory	:	Compulsory
Course Code	:	MATH-1012
Max. Marks	:	85

Course Outcomes

CO1- Define Beta function, difference equation [(z+1) = z (cz) and functional function.
CO2- Prove the Gauss multiplication theorem Legendre's duplication formula.
CO3- Describe hyper geometric function.
CO4- Explain series manipulations and confluent typer geometric function.

Unit1- Revision of graph theoretic preliminaries. Isomorphism of graphs, subgraphs.

Unit2- Walks, Paths and circuits, connected graphs, Disconnected graphs andcomponents, Euler Graphs, Operations on Graphs, Hamiltonian paths and circuits, The traveling salesman problem.

Unit3- Trees, Properties of trees, Distance and centers in a tree, Rooted and Binary trees, Spanning trees, Fundamental circuits, spanning trees in a weighted graph.

Unit4- Cut-sets, Properties of a cut-set, Fundamental circuits and cut-sets, connectivity and separability.

Unit5- Planar graphs, Kuratowski's two graphs. Different

Representations of a planer graph. Detection of Planarity, Geometric Dual, Combinational Dual.

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Class	:	M.SC
Semester	:	III
Subject	:	Mathematics
Paper	:	III
Title of Subject	:	Advanced Special Function - I
Compulsory	:	Compulsory
Course Code	:	MATH-1013
Max. Marks	:	85

Course Outcomes

CO1- Define Beta function, difference equation [(z+1) = z (cz) and functional function.
CO2- Prove the Gauss multiplication theorem Legendre's duplication formula.
CO3- Describe hyper geometric function.
CO4- Explain series manipulations and confluent typer geometric function.

Unit1- Gamma and Beta Function: The Euler or Macheroni Constant Y,

Gamma Function A series for Γ (z)/Γ(z), Difference equation

Γ {z+1) z Γ (z) value of $T\frac{\Gamma z}{\Gamma(1-z),}$(1-2), Factorial function, Legendre's duplication formula, Gauss multiplication theorem.

Unit2- Hypergeometric function and function 26 (a,b;c;z). A simple integral form valuation of ${}_2F_1$(a,b;cz). Contiguous function relations, Hyper geometric differential equation and its solutions, F (a,b,c;z) as function of its parameters.

Unit3- Generalized Hypergeometric function.

Unit4- Elementary series manipulations, Simple transformation, Relations between functions of z and l-z.

Unit5-

confluent hyper geometric function and its properties.

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Class	:	M.SC
Semester	:	III
Subject	:	Mathematics
Paper	:	IV
Title of Subject	:	Fuzzy Sets and their applications - I
Compulsory	:	Compulsory
Course Code	:	MATH-1014
Max. Marks	:	85

Course Outcomes

CO1- Classify the operations on fuzzy sets.
CO2- Explain fuzzy members, lattice of fuzzy member & fuzzy equation.
CO3- Define convex sets, Algebraic product, fuzzy intersection t-norms, Interval valued fuzzy sets.

Unit1- Fuzzy Sets- Definition and types of fuzzy sets, basic concepts, properties of a cuts and strong a cuts A level sets, Convex sets, Algebra of convex fuzzy sets.

Unit2- Basic operation on fuzzy sets. representation of fuzzy sets, Decomposition theorems, Fuzzy complement and their Characterization Theorems, Cartesian product and Algebraic Product.

Unit3- Bounded sum and Bounded Difference, Fuzzy Intersection t-Norms and Fuzzy t-conforms, Combination of operation, Aggregation Operations.

Unit4- Fuzzy numbers, arithmetic operations on intervals, arithmetic operations on fuzzy numbers, Lattice of fuzzy numbers, Fuzzy equations.

Unit5- Image of fuzzy sets, Inverse Image of a Fuzzy sets, Interval Valued Fuzzy Sets, Extension Principle for fuzzy sets and its properties.

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Class	:	M.SC
Semester	:	III
Subject	:	Mathematics
Paper	:	V
Title of Subject	:	Operations research - I
Compulsory	:	Compulsory
Course Code	:	MATH-1015
Max. Marks	:	85

Course Outcomes

CO1- Define Operations Research & its scope.
CO2- Explain mathematical formulation & Graphical Solution.
CO3- Discuss Linear Programming Problems and application part.
CO4- Explain Duality.

Unit1- Operations Research and its scope, Orgin and Development of Operations Research, Characteristics of Operations Research.

Unit2- Model in Operations Research, Phase of Operations Research, Uses and Limitations of Operation Research, Linear Programming Problems.

Unit3- Mathematical Formulation, Graphical Solution Method.

Unit4- General Linear Programming Problem: Simplex Method exceptional cases, artificial variable techniques; Big M method , two phase Method and Cyclic problems, problem of degeneracy.

Unit5- Duality, Fundamental Properties of duality and theorem of duality

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Class	:	M.SC
Semester	:	III
Subject	:	Mathematics
Paper	:	VI
Title of Subject	:	Integral Transform - I
Compulsory	:	Compulsory
Course Code	:	MATH-1016
Max. Marks	:	85

Course Outcomes

CO1- Define Laplace Transform and applications.
CO2- Prove Convolution theorem with examples.
CO3- Discus application to differential equations, Integral equation, wave equations, Head conduction equation.
CO4- Explain electric Circuits.

Unit1- Laplace Transform, Inverse Laplace Transform. Transforms of derivatives, shifting theorem, convolution Theorem.

Unit2- Application to Differential Equations, Application to Integral equations. Solution of simulates differential equations.

Unit3- Laplae Equation in two dimension, Wave Equation in one-dimension Application to wave equation.

Unit4- Application of Laplace Transform to electrical circuits, Application to Beams.

Unit5- Heat conduction equation in one dimension, Application to heat conduction equation.

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SADHU VASWANI AUTONOMOUS COLLEGE
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Syllabus recommended by Board of studies of Mathematics
Session 2016-17 to 2020-21

Class	:	M.SC
Semester	:	IV
Subject	:	Mathematics
Paper	:	I
Title of Subject	:	Functional Analysis-II
Compulsory	:	Compulsory
Course Code	:	MATH-1017
Max. Marks	:	85

Course Outcomes

CO1- Concept of Hilbert ad joint operator and unitary and normal operator.

CO2- Prove the Zornis lemma, Hahn- Branch theorem for real/ complex linear spaces.

CO3- Companying relation between ad joint operator & ad joint operator.

CO4- Prove the category theorem. Baire's Category, uniform bendiness.

Unit1- Hilbert adjoint operator and its properties, self adjoint, Unitory and normal operator's positive operator.

Unit2- Zorn's Lemma Hahn-BanchThorem for real linear spaces, Hahn Banach theorem for complex linear space and normed linear spaces.

Unit3- Adjoint operators on normed spaces, relation between adjoint operator and Hilbert adjoint operator, Reflexive spaces, Reflexivity of Hilbert space.

Unit4- Category theorem- Baire's Category theorem, uniform boundedness theorem and some of its application, strong and weak convergence in normed spaces.

Unit5- Convergence of sequences of operators and functional, open mapping theorem, closed graph theorem, contraction theorem.

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Class	:	M.SC
Semester	:	IV
Subject	:	Mathematics
Paper	:	II
Title of Subject	:	Advanced Graph Theory -II
Compulsory	:	Compulsory
Course Code	:	MATH-1018
Max. Marks	:	85

Course Outcomes

CO1- Illustrate different types of matrix representation of graphs and on application to a, switching network.

CO2- Define chromatic number, polynomials.

CO3- Describe the four colour problem.

CO4- Explain digraph, ruler digraphs.

CO5- Describe Trees.

Unit1- Matrix representation of graphs, Incidence matrix, Submatrices of A(G), Circuit Matrix, Fundamental circuit matrix and Rank of B, An application to a switching Network .

Unit2- Cut-set Matrix, Relationships among As, Bf and Cf, path matrix, Adjacency matrix.

Unit3- Chromatic Number, chromatic Partitioning, chromatic Polynomial, Coverings, matching's.

Unit4- The four color problem, directed graph, some types of Digraphs, Digraphs and Binary relations, Euler digraphs, Directed paths and connectedness.

Unit5- Trecs with directed graphs, Arborcocence, Fundamental Circuits in Digraphs. Matrix A, B and C of Digraphs, Adjacency matrix of a Digraph.

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Class	:	M.SC
Semester	:	IV
Subject	:	Mathematics
Paper	:	III
Title of Subject	:	Advanced Special Function-II
Compulsory	:	Compulsory
Course Code	:	MATH-1019
Max. Marks	:	85

Course Outcomes

CO1- Explain Bessel function, generating function.

CO2- Describe the Legendre polynomials, foregoes formula.

CO3- Define hermit polynomials, Leaguers polynomials, Jacobi polynomial.

CO4- Explain orthogonal properties.

Unit1- Bessel function, Bessel's differential equation, Generating function, Bessel's integral with index half and an odd interger.

Unit2- Generating function for Legendre polynomials, Rodrigues formula, Bateman's generating function, Additional generating functions.

Unit3- Definition of Hermite polynomials Hn(X), Pure recurrence relations, Differential recurrence relation, Rodrigue's formula. Other generating functions, Othogonality, Expansion of polynomials, more generating functions.

Unit4- Laguerre Polynomials: The LaguerrePloynomials Ln (X), Generating functions, Pure recurrence relations, Differential recurrence relation, Rodrigue's formula.

Unit5- Jacobi polynomial. Generating functions, Differential Equation of Jacobi Polinomial, Orthogonal Properties.

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Class	:	M.SC
Semester	:	IV
Subject	:	Mathematics
Paper	:	IV
Title of Subject	:	Operations research - II
Compulsory	:	Compulsory
Course Code	:	MATH-1020
Max. Marks	:	85

Course Outcomes

CO1- Describe Transportation problems, Assignment problems, network Analysis.

CO2- Explain – simulation with examples & Game theory.

Unit1- Transportation problems: North-West Corner Method Least-Cost Method. Vogel's Approximation Method, MODI Method. Exceptional cases and problem of degeneracy.

Unit2- Assignment problems, Non-Linear Programming Techniques-Kuhn-Tucker constraintsNon –negative Conditions,

Unit3- Network analysis, constraints in Network, Construction of network, Critical Path Method (CPM) PERT, PERT calculation, Resource Leveling by Network Techniques and advances of network (PERT/CPM).

Unit4- Simulation: Monte-Carlo Simulation. Simulation of Networks, Advantage and Limitation of Simulation.

Unit5- Game theory. Two persons, Zero-sum Games, MaximixMinimax principle, games without saddle points. Mixed strategies, Graphical solution of 2xm and mx2 games, solution by Linear Programming.

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Class	:	M.SC
Semester	:	IV
Subject	:	Mathematics
Paper	:	IV
Title of Subject	:	Integral Transform - II
Compulsory	:	Compulsory
Course Code	:	MATH-1021
Max. Marks	:	85

Course Outcomes

CO1- Define Fourier transform and finite former transform.

CO2 Prove convolution theorem and parietal's identity for foamier series/ transform

CO3- Explain the Henkel & milling transforms.

Unit1- Fourier Transform, Infinite Fourier transform, Complex Fourier transform.

Unit2- Finite Fourier Transform and Fourier Integral

Unit3- Convolution theorem, Perseval's Identity for Fourier series, Parseval's Identity for Fourier transform.

Unit4- Application for Fourier Transform to Boundary value Problems.

Unit5- Introduction to Hankel and Mellin Transforms, Fourier Seriesand Boundary value problems.

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Syllabus recommended by Board of studies of Mathematics

Session 2016-17 to 2020-21

Class - M.Sc.

Semester - IV

Subject - Mathematics

Paper Title - Spherical Trigonometry and Astronomy-II

Paper - Optional –XIII

COURSE CODE- MATH-1023

Max. Marks: 85

Unit-I Fundamental definitions, motion of sun, Twilight.

Unit-II Dip of the horizon, Refraction, meridian circle.

Unit-III Kepler's Laws of planetary motion, time.

Unit-IV Planetary motion and phenomena, Aberration.

Unit-V Precession and mutation, parallax and eclipses.

Year 2020-21

1. Explain motion of sun, refraction, time.
2. Prove the kelpie’s laws.
3. Describe the planetary motion and phenomena.
4. Define parallax and eclipses.

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SADHU VASWANI AUTONOMOUS COLLEGE
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Syllabus Recommended by Board of Studies of Physics
Session 2016-17 to 2020-21

Class	:	M.Sc.
Semester	:	I
Subject	:	Physics
Paper	:	I - MATHEMATICAL PHYSICS
Course Code	:	PHY-3001
Max. Marks	:	85+ (CCE) 15 = 100

Course Outcomes

CO1 Learn about Gradient, Divergence and Curl in orthogonal curvilinear and their typical Applications in physics.

CO2 Mathematical Physics to develop a understanding of physics and solve the complex problem under the quantum mechanics classical mechanics and fluid dynamics.

CO3 Get introduced to Special functions like Bessel functions, Hermite and Legendre and their recurrence relations.

CO4 Students have cleared a concept of vector and tensor analysis.

CO5 Students should also be able to understand the Fourier and Laplace Transform, Series and Analytic functions to solve many complex problems and useful to higher Studies.

UNIT-I

Differential equations: Recursion relation, generating functions and orthogonality of Bessel functions of first and second kind, Hermite, Legendre, Associate Legendre and Laguerre Polynomials, Curvilinear co-ordinate system with specific cases of Cartesian, Cylindrical, and Spherical coordinate systems.

UNIT-II

Integral transforms Fourier integral, Fourier Transform and Inverse Fourier Transforms. Fourier Transform of derivatives, Convolution Theorem. Elementary Laplace transforms. Laplace Transform of derivatives, Applications to a damped harmonic oscillator.

UNIT-III

Green’s Functions: Non homogenous boundary value problems, Green’s Function for one dimensional problems, Eigen Function, expansion of Green’s function, Fourier Transform Method of constructing Green’s Function, Green’s Function for electrostatic boundary value problems and quantum mechanical scattering problem.

UNIT-IV

Complex variables: Analyticity of complex functions, Cauchy Riemann equations, Cauchy theorem, Cauchy integral formula, Taylors, Maclaurin, Laurent series & mapping, Theorem of residues, Simple cases of contour integration, Jordan’s lemma Integrals involving multiple valued functions (Branch points).

UNIT-V

This unit will have a short note question covering all the four units. The students will have to answer any two questions out of the four.

Books Recommended:

1.	L. A. Pipes	Mathematics of Engineers and Physicists
2.	Arfken	Mathematical Methods for Physicists
3.	P. K. Chattopadhyay	Mathematical Physics
4.	H. K. Dass	Mathematical Physics
5.	Ghatak, Goyal & Guha	Mathematical Physics
6.	M. R. Spiegel (Schaum Series)	Complex Variable & Laplace Transform

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Session 2016-17 to 2020-21

Class	:	M.Sc.
Semester	:	I
Subject	:	Physics
Paper	:	II - CLASSICAL MECHANICS
Course Code	:	PHY-3002

Max. Marks : 85+ (CCE) 15 = 100

Course Outcomes

CO1 The Lagrangian and Hamiltonian approaches in classical mechanics.

CO2 The classical background of Quantum mechanics and get familiarized with Poisson brackets and Hamilton -Jacobi equation.

C03 Kinematics and Dynamics of rigid body in detail and ideas regarding Euler's equations of motion.

CO4 Theory of small oscillations in detail along with basis of free vibrations.

CO5 Students will be able to understand the possibility to extend ordinary vector analysis to four dimensional formulations by four vectors and four momentums.

UNIT-I

Newtonian mechanics of one and many particles systems: Conservation laws, Constraints and their classification, Principle of virtual work: D' Alembert's principle in generalized coordinates, The Lagrange's equation from D'Alembert's principle, Configuration space, Hamilton's principle deduction from D'Alembert's principle, Generalized momenta and Lagrangian formulation of the conservation theorems, Reduction to the equivalent one body problem; the equation of motion and first integrals, the differential equation for the orbit.

UNIT-II

The equations of canonical transformation and generating functions, The Hamilton- Jacobi Action and Angle variables, Possion's brackets; simple algebraic properties of Possion's brackets, The equation of motion in Possion's brackets notation, Possion's theorem, principle of least action, The Kepler problem, Inverse central force field, Rutherford scattering.

UNIT-III

Theory of small oscillations, Equations of motion, Eigen frequencies and general motion, normal modes and coordinates, Applications to coupled pendulum and linear bistable molecule, Rotating coordinate systems, Acceleration in rotating frames, Coriolis force and its terrestrial astronomical applications, Elementary treatment of Eulerian coordinates and transformation matrices, Angular momentum inertia tensor, Eular equations of motion for a rigid body, Torque free motion for a rigid body.

UNIT-IV

Symmetries of space and time, Invariance under Galilion transformation, Covariant four- dimensional formulation, 4-vectors and 4-scalers, Relativistic generalization of Newton's laws 4- momentum and 4-force, variance under Lorentz transformation relativistic mechanics, Covariant Lagrangian, covariant Hamiltonian, Examples.

UNIT-V

This unit will have a short note question covering all the four units. The students will have to answer any two questions out of the four.

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Class	:	M.Sc.
Semester	:	I
Subject	:	Physics
Paper	:	III - QUANTUM MECHANICS -I
Course Code	:	PHY-3003

Max. Marks : 85+ (CCE)

Course Outcomes

CO1 In Quantum mechanics, Schrodinger equation gives us a detailed account of the form of the wave functions of probability waves that control the motion of same smaller particles.

CO2 The equation also describes how these waves are influenced by external factors.

CO3 Linear vector space, Hilbert space, concepts of basis and operators and bra and ket notation.

CO4 Both schrodinger and Heisenberg formulations of time development and their applications.

CO5 Solve the linear harmonic oscillator and hydrogen-like atom problems.

UNIT-I

Basic Postulates of quantum mechanics, equation of continuity, Normality, Orthogonality and closure properties of Eigen functions, expectation values and Ehrentest theorems, solution of Schrodinger equation for one dimensional (a) potential well (b) potential step and (c) potential barrier.

UNIT-II

Linear vector space, concept of Hilbert space, bra and ket notation for state vector, representation of state vectors and dynamical variables by matrices and unitary transformation (Translation and rotation), creation and annihilation operators, matrices for x and p. Heisenberg uncertainty relation through operators (Schwartz inequality).

UNIT-III

Solution of Schrodinger equation for (a) Linear harmonic oscillator (b) hydrogen-like atom (c) square well potential and their respective application to atomic spectra, molecular spectra and low energy nuclear states (deutron)

UNIT-IV

Angular momentum in quantum mechanics, Eigen values and Eigen function of L^2 and L_z in term of spherical harmonics, commutation relation, Time independent perturbation theory, Non- degenerate and degenerate cases.

UNIT-V

This unit will have a short note question covering all the four units. The students will have to answer any two questions out of the four.

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Session 2016-17 to 2020-21

Class	:	M.Sc.
Semester	:	I
Subject	:	Physics
Paper	:	IV - ELECTRONIC DEVICES
Course Code	:	PHY-3004
Max. Marks	: 85+ (CCE) 15 = 100	

Course Outcomes

CO1 Understanding of the devices their characteristics and applications, to be able to use them in electronic circuits.

CO2 To have knowledge about photonic materials such as LEDs and solar cell their working principles.

CO3 The Syllabus is systematically organized and the presentation has been kept at a level suitable for a student with basic knowledge of circuit theory and electronic devices.

CO4 Expanded and improved coverage of CMOS Logic.

CO5 Understanding of Electro-optic, Magneto-optic and Acoustic-optic effects.

UNIT-1

Transistors: JFET, BJT, MOSFET and MESFET, structure derivations of the equations for I-V characteristics under different condition, microwave devices, tunnel diode, transfer electron devices (Gunn diode), avalanche transits time devices, Impatt diodes and parametric devices.

UNIT-II

Photonic devices: radiative and non- radiative transitions, optical absorption, bulk and thin film photo conductive devices (LDR), diode photo detectors, solar cell (open circuit voltage and short circuit current, fill factor), LED (high frequency limit, effect of surface and indirect recombination current, operation of LED), semi- conductors; diode lasers (conditions for population inversion in active region, light confinement factor, optical gain and threshold current for lasing.

UNIT-III

Memory Devices: Read Only Memory (ROM) and Random Access Memory (RAM), Types of ROM: PROM, EPROM, EEPROM and EAPROM, static and dynamic RAM (SRAM & DRAM), characteristics of SRAM and DRAM. Hybrid Memories: CMOS and NMOS memories, Nonvolatile RAM, Ferro- electric memories, charge coupled devices (CCD), storage devices: Geometry and organization of magnetic (FDD & HDD) and optical (CD-ROM, CD-R, CD-R/W, DVD) storage devices.

UNIT-IV

Electro-optic, Magneto-optic and Acoustic-optic effects, material properties related to get these effect, important Ferro electric, liquid crystal and polymeric materials for these devices, piezoelectric, electrostrictive and magnetostrictive effects, Important materials for these properties and their applications in sensors and actuator devices, acoustic delay lines, piezoelectric resonators and filters, high frequency piezoelectric devices-surface, acoustic wave devices.

UNIT-V

This unit will have a short note question covering all the four units. The students will have to answer any two questions out of the four.

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Class	:	M.Sc.
Semester	:	I
Subject	:	Physics
Paper	:	Practical

Course Code : PR PHY-3005 LAB (A)

1. Verification of Cauchy's formula.
2. Verification of Fresnel's formula.
3. Young's modulus of a metal rod by Newton's ring (interference method)
4. Characteristics of a tetrode valve.
5. Characteristics of a pentode valve.

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Class	:	M.Sc.
Semester	:	I
Subject	:	Physics
Paper	:	Practical
Course Code	:	PR PHY-3006 LAB (B)

1. Determination of Energy Band Gap of a semiconductor by reverse saturation.
2. To plot input & output characteristic curves of a given transistor in CE mode and calculate 'h' parameter.
3. To study Drain & Mutual characteristics of a FET & calculation of u, r_d and g_f.
4. Study of Uni-Junction Transistor (UJT).
5. To Study Cathode Ray Oscilloscope (CRO).

NOTE : Experiments of similar standards can also be designed by the faculty members.

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Class	:	M.Sc.
Semester	:	II
Subject	:	Physics
Paper	:	I - QUANTUM MECHANICS-II
Course Code	:	PHY-3007
Max. Marks	:	85+ (CCE) 15 = 100

Course Outcomes

CO1 Approximation methods for time-independent problems like the WKB approximation.
CO2 Perturbation theory and Interaction of an atom with the electromagnetic field.
CO3 Theory of scattering and calculation of scattering cross section.
CO4 Einstein's A and B Coefficients and transition probability.
CO5 Relativistic Quantum Mechanics using Dirac equation, Dirac matrices, The Klein Gordon Equation etc.

UNIT-I

Approximation method for bound states: Rayleigh-Schrodinger perturbation theory of non- degenerate and degenerate levels and their applications to perturbation of an oscillator, Normal helium atom and first order stark effect in hydrogen, Variation method and its applications to ground state helium, WKB Approximation method, connection formula, ideas on potential barrier with application to theory of alpha decay.

UNIT-II

Time dependent perturbation theory: Method of variation of constants and transition probability, adiabatic and sudden approximation, wave equation for a system of charged particles under the influence of external electromagnetic field, absorption and induced emission, Einstein's A and B coefficients transition probability.

UNIT-III

Theory of Scattering, Physics concepts, scattering amplitude, scattering cross-section, Born-Approximation and partial waves, scattering by perfectly rigid sphere, complex potential and absorption, scattering by spherically symmetric potential, identical particles with spin, Pauli's spin matrices.

UNIT-IV

Schrödinger's relativistic equation (Klein-Gordon equation), Probability and current density, Klein-Gordon equation in presence of electromagnetic field, hydrogen atom, short comings of Klein-Gordon equation, Dirac's relativistic equation for free electron, Dirac's Matrices, Dirac's relativistic equation in electromagnetic field, negative energy states and their interpretation hydrogen atom, hyperfine splitting.

UNIT-V

This unit will have a short note question covering all the four units. The students will have to answer any two questions out of the four.

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Class	:	M.Sc.
Semester	:	II
Subject	:	Physics
Paper	:	Practical

Course Code : PR PHY-3011 LAB (A)

1. To draw B-H curve for the specimen of iron in the form of an anchor ring by Ballistic method.
2. Verification of Child's law.
3. Verification of Richardson's equation.
4. To determine the self & mutual inductance of a given coil by Anderson's method.
5. To determine the specific charge (e/m) of electron by Thomson's method.

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Class	:	M.Sc.
Semester	:	II
Subject	:	Physics
Paper	:	Practical
Course Code	:	PR PHY-3012 LAB (B)

1. Study of Multivibrator (transistorized).
2. Study of two stages R-C coupled amplifier.
3. Study of two Emitter-Followers.
4. Study of MOSFET.
5. Study of Wien's- bridge oscillator.

NOTE:- Experiments of similar standards can also be designed by the faculty members.

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Class	:	M.Sc.
Semester	:	II
Subject	:	Physics
Paper	:	II - STATISTICAL MECHANICS
Course Code	:	PHY-3008
Max. Marks	: 85+ (CCE) 15 = 100	

Course Outcomes

CO1 Explain statistical physics and thermodynamics as logical consequences of the postulates of
statistical mechanics.

CO2 Apply the principles of statistical mechanics to selected problems.

CO3 Grasp the basis of ensemble approach in statistical mechanics to a range of situations.

CO4 To learn the fundamental differences between classical and quantum statistics and learn about quantum statistical distribution laws.

CO5 Study important examples of ideal Bose systems and Fermi systems.

UNIT-I

Foundation of statistical mechanics, specification of states of a system contact between statistics and thermodynamics, classical ideal gas entropy of mixing and Gibb's paradox, Microcanonical ensemble, phase space, trajectories and density of states, Liouville's theorem, canonical and grand canonical ensembles, partition function, calculation of statistical quantities, energy and density fluctuations.

UNIT-II

Statistics of ensembles, statistics of indistinguishable particles, density matrix, Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstein statistics, properties of ideal Fermi gas, Bose-Einstein condensation, properties of ideal Fermi gas, electron gas in metals, Boltzmann transport equation.

UNIT-III

Cluster expansion for a classical gas, virial equation of state, mean field theory of Ising model in 3,2 and 1 dimension, Exact solution in one- dimension.

UNIT-IV

Thermodynamics fluctuation spatial correlation, Brownian motion, Langevin theory, fluctuation dissipation theorem, the Fokker - Planck equation, Onsager reciprocity relations.

UNIT-V

This unit will have a short note question covering all the four units. The students will have to answer any two questions out of the four.

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Class	:	M.Sc.
Semester	:	II
Subject	:	Physics
Paper	:	III - ELECTRODYNAMICS AND PLASMA PHYSICS
Course Code	:	PHY-3009
Max. Marks	: 85+ (CCE) 15 = 100	

Course Outcomes

C01 Have gained a clear understanding of Maxwell's equations and electromagnetic boundary conditions.

CO2 Students will able to understand the concept of electromagnetic theory, EM wave Propagation by different modes, ionosphere and communication techniques will be useful in our daily life.

CO3 The concept of various potentials and gauge transformation give a working knowledge and applications.

C04 Extend their understanding of special theory of relativity by including the relativistic Electrodynamics.

CO5 Students have studied Introduction of Plasma, occurrence of plasma and plasma wave's that is motivated to research in plasma.

UNIT-I

Review of Basics of electrostatics and magnetostatics (electric field, Gauss's law, Laplace and Poisson equations, method of images, Biot- Sawart law, Ampere's law, Maxwell's equations, scalar and vector potentials, Gauge transformation, Lorentz Gauge, Coulomb Guage, Solution of Maxwell equations in conducting media radiations by moving charges, retarded potentials, Lienard Wiechrt potentials, fields of charged particles in uniform motion, fields of arbitrarily moving charge particle.

UNIT-II

Fields of an accelerated charge particles at low velocity and high velocity, angular distribution of power radiated, Review of four vector and Lorentz transformation in 4- dimensional spaces, Invariance of electric charge, relativistic transformation properties of E and H fields, Electromagnetic fields tensor in 4-dimensional Maxwell equation, Four Vector current and potential and their invariance under Lorentz transformation, covariance of electrodynamics, Lagrangian and Hamiltonian for a relativistic charged particle in external EM field, motion of charged particles in electromagnetic field, Uniform and non-uniform E and B fields.

UNIT-III

Elementary concept of occurrence of plasma, Gaseous and solid state plasma, Production of gaseous and solid state plasma, Plasma parameters, Plasma confinement pinch effect instability in a pinched- plasma column, Electrical neutrality in a plasma, Debye screening distance, Plasma oscillations: Transverse oscillations and longitudinal oscillations.

UNIT-IV

Domain of Magnetohydrodynamics and plasma physics: magnetohydrodynamics equations, magnetic hydro-static pressure hydrodynamic waves: magneto-sonic and Alfven waves, particle orbits and drift motion in a plasmas, Experimental study of Plasma, the theory of single and double probes.

UNIT-V

This unit will have a short note question covering all the four units. The students will have to answer any two questions out of the four.

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Class	:	M.Sc.
Semester	:	II
Subject	:	Physics
Paper	:	IV - ATOMIC AND MOLECULAR PHYSICS
Course Code	:	PHY-3010

Max. Marks : 85+ (CCE) 15 = 100

Course Outcomes

C01 Know about different atom models and will be able to differentiate different atomic systems, different coupling schemes and their interactions with magnetic and electric fields.

CO2 Atomic Spectroscopy is the study of the electromagnetic radiation absorbed and emitted by atoms.

C03 Be able to apply the principle of Raman spectroscopy and its applications in the different field of science & technology.

CO4 Atomic Spectroscopy pays a Major role as the basis of a wide range of analytical technique.

CO5 Have gained ability to apply the techniques of microwave and infrared spectroscopy to elucidate the structure of molecules.

UNIT-I

Quantum states of one electron atom, Atomic orbitals, Hydrogen spectrum, Pauli's principle, Spectra of alkali elements, spin orbit interaction and line structure of alkali Spectra. Methods of molecular quantum mechanics, Thomas Fermi statistical model, Hartree and Hartree fock method, Two electron system, Interaction energy in L-S and J-J coupling, hyperfine structure (qualitative), line broadening mechanisms (general ideas).

UNIT-II

Types of molecules, Diatomic linear, Symmetric top, asymmetric top and spherical top molecules, Rotational spectra of diatomic molecules as a rigid rotator, Energy level and spectra of non- rigid rotator, intensity of rotational lines.

UNIT-III

Vibrational energy of diatomic molecule, diatomic molecule as a simple harmonic oscillator, Energy levels and spectrum, Morse potential energy curve, Molecules as vibrating rotator, Vibration spectrum of diatomic molecules, PQR branches, IR spectrometer (qualitative).

UNIT-IV

Introduction to ultraviolet, visible and infra-red spectroscopy, Raman spectroscopy: Introduction, pure rotational and vibrational spectra, Techniques and instrumentation, photo electron spectroscopy, elementary idea about photoacoustic spectroscopy and Mossbauer spectroscopy (principle)

UNIT-V

This unit will have a short note question covering all the four units. The students will have to answer any two questions out of the four.

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Class	:	M.Sc.
Semester	:	III
Subject	:	Physics
Paper	:	Practical

Course Code: PR-PHY-3017
LAB (A)

1. Study of Silicon Controlled Rectifier (SCR) characteristics.
2. To study Electron Spin Resonance (ESR).
3. Determination of Hall coefficient of a semiconductor.
4. Study of 555 Multivibrator.
5. To study the characteristics of a Voltage Regulator Tube.

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Class	:	M.Sc.
Semester	:	III
Subject	:	Physics
Paper	:	Practical

Course Code: PR-PHY-3018
LAB (B)

1. Analog to Digital converter.
2. Study of Hartley Oscillator.
3. To study the operation of amplitude Modulation & Demodulation.
4. Basic computer programmers and their execution.
5. To study the characteristics of Radio Receiver.

NOTE:- Experiments of similar standards can also be designed by the Faculty members

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Class	:	M.Sc.
Semester	:	III
Subject	:	Physics
Paper	:	IV - Atomic and Molecular Physics
Course Code	:	PHY-3016

Max. Marks : 85+ (CCE) 15 = 100

Course Outcomes

CO1 Students learned the atomic and molecular spectroscopy and various techniques used to study the spectra.

CO2 Students learned rotational, vibrational, electronic and Raman spectra of molecules.

CO3 The principle and working of Raman spectroscopy, Mossbauer spectroscopy to study the spectra of material.

CO4 Students will also familiar with Electron Spin resonance and Nuclear magnetic resonance techniques which are useful for high Studies and research work.

CO5 To find solutions to problems related different spectroscopic systems.

Unit –I Nuclear Magnetic Resonance Spectroscopy

Concept of Nuclear Magnetic Resonance spectroscopy, Interaction between nuclear spin and magnetic field, population of energy level, relaxation processes, spin-spin interaction and spin-spin coupling between two and more Nuclei (qualitative).

UNIT –II Electronic Spectra of Diatomic Molecules

Franck Condon principles, dissociation and pre-dissociation, dissociation energy, Born-Oppenheimer-approximation, vibration coarse structure of electronic spectra (bands progression and sequence)

UNIT –III Raman Spectra

Raman effect, quantum theory of Raman effect, Molecular Polarisibility in Raman effect, Vibrational Raman spectra, vibration-rotation Raman Spectra of diatomic molecules, application of Raman and infrared spectroscopy in the structure determination.

UNIT –IV Mossbauer Spectroscopy

Mossbauer Effect, principles of Mossbauer spectroscopy, recoil less emission of gamma emission, line width and resonance absorption, application of Mossbauer spectroscopy (Isomer shift, Quadra pole splitting magnetic field effect).

UNIT –V Electron Spin Resonance Spectroscopy

Elementary idea about ESR, principle of ESR , ESR spectrometer, splitting of electron energy levels by a magnetic field, G- Values, simple experimental setup of ESR, ESR spectra of free radicals in solution, An Isotropic system.

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Class	:	M.Sc.
Semester	:	III
Subject	:	Physics
Paper	:	I - Condensed Matter Physics-I
Course Code	:	PHY-3013
Max. Marks	: 85+ (CCE) 15 = 100	

Course Outcomes

CO1 Able to understand properties of solid.

CO2 Able to correlate the x-ray diffraction pattern for a given crystal structure based on the corresponding reciprocal lattice.

CO3 Able to understand the quantum theory of Lattice vibrations.

CO4 Know the concepts of Phonons and its applications.

CO5 Understanding skin effect and anomalous skin effect.

Unit –I: Crystal Structure

Bravais lattice in two and three dimension. Simple crystal structures: Hexagonal close packed structure, Diamond structure, Zinc blende structure, Sodium chloride structure, Cesium chloride structure.

UNIT-II: Crystal diffraction by X-Ray

Reciprocal lattice, Reciprocal lattice of bcc and fcc lattice. Relation between crystal lattice axes and crystal reciprocal lattice axes, Bragg's diffraction, Condition in terms of reciprocal lattice vector, Brillouin zones.

UNIT –III: Elastic Properties of Solids

Stress and strain components, elastic compliance and stiffness constants, elastic energy density, reduction of number of elastic constants, elastic stiffness constants for isotropic body, elastic constant for cubic isotropic bodies, elastic waves, waves in (100) direction, experimental determination of elastic constants.

UNIT- IV: Lattice Vibration and Phonons

Lattice dynamics of a diatomic linear lattice, Lattice vibration spectrum, The concept of phonons, momentum of phonons, Inelastic scattering of photons by phonons, inelastic scattering of neutrons by phonons, Inelastic scattering of X-Ray.

UNIT- V: Thermal Properties and band theory of solids

Anharmonicity, thermal expansion, thermal conductivity, equation of state of solids, Gruneisen constant, Band theory, classification of solids, concepts of effective mass, Fermi surfaces, anomalous skin effect, De Hass van alphen effect, cyclotron resonance, Magneto resistance.

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Class	:	M.Sc.
Semester	:	III
Subject	:	Physics
Paper	:	II - Nuclear and Particle Physics
Course Code	:	PHY-3014
Max. Marks	: 85+ (CCE) 15 = 100	

Course Outcomes

CO1 After completion of the course students get a sound knowledge of nucleus, interaction with nucleons, size and nuclear force.

CO2 Students understand the properties and nuclear reaction on the basis of different models such as Liquid drop, Shell model and collective model.

CO3 Students get the knowledge with high energy based Accelerator like Betatron, Synchrotron, Linear accelerator and other. Students also explore the concept of Alpha, Beta and Gamma rays.

CO4 Students familiarize to fundamental of particles and its nature which will useful in research.

CO5 Understand the basic forces in nature and classification of particles and study in detail conservations laws.

Unit –I Nuclear Interaction and Nuclear Reaction

Nuclear forces, exchange and tensor forces, meson theory of nuclear forces, Low-energy n-p scattering and spin dependence of n-p forces, Direct and compound nuclear reaction mechanism, reciprocity theorem.

UNIT-II Accelerators of charged particles

Study of cyclotron, phase stability, frequency modulated cyclotron (synchrocyclotron) magnetic induction accelerator (Betatron), Electron synchrotron and linear accelerator (LINAC).

UNIT –III Nuclear models

Liquid drop model, Bohr- wheeler's theory of nuclear fission, shell model, spin orbit interaction, magic number, spin and angular momenta of nuclear ground state, nuclear quadrupole moment.

UNIT –IV Nuclear decay and elementary particles

β Decay, general features of β ray spectrum, Fermi theory of β decay, selection rules, parity in β decay, multipole radiation, internal conversion, nuclear isomerism.

UNIT –V Elementary particles

Classification of elementary particles, fundamental interaction, parameters of elementary particles, Symmetry and conservation laws, symmetry schemes of elementary particles SU (3) Symmetry.

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Class	:	M.Sc.
Semester	:	III
Subject	:	Physics
Paper	:	III - Digital Electronics
Course Code	:	PHY-3015
Max. Marks	: 85+ (CCE) 15 = 100	

Course Outcomes

CO1 The fundamental concepts of digital electronics and commonly used codes in digital systems and the basic digital circuit.

CO2 Various number systems and commonly used codes in digital systems included.

CO3 Digital electronics basics using logic gates and working of major digital devices like flip flops.

CO4 Students will learn about counters and their use in digital electronics.

CO5 The A/D and D/A converters form an important part of many digital systems and the commonly used techniques for such conversions are included.

Unit –I

Number system (Binary, Octal, Decimal, Hexadecimal) and conversion between them, Boolean arithmetic signed and unsigned binary numbers, 1's complement, 2's complement.

UNIT –II

Codes:BCD, Gray, ASCII, EBCDIC, De- morgan's theorem, Gates: OR, AND, NOT, NOR, NAND, XOR, XNOR, Boolean algebra, karnaugh map, adder and subtractor circuit design.

UNIT –III

Multiplexer, Demultiplexer, encoder, decoder, parity checker and generator, Flip- Flops: R-S,J-K, J-K Master slave, D Flip –Flop, race around condition, registers: shift registers(left and right shift).

UNIT –IV

Counters: asynchronous (ripple) counter, synchronous (parallel) counter, MOD-5 counter and MOD-10 counter, BCD counters, UP –Down counter, Shift register counter (Ring counter).

UNIT –V

Digital to analog conversion (Binary) weighted register method, R-2R ladder network method, complete DAC structure, Analog to digital converters (Stair case or counter method, single slope, equal slope successive approximation ADC).

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Class	:	M.Sc.
Semester	:	IV
Subject	:	Physics
Paper	:	Practical LAB (A)

Course Code: PR-PHY-3023

1. To Calculate Energy Band Gap by Four Probe method.
2. Study of Microprocessor.
3. To study the characteristics of the Geiger Muller (GM) counter and hence to determine its operating voltage
4. To study the dispersion relation for the mono- atomic lattice.
5. To study of Regulated Power Supply using transistor.

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Class	:	M.Sc.
Semester	:	IV
Subject	:	Physics
Paper	:	Practical LAB (B)

Course Code : PR-PHY-3024

1. Verification of De-Morgan's theorem & study OR, AND,& NAND gate.
2. To study Half Adder And Full Adder
3. Study of Adder, Subtractor, Differentiator and Integrator using Op-Amp.
4. To study 3- PIN IC- 317 Voltage Regulator.
5. Study of Push-Pull amplifier using Transistor.

NOTE:-Experiments of similar standards can also be designed by the faculty members.

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Class	:	M.Sc.
Semester	:	IV
Subject	:	Physics
Paper	:	I - Condensed Matter Physics –II
Compulsory/ Optional	:	Compulsory
Course Code	:	PHY-3019
Max. Marks	:	85+ (CCE) 15 = 100

Course Outcomes

CO1 Superconductivity: Properties of superconductors with discussion on Meissner effect. London's equations are covered and discussion on superconducting magnets is carried out.

CO2 Able to differentiate between type-I and type-II superconductors and their theories.

CO3 In Magnetic properties of solids, Diamagnetism, paramagnetic susceptibility and ferromagnetism is discussed and a quantum picture of Heisenberg exchange energy is covered.

CO4 Students will be able to learn thin films.

CO4 Students will be able to learn different methods of preparation of nano materials.

Unit –I Superconductivity

Concept of superconducting state, persistent current, critical temperature, Meissner effect, thermodynamics of the superconducting transitions, London equation and penetration depth, coherence length, Type I and Type II superconductors, B.C.S. theory of superconductivity, AC and DC Josephson effects, Josephson Tunneling.

UNIT –II Magnetism

Weiss theory of ferromagnetic Heisenberg model and molecular field theory, Domain and Bloch wall energy, Spin waves and magnons, curie Weiss law for susceptibility, Ferri and Anti ferrimagnetic.

UNIT –III Imperfection in Crystals

Imperfection in atomic packing, point defects, interstitial Schottky and Frenkle defects, lattice vacancies color centres, F centres, F′ centres, coagulation of F centres, production of color centres and V centres, explanation of experimental facts, line defects, edge and screw dislocation mechanism of plastic deformation in solids, stress and strain fields of screw and edge dislocation, elastic energy of dislocation, slip and plastic deformation, shear strength of single crystal, burgers vector stress fields around dislocation

UNIT –IV Thin Film

Study of surface topography by multiple beam interferometer, conditions for accurate determination of step height and film thickness (Fizeau fringes) Electrical conductivity of thin films, expression for electrical conductivity of thin films, Hall- coefficient quantum size effect in thin film.

UNIT –V Nano Structure

Definition and properties of nano structured material, different method of preparation of nano materials, plasma enhanced chemical vapor deposition, electro deposition. Structure of single wall carbon nano tubes (classification, chiral vector Cn, Translational vector T. Symmetry vector R. Unit Cell, Brillouin Zone) Electronic, mechanical, thermal and phonon properties.

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Class	:	M.Sc.
Semester	:	IV
Subject	:	Physics
Paper	:	II - Laser Physics
Compulsory/ Optional	:	Compulsory
Course Code	:	PHY-3020
Max. Marks	:	85+ (CCE) 15 = 100

Course Outcomes

CO1 Absorption, spontaneous and stimulated emission in two level systems.
CO2 Explain principle of Lasers.
CO3 Basic properties of the most common laser i.e. He-Ne, and carbon –dioxide, Ruby, Nd-YAg.
CO4 Students will be able to learn different applications of Laser.
CO5 Non- Linear optical frequency conversion optical parametric conversion

Unit –I Basic Principles of Laser

Introduction to Laser, spontaneous and stimulated emission, Einstein coefficients, Idea of light amplification, Population inversion, Laser pumping schemes for two and three level system with threshold condition for Laser oscillation.

UNIT –II Properties of Laser Beams and Resonators

Properties of Laser- Temporal coherence, spatial coherence, directionality and monochromaticity of Laser beam, resonators, vibrational mode of resonators, Laser amplification, open resonator.

UNIT –III Types of Laser

Solid state Laser i.e Ruby Laser, Nd- Yag Laser, Semiconductor Laser, Gas Laser i.e. Carbon dioxide Laser, He –Ne Laser, Basic idea about liquid Laser, Dye Laser and chemical Laser i.e. HCI and HF Lasers.

UNIT –IV Applications of Laser

Holography and its principle, theory of holograms, Reconstruction of image, characteristics of Holographs Application of Laser in chemistry and optics, Laser in Industry i.e. Laser welding, Hole drilling, Laser cutting, applications of Laser in medicines.

UNIT –V Basic idea about non- linear optics

Harmonic generation, Second and third harmonic generation, phase matching, optical mixing, parametric generation of light, self- focusing of light.

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Class	:	M.Sc.
Semester	:	IV
Subject	:	Physics
Paper	:	III - Computer Programming and Informatics
Compulsory/ Optional	:	Compulsory
Course Code	:	PHY-3021
Max. Marks	: 85+ (CCE) 15 = 100	

Course Outcomes

CO1 Students able to understand introduction, algorithm, operators and languages of computer.
CO2 Students able to write a programme in C++ language using commands that is useful in scientific purpose.
CO3 Students also learn the LAN, WAN and MAN networking of computers that will connected to worldwide.
CO4 Students learn about Internet explorer navigation and introduction to HTML and brief idea about HTTP.
CO5 HTML language and C++ language explore the creative programming for research purposes.

Unit –I

Conceptual framework of computer languages (Algorithm, Flowcharts) Need of structured programming, Top- down, bottom-up and modular programming design, Introduction to languages- basic structure of C program, Character set, keyword and identifiers, C data types, variable and data type declaration. Various operators like arithmetic, relational, logical, assignment, conditional, increment and decrement operators, Evaluation of expression and operator precedence.

UNIT –II

Input and output statement, control statement (if, if-else, nested-if, if-else statements, switch, while, Do…while and for statements) simple C programs like search of prime number between given range of numbers, finding the smallest and largest of three numbers, sum of algebraic series, factorial of given numbers, roots of a quadratic equation, binary to decimal and decimal to binary conversion etc.

UNIT –III

Functions: Need of functions, calling the function by value and by reference, category of function: no argument no return, argument but not return, argument with return, Recursion, One and two dimensional arrays. String and string handling functions like sprintf(), strcpy(), sscanf(), strlen(), sizeorf(), strcmp() etc. Simple programs using user define functions, arrays and string functions.

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UNIT –IV Network
Terminals- Dump terminals, smart terminals, intelligent terminals
Types of network:

- According to range: LAN, MAN, WAN, Client server.
- According to topologies : BUS, RING ,STAR, Mesh Network.

Internet: History Of Internet Service Provider (ISP), Introduction of types of internet account-shell/AC, TCP/IP A/c. types of connectivity- Dialup, Leased lines, Satellite, IP Address- Class A, Class B, Class C Domain Name Address, URL- absolute and relative.

UNIT –V Web enabled technology (Email and HTML)
Web Browser: Internet Explorer, Netscape Navigator, Station and Dynamic web page, Introduction to HTML, HTML tags:

- <HTML>, <TITLE>, <HEAD>, <BODY>
- <P>,
, <ALIGN>, <I>, <B>, <DIV>, <PRE>, and their attributes.
- <IMG>, <a>, and their attributes.
- Ordered and Unordered list tags.
- Tags and associated tags and its properties.

Creation of simple forms using text, Password, text area, radio, submit, Reset And Hidden, Brief idea about HTTP. Search engine, its working, types of search engines: sub directories Meta search engines, search function – AND and OR, Population search engines.

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Class	:	M.Sc.
Semester	:	IV
Subject	:	Physics
Paper	:	(IV-D) - Communication Electronics
Compulsory/ Optional	:	Optional-I
Course Code	:	PHY-3022
Max. Marks	:	85+ (CCE) 15 = 100

Course Outcomes

CO1 Many Practical circuits for AM and FM generation and detections have also been incorporated.

CO2 Students will be able to learn Propagation of waves and satellite communication.

CO3 To understand Different communication system.

CO3 Pulse Code Modulations (PCM) also discusses other systems such as Delta Modulation and Adaptive Delta Modulation.

CO5 Students will be able to Data Transmission

Unit –I Communication Electronics

Amplitude modulation – generation of AM waves demodulation of AM waves, DSBSC modulation, Generation of DSBSC waves, coherent detection of DSBSC waves, SSB modulation, generation and detection of SSB waves, vestigial sideband modulation.

UNIT –II Propagation of Waves

Ground Waves, sky wave, space wave, propagation, maximum usable frequency, skip distance, virtual height, fading of signals, Satellite communication: orbital satellite, geostationary satellites, orbital pattern, look angles, orbital spacing, satellite system, link modules.

UNIT –III Microwave

Advantages and disadvantages of microwave transmission loss in free-space, propagation of microwaves, atmospheric effects on propagation, Fresnel Zone problem used in microwave communication systems.

UNIT –IV Digital Communications

Pulse- Modulation system, sampling theorem, low pass and Band pass signals, PAM, channel BW for a PAM signal, Natural Sampling, Flat top sampling, signals Recovery through Holding, Quantization of signals, Quantization, Differential PCM Delta Modulation, Adaptive Delta Modulation, and CVSD.

UNIT –V Data Transmission

Base-band signal receiver, probability of error, optimum filter, white noise, matched filter and probability of error, coherent reception correlation, PSK, FSK, non coherent detection of FSK, differential PSK, QPSK, calculation of error probability for BPSK, BFSK and QPSK.

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Class	:	M.Sc.
Semester	:	IV
Subject	:	Physics
Paper	:	(IV-A) - Computer Architecture, Networking & Assembly Language Programming
Compulsory/ Optional	:	Optional -II (PHY-3022)
Max. Marks	:	85+ (CCE) 15 = 100

Course Outcomes

Unit-1 Graphical User Interface

Common Graphical User Interfaces & its Functionality,

GUI Design Consideration: Psychological factors & Standards; GUI Examples: Microsoft Windows Macintosh Toolbox, X- windows, Next, etc

Unit-2 Operating System

Evolution of Operating System – Serial Processing, Batch Processing, Multiprogramming: Operating System Structure – Layered Structure Approach, Virtual Machine, Client – Server Model & Kernel Approach.

Unit-3 Logic Circuits

Logic Gates, Logic Circuits, Combinational Circuits – Canonical and Standard Forms, Minimization of Gates ; Design of Combinational circuits : Examples of Logic Combinational Circuits – Adders, Decoders, Multiplexer, Encoder, Programmable Logic Array, Read Only Memory(ROM).

Sequential Circuit's Definition, Flip Flops- Basic Flip-Flops, Excitation Tables, Master Slave Flip Flops, Edge Triggered Flip- flops; Sequential Circuit Design & its example- Registers, Counters (Asynchronous & Synchronous), RAM; Design of a Simple Counter.

Unit-4 Assembly Language Programming (ALP)-I

Microprocessor Architecture: Microcomputer Architecture; Structure of 8086 CPU [The Bus Interface Unit, Execution Unit (EU)]; Register Set of 8086; Instruction Set of 8086 – Data Transfer Instructions, Arithmetic Instructions, Bit Manipulation Instructions, Program Execution Transfer Instructions, String Instructions, Processor Control Instructions; Addressing Modes- Register, Immediate, Direct & Indirect Addressing Modes.

Introduction to ALP: Need and use of ALP; Assembly Program Execution; An Assembly Program and its components- The Program Annotation & Directives; Input Output in ALP- Interrupts, DOS Function Calls (Using INT 21H); The Types of Assembly Programs- COM Programs, Exe Programs & Bin Programs.

Unit -5 Assembly Language Programming (ALP)-II

Simple Assembly Programs – Data Transfer, Simple Arithmetic Application, Application Using Shift Operations, Larger of the Two Number; Programming With Loops and Comparisons – Simple Program Loops, Find the Largest and the Smallest Array Values, Character Coded Data, Code Conversion;

Programming for Arithmetic and String Operations – String Processing & Arithmetic Problems

Use of Arrays in Assembly; Modular Programming – The stack, FAR and NEAR Procedures, Parameter Passing in Procedures, External Procedures.

Interfacing Assembly Language Routines to High Level Language i.e. C

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Class	:	M.Sc.
Semester	:	IV
Subject		Physics
Paper	:	(IV-B) - Material Science
Compulsory/ Optiona l	:	Optional -III(PHY-3022)
Max. Marks	: 85+ (CCE) 15 = 100	

Course Outcomes

Unit –I Classification of Materials

Types of materials: Crystalline Polycrystalline, Amorphous (Introduction and their structure), Elementary idea of polymers structure and properties method of polymerization, Glasses: Structure and properties, Types of Glasses, Fracture in glasses, Composite Materials: Introduction, their types and properties, Different types of bonding, Medalung energy for ionic crystal.

UNIT –II Phase Transitions

Thermodynamics of phase transformation, Free-energy calculation, I and II order transformation, Hume-Rother rule, solid solution and types of solid solutions, phase rule, One, Two component systems, Eutectic and peritectic phase diagrams, Lever rule, phase diagrams of Mg-A1, Fe-C Kinetics of transformations, Homogeneous and heterogeneous nucleation, Growth kinetics.

UNIT –III Diffusion in Materials

Mechanism of diffusion, Energy of formation and motion, long distance motion, Rate theory of diffusion, Einstein relation (relation between diffusivity and mobility), Fick's laws of diffusion and solution of Fick's second law, Kirkendal effect, Diffusion of vacancies in ionic crystals, Experimental determination of Diffusion coefficient.

UNIT –IV Elastic and Inelastic Behavior

Atomic models for elastic behavior, Elastic deformation in single crystals, Elastic anisotropy, Elastic constant and elastic module (Cubic system, isotropic body), Rubber like elasticity, Inelastic behavior, Thermo- elastic effect and relaxation process, Idea of visco-elastic behavior (Spring- Dashpot model), Determination of elastic constant of cubic crystal by ultrasonic wave propagation.

UNIT –V Transport Properties of Solids

Electrical conductivity of metals and alloys, Extrinsic, Intrinsic semiconductors and amorphous semiconductors, Scattering of electrons by phonons, impurity, etc, Relaxation time, Carrier mobility and its temperature dependence, Mathiessio's rule for resistivity, temperature dependence of metallic resistivity.

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Class	:	M.Sc.
Semester	:	IV
Subject	:	Physics
Paper	:	(IV-C) - Environmental Physics
Compulsory/ Optional	:	Optional-IV(PHY-3022)
Max. Marks	:	85+ (CCE) 15 = 100

Course Outcomes

Unit –I Essentials of Environmental Physics
Structure and thermodynamics of the atmosphere, Composition of air, Greenhouse effect, Transport of matter, energy and momentum in nature, Stratification and stability of atmosphere, laws of motion, hydrostatic equilibrium.

UNIT –II Solar and Terrestrial
Physics of radiation, Interaction of light with matter, Rayleigh and Mie scattering, Laws of radiation (Kirchoff's law, Planck's law, Wien's displacement law, etc.) solar and terrestrial spectra, UV radiation Ozone depletion problem, IR absorption.

UNIT –III Environmental Pollution and Degradation
Elementary fluid dynamics, Diffusion, Turbulence and turbulent diffusion, Factors governing air, water and noise pollution, Air and water quality standards, Waste disposal, Gaseous and particulate matters, Wet and dry deposition.

UNIT –IV Environmental Changes and Remote Sensing
Energy sources and combustion processes, Renewable sources of energy: Solar energy, wind energy, bio- energy, hydropower, fuel cells, nuclear energy.

UNIT –V Global and Regional Climate
Elements of weather and climate, Stability and vertical motion of air, Horizontal motion and air water, Pressure gradient forces, Viscous forces, Inertia forces, Reynolds number, Enhanced Greenhouse Effect, Global climate models.

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Class	:	M.Sc.
Semester	:	IV
Subject	:	Physics
Paper	:	(IV-E) - Digital Electronics
Compulsory/ Optional	:	Optional 5
Max. Marks	:	85+ (CCE) 15 = 100

Unit –I OP-AMP
Differential amplifier circuit configurations: dual input balanced output, dual input unbalanced output, single input unbalanced output (ac analysis) only, block diagram of a typical op amp analysis, schematic symbol of an op- amp.

UNIT –II OP-AMP Parameters
Ideal Op-amp, Op-amp parameters, input offset voltage, input offset current, input bias current, CMRR, SVRR, large signal voltage gain, Slew rate, Gain band width product, output resistance, supply currents power consumption inverting and non- inverting inputs.

UNIT –III Applications of OP-AMP
Inverting and non- inverting amplifier, summing, scaling and averaging amplifier, integrator and differentiator, Oscillator principle, oscillator types, frequency stability response, the phase shift oscillator Wein-bridge oscillator, L-C tunable oscillator, square wave generator.

UNIT –IV Microprocessors and Micro Computers
Microprocessor and Architecture: Intel 8086, Microprocessor architecture modes of memory addressing, 8086/8088 Hardware specification: Pin- outs and pin functions, clock generator (8284A) Bus buffering and latching, Bus timing, ready and wait state, minimum mode versus maximum mode.

UNIT –V Programming the Microprocessors
Addressing modes: Data addressing modes, program memory addressing modes, stack memory-addressing modes. Instruction set: data movement Instructions, Arithmetic and logic instructions, and Program control instructions, Programming example: Simple assembly language programs table handling direct table addressing, searching a table, sorting a table, pseudo oops.

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