

एम0ए0 हिन्दी स्नातकोत्तर पाठ्यक्रम
श्रीदेव सुमन उत्तराखण्ड राज्य विश्वविद्यालय, बादशाहीथौल, टिहरी गढ़वाल।

प्रथम वर्ष (प्रथम सत्र)

- पहला प्रश्न पत्र – हिन्दी साहित्य का इतिहास (आरम्भ से रीतिकाल तक)
दूसरा प्रश्न पत्र – आदिकालीन एवं निर्गुण काव्य
तीसरा प्रश्न पत्र – मध्यकालीन सगुण एवं रीतिकालीन काव्य
चौथा प्रश्न पत्र – हिन्दी साहित्य का इतिहास (भारतेन्दु युग से अब तक)

द्वितीय सत्र

- पांचवां प्रश्न पत्र – भारतीय काव्य शास्त्र एवं हिन्दी आलोचना
छठवां प्रश्न पत्र – आधुनिक गद्य (निबन्ध, नाटक एवं अन्य गद्य विधाएँ)
सातवां प्रश्न पत्र – उपन्यास एवं कथा साहित्य
आठवां प्रश्न पत्र – पाश्चात्य काव्य शास्त्र
नौवां प्रश्न पत्र – आधुनिक काव्य (भारतेन्दु युग से उत्तर छायावाद तक)

द्वितीय वर्ष (तृतीय सत्र)

- दसवां प्रश्न पत्र – भाषा विज्ञान एवं हिन्दी भाषा
ग्यारहवां प्रश्न पत्र – आधुनिक काव्य (छायावादोत्तर हिन्दी कविता)
बारहवां प्रश्न पत्र – (विकल्प) (क) लघु शोध प्रबन्ध
(ख) भारतीय साहित्य
(ग) जयशंकर प्रसाद
(घ) चंद्रकुंवर बर्तवाल
तेरहवां प्रश्न पत्र – (विकल्प) (क) सूरदास
(ख) तुलसीदास
(ग) हिन्दी नाटक और रंगमंच
(घ) प्रेमचन्द

चतुर्थ सत्र

- चौदहवां प्रश्न पत्र – भाषा विज्ञान और हिन्दी भाषा
पन्द्रहवां प्रश्न पत्र – प्रयोजन मूलक हिन्दी और मीडिया लेखन
सोलहवां प्रश्न पत्र – (विकल्प) (क) संस्कृत
(ख) गढ़वाली लोक साहित्य
(ग) अनुवाद : सिद्धान्त और प्रयोग
सत्रहवां प्रश्न पत्र – (विकल्प) (क) जनपदीय भाषा साहित्य (गढ़वाली भाषा साहित्य)
(ख) हिन्दी आलोचना साहित्य
(ग) अनुसंधान : प्रविधि और प्रक्रिया
अठारहवां प्रश्न पत्र – मौखिकी

Department of Political Science
Sri Dev Suman Uttarakhand Vishwavidhyalaya, Tehri

M.A. Courses

Pol. Sc.

The Masters (M.A.) Programme in Political Science shall be a 2 years programme divided in 4 Semesters. Each Semester shall consist of 4 Courses carrying 100 marks each. Admission to the Programme shall be granted on the basis of the recommendation of the Admission Committee of the Department made on the basis of merit and a personal interview. The number of seats in the Programme shall be such as notified in the Prospectus issued every year. A student taking the Programme shall be required to pass in the sessional test as well as course papers for completing the Programme in the duration of the Programme extendable in accordance with the Ordinances of the University governing the Masters Programmes.

Courses in the M.A. Programme at a Glance

FIRST SEMESTER

Course no.	Name of the Course
POL.SC.C-01	Western Ancient and Mediaval Political Thought <i>⊕ L.J.</i>
POL.SC.C-02	Comparative Politics <i>SK</i>
POL.SC.C-03	Indian Political System <i>SK</i>
POL.SC.C-04	Local Self Government in India <i>MK</i>

SECOND SEMESTER

Course no.	Name of the Course
POL.SC.C-05	Western Modern Political Thought <i>L.J.</i>
POL.SC.C-06	Modern Political Systems <i>⊕ SK</i>
POL.SC.C-07	India's Foreign Policy <i>MK</i>
POL.SC.C-08	Research Methodology <i>L.J.</i>
POL.SC.C-09	Viva-Voce

THIRD SEMESTER

Course no.	Name of the Course
POL.SC.C-10	Indian Political Thought <i>L.J. SK</i>
POL.SC.C-11	International Relations <i>⊕ L.J.</i>
POL.SC.E-12-A	Public Administration
POL.SC.E-13-A	International Organizations <i>M.K.</i>
POL.SC.E-14-B	Regional Development in India
POL.SC.E-15-B	Indian Administration <i>SK</i>

FOURTH SEMESTER

Course no.	Name of the Course
POL.SC.C-16	Theories of International Politics <i>L.J.</i>
POL.SC.C-17	International Law II <i>SK</i>
POL.SC.E-18-A	Political Philosophy of Mahatma Gandhi <i>MK</i>
POL.SC.E-19-A	Human Rights <i>MK</i>
POL.SC.E-20-B	Modern Political Analysis <i>SK</i>
POL.SC.E-21-B	Politics of Environment and Development <i>MK</i>
POL.SC.C-22	Dissertation / Viva

REVISED SYLLABUS OF CBCS (HINDI)

B.A. (PROGRAMME) HINDI

CORE COURSE (CC)

1. हिंदी साहित्य का इतिहास
2. मध्यकालीन हिंदी कविता
3. आधुनिक हिंदी कविता
4. हिंदी गद्य साहित्य

1. हिंदी साहित्य का इतिहास

काल विभाजन एवं नामकरण, आदिकालीन काव्य धाराएँ – सिद्ध, नाथ एवं जैन साहित्य, प्रमुख रासो काव्य, आदिकालीन हिन्दी साहित्य की सामान्य विशेषताएँ।

भक्ति आन्दोलन : सामाजिक-सांस्कृतिक पृष्ठभूमि, प्रमुख निर्गुण कवि, प्रमुख सगुण कवि, भक्तिकाल की सामान्य विशेषताएँ।

रीतिकाल की ऐतिहासिक पृष्ठभूमि, रीतिबद्ध, रीतिसिद्ध तथा रीतिमुक्त कवि।

1857 का स्वतंत्रता संघर्ष और हिन्दी नवजागरण, भारतेन्दु युगीन साहित्य की विशेषताएँ, महावीर प्रसाद द्विवेदी और उनका युग, द्विवेदी युग के प्रमुख गद्य लेखक और कवि, मैथिलीशरण गुप्त और राष्ट्रीय काव्यधारा।

हिन्दी में गद्य विधाओं का उद्भव और विकास – उपन्यास, कहानी, नाटक, निबंध।

2. मध्यकालीन हिंदी कविता

1. कबीरदास
2. सूरदास
3. तुलसीदास
4. मीराबाई
5. रसखान
6. बिहारी
7. भूषण
8. घनानंद

विश्वविद्यालय अपनी आवश्यकता एवं अपेक्षा के अनुरूप इन कवियों की रचनाएँ चयनित कर सकते हैं।

3. आधुनिक हिंदी कविता

1. भारतेन्दु हरिश्चन्द्र
2. अयोध्या सिंह उपाध्याय 'हरिऔध'
3. मैथिलीशरण गुप्त
4. जयशंकर प्रसाद
5. सूर्यकांत त्रिपाठी निराला
6. सच्चिदानंद हीरानंद वात्स्यायन 'अज्ञेय'
7. नागार्जुन
8. नरेश मेहता

विश्वविद्यालय अपनी आवश्यकता एवं अपेक्षा के अनुरूप इन कवियों की रचनाएँ चयनित कर सकते हैं।

4. हिंदी गद्य साहित्य

- | | | |
|-------------------------|---|----------------------|
| ● उपन्यास : त्यागपत्र | — | जैनेन्द्र कुमार |
| ● कहानी : नमक का दारोगा | — | प्रेमचंद |
| आकाशदीप | — | जयशंकर प्रसाद |
| परदा | — | यशपाल |
| वापसी | — | उषा प्रियंवदा |
| ● निबंध : लोभ और प्रीति | — | रामचंद्र शुक्ल |
| कुटज | — | हजारीप्रसाद द्विवेदी |

B.A. (PROGRAMME) HINDI

ABILITY ENHANCEMENT COMPULSORY COURSE (AECC)

1. हिंदी व्याकरण और संप्रेषण
2. हिंदी भाषा और संप्रेषण

1. हिंदी व्याकरण और संप्रेषण

- हिंदी व्याकरण एवं रचना – संज्ञा, सर्वनाम, विशेषण, क्रिया एवं अव्यय का परिचय। उपसर्ग, प्रत्यय तथा समास। पर्यायवाची शब्द, विलोम शब्द, अनेक शब्दों के लिए एक शब्द, शब्द शुद्धि, वाक्य शुद्धि, मुहावरे और लोकोक्तियां, पल्लवन एवं संक्षेपण।
- संप्रेषण की अवधारणा और महत्त्व
- संप्रेषण के प्रकार
- संप्रेषण के माध्यम
- संप्रेषण की तकनीक
- अध्ययन, वाचन एवं चर्चा : प्रक्रिया एवं बोध
- साक्षात्कार, भाषण कला एवं रचनात्मक लेखन

2. हिंदी भाषा और संप्रेषण

- भाषा की परिभाषा, प्रकृति एवं विविध रूप
- हिंदी भाषा की विशेषताएँ : क्रिया, विभक्ति, सर्वनाम, विश्लेषण एवं अव्यय संबंधी।
- हिंदी की वर्ण-व्यवस्था : स्वर एवं व्यंजन।
- स्वर के प्रकार – ह्रस्व, दीर्घ तथा संयुक्त।
- व्यंजन के प्रकार – स्पर्श, अन्तस्थ, ऊष्म, अल्पप्राण, महाप्राण, घोष तथा अघोष।
- वर्णों का उच्चारण स्थान : कण्ठ्य, तालव्य, मूर्द्धन्य, दन्त्य, ओष्ठ्य तथा दन्तोष्ठ्य।
- बलाघात, संगम, अनुतान तथा संधि।
- भाषा संप्रेषण के चरण : श्रवण, अभिव्यक्ति, वाचन तथा लेखन।
- हिंदी वाक्य रचना, वाक्य और उपवाक्य। वाक्य भेद। वाक्य का रूपान्तर।
- भावार्थ और व्याख्या, आशय लेखन, विविध प्रकार के पत्र लेखन।

B.A. (PROGRAMME) HINDI

SKILL ENHANCEMENT COURSE (SEC)

1. कार्यालयी हिन्दी
2. भाषा शिक्षण
3. अनुवाद विज्ञान
4. संभाषण कला
5. भाषा कम्प्यूटिंग
6. रंग आलेख एवं रंगमंच
7. चलचित्र लेखन
8. समाचार संकलन और लेखन

(उपर्युक्त में से कोई चार पाठ्यक्रम)

1. कार्यालयी हिन्दी

- हिन्दी भाषा के विभिन्न रूप—राष्ट्रभाषा, राजभाषा, जनभाषा।
- शिक्षण माध्यम—भाषा, संचार भाषा, सर्जनात्मक भाषा, यांत्रिक भाषा।
- राजभाषा का स्वरूप, भारतीय संविधान में राजभाषा संबंधी परिणियमावली का सामान्य परिचय, राजभाषा के रूप में हिन्दी के समक्ष व्यावहारिक कठिनाइयाँ एवं संभावित समाधान।
- टिप्पण (नोटिंग), प्रारूपण/आलेखन (ड्राफ्टिंग), पल्लवन, संक्षेपण।
- विभिन्न प्रकार के पत्राचार, प्रशासनिक पत्रावली की निष्पादन प्रक्रिया।
- पारिभाषिक शब्दावली।
- कार्यालयी प्रयोजनों में विभिन्न यांत्रिक उपकरणों का अनुप्रयोग — कम्प्यूटर, लैपटॉप, टैबलेट, टेलीप्रिंटर, टेलेक्स, वीडियो कान्फ्रेंसिंग।

2. भाषा शिक्षण

- हिन्दी भाषा एवं शब्द भण्डार — तत्सम, तद्भव, देशज, विदेशज, कृत्रिम।
- प्रतीक भाषा, मिथकीय भाषा, मूक—बधिर भाषा, ब्रेल लिपि प्रशिक्षण।
- भाषिक प्रशिक्षण के विभिन्न स्तर— प्रारंभिक कक्षाओं में, उच्च शिक्षा संस्थाओं में, हिन्दीतर भाषियों, विभाषियों— विदेशियों के बीच द्वितीय भाषा के रूप में।
- भाषा विज्ञान के मूलाधार— व्याकरण बोध, मानक वर्तनी का ज्ञान, शुद्ध वाक्य विन्यास, वैज्ञानिक उच्चारण, मानकीकृत देवनागरी लिपि का अभ्यास।
- पर्यायवाची, समानार्थक, विलोम, गूढ़ार्थवाची, समश्रुत, अनेक शब्दों के लिए एक शब्दयुग्म।
- देवनागरी लिपि का इतिहास तथा वैशिष्ट्य, देवनागरी की वैज्ञानिकता, कम्प्यूटरीकरण की दृष्टि से संक्षेपण, संशोधन की आवश्यकता।
- हिन्दी का अनुप्रयोगात्मक व्याकरण।
- शैली विज्ञान—प्रारंभिक परिचय।
- हिन्दी भाषा के विशिष्ट शब्दों का भारतीय भाषाओं के संदर्भ में तुलनात्मक अध्ययन।
- हिन्दी भाषा का भविष्य।

3. अनुवाद विज्ञान

- अनुवाद का तात्पर्य, अनुवाद के विभिन्न प्रकार – भाषान्तरण, सारानुवाद तथा रूपान्तरण में साम्य – वैषम्य। अनुवाद के प्रमुख प्रकार—कार्यालयी, साहित्यिक, ज्ञान—विज्ञानपरक, विधिक, वाणिज्यिक।
- अनुवाद के शिल्पगत भेद अविकल अनुवाद (लिटरल), भावानुवाद/छायानुवाद, आशु अनुवाद, डबिंग, कम्प्यूटर अनुवाद।
- साहित्यिक अनुवाद के प्रमुख रूप—काव्यानुवाद, कथानुवाद, नाट्यानुवाद।
- अनुवाद में पर्यवेक्षण (वेटिंग) की भूमिका।
- वैज्ञानिक तकनीकी शब्दावली का अनुवाद, मुहावरों/लोकोक्तियों का अनुवाद, संक्षिप्ताक्षरों तथा कूटपदों का अनुवाद, आंचलिक शब्दावली का अनुवाद, व्यंजनापरक लाक्षणिक पद प्रयोगों का अनुवाद।
- अनुवाद की सम्पादन प्रविधि।
- अनुवादक की अर्हता और सफल अनुवाद के अभिलक्षण।
- विश्व भाषाओं की प्रमुख कृतियों के हिन्दी अनुवाद एवं हिन्दी की प्रमुख कृतियों के विश्वभाषाओं में किये गये अनुवाद।
- भारत में अनुवाद प्रशिक्षण के प्रमुख केन्द्र, अनुवाद के राष्ट्रीय प्राधिकरण के गठन की आवश्यकता।
- हिन्दी अनुवाद का भविष्य।

4. संभाषण कला

- संभाषण का अर्थ। संभाषण के विभिन्न रूप—वार्तालाप, व्याख्यान, वाद विवाद, एकलाप, अवाचिक अभिव्यक्ति, जन संबोधन।
- जन सम्पर्क में वाक्कला की उपयोगिता
- संभाषण कला के प्रमुख उपादान – यथेष्ट भाषा ज्ञान, मानक उच्चारण, सटीक प्रस्तुति, अन्तराल ध्वनि (वाल्जूम), वेग, लहजा (एक्सेण्ट)
- संभाषण कला के विभिन्न रूप, उद्घोषणा कला (अनाउन्सेमेंट), आंखों देखा हाल (कमेन्ट्री), संचालन (एंकरिंग) वाचन कला, समाचार वाचन (रेडियो, टी. वी.) मंचीय वाचन (कविता, कहानी, व्यंग्य आदि)
- वाद—विवाद प्रतियोगिता एवं समूह संवाद।
- लोक प्रशासन, जनसम्पर्क एवं विपणन के विकास में संभाषण कला का योगदान।
- संवादी भाषा (कनवर्सेशनल लैंग्वेज) के रूप में हिन्दी की भाषिक संवेदना की विवेचना।

5. भाषा कम्प्यूटिंग

- कम्प्यूटर प्रबंधन—हार्डवेयर, सॉफ्टवेयर, प्रमुख एप्लीकेशन पैकेज, वेबसाइट, ई-मेल, वेब सर्फिंग।
- इलेक्ट्रॉनिक मीडिया, सी.डी., मोबाइल और किंडल, मैग्जीन का निर्माण।
- मल्टीमीडिया की कार्य प्रणाली।
- कम्प्यूटर में डाटा प्रविष्टि, स्मृति (मेमोरी), सूचना संग्रहण।
- कम्प्यूटर मुद्रण।
- सूचना प्रौद्योगिकी का स्वरूप।
- संचार प्रौद्योगिकी की प्रयोजनीय शब्दावली।
- संचार भाषा के रूप में हिन्दी की उपलब्धियाँ।
- कम्प्यूटर में हिन्दी के विभिन्न अनुप्रयोग।
- कम्प्यूटर अनुवाद।
- रेडियो और टेलीविजन के कम्प्यूटर साधित कार्यक्रम।

6. रंग आलेख एवं रंगमंच

- नाटक के प्रमुख प्रकार और उनका रचना विधान—पूर्णाकी, एकांकी, लोकनाटक, प्रहसन, काव्यनाटक, नुक्कड़ नाटक, प्रतीकनाटक, भावनाटक, पाठ्यनाटक, रेडियो नाटक, टीवी नाटक।
- हिन्दी नाट्यशास्त्र और नाट्यलेखन का इतिहास
हिन्दी नाटक की प्रमुख प्रवृत्तियाँ – सामाजिक, सांस्कृतिक, ऐतिहासिक, समस्यामूलक तथा एबसर्ड नाटक।
- हिन्दी के प्रमुख नाटक और नाटककार।
- हिन्दी रंगमंच के प्रमुख रूप –1.शौकिया मंच 2. व्यावसायिक मंच 3. सरकारी मंच।
- हिन्दी क्षेत्र की प्रसिद्ध रंगशालाएं तथा संस्थाएं।
- रंग शिल्प प्रशिक्षण, रंग स्थापत्य, रंग सज्जा, रंग दीपन, ध्वनि व्यवस्था एवं प्रसाधन, निर्देशन एवं अभिनय। रंगमंचीय भाषा की विशेषताएं।
- रंग आलेख की प्रविधि – वस्तुविधान, पात्र परिकल्पना, परिस्थिति योजना, संवाद लेखन का वैशिष्ट्य, रंग निर्देशों की उपयोगिता।
- रंग समीक्षा का महत्त्व।

7. चलचित्र लेखन

- भारतीय सिनेमा का इतिहास।
- हिन्दी की आरंभिक मूक और सवाक् फिल्में।
- विगत शताब्दी की लोकप्रिय हिन्दी फिल्में, लोकप्रिय फिल्मी गीत तथा प्रसिद्ध संवाद।
- प्रमुख निर्देशक एवं अभिनेता।
- हॉलीवुड फिल्मों की हिन्दी डबिंग।
- बॉलीवुड का हिन्दी फिल्मी उद्योग।
- फिल्म निर्माण की प्रक्रिया।
- हिन्दी पटकथा लेखन (सिनेरियो) का क्रमिक विकास, संवाद लेखन—प्रणाली या प्रविधि।
- रीमेक फिल्मों का भाषिक पक्ष, समकालीन हिन्दी फिल्मों की भाषिक संरचना।
- वृत्त चित्र की निर्माण पद्धति, फीचर।
- हिन्दी में निर्मित विज्ञापन फिल्में (एड्—फिल्में)।
- फिल्मी अभिनेताओं द्वारा उच्चारित संवादों का स्वनिम के आधार पर विश्लेषण।
- हिन्दी की विश्व व्याप्ति में फिल्मों की भूमिका। हिन्दी की प्रमुख फिल्मों के आधार पर भाषिक संरचना का व्यावहारिक प्रशिक्षण— देवदास (तीनों निर्मितियाँ) तथा शोले।

8. समाचार संकलन और लेखन

- समाचार : अवधारणा, परिभाषा, बुनियादी तत्व, समाचार और संवाद, संरचना (घटक), समाचार मूल्य। समाचार के स्रोत।
- समाचार संग्रह—पद्धति और लेखन—प्रक्रिया : सिद्धान्त और मार्गदर्शक बातें। विकासशील और जनरुचि की दृष्टियाँ।
- समाचार का वर्गीकरण। खोजी, व्याख्यात्मक, अनुवर्तन समाचार।
- संवाददाता : भूमिका, अर्हता, श्रेणियाँ, प्रकार्य एवं व्यवहार—संहिता।
- रिपोर्टिंग के क्षेत्र और प्रकार : विधायिका, न्यायपालिका, मंत्रालय और प्रशासन, विदेश, रक्षा, राजनीति, अपराध और न्यायालय, दुर्घटना एवं नैसर्गिक आपदा, ग्रामीण, कृषि, विकास, अर्थ एवं वाणिज्य, बैठकें एवं सम्मेलन, संगोष्ठी, पत्रकार वार्ता, साहित्य एवं संस्कृति, विज्ञान, अनुसंधान एवं तकनीकी विषय, खेलकूद, पर्यावरण, मानवाधिकार और अन्य सामाजिक विषयों और क्षेत्रों से सम्बन्धित रिपोर्टिंग।
- इलेक्ट्रॉनिक माध्यमों से प्राप्त समाचारों का पुनर्लेखन।
- लीड : अर्थ, प्रकार, विशेषता, महत्त्व।
- शीर्षक : अर्थ, प्रकार, लिखने की कला, महत्त्व।
- रिपोर्टिंग : कला और विज्ञान के रूप में विश्लेषण, वस्तुपरकता और भाषा—शैली।

B.A. (PROGRAMME) HINDI
DISCIPLINE SPECIFIC ELECTIVE (DSE)

1. लोक साहित्य
2. कबीर
3. तुलसीदास
4. सूर्यकांत त्रिपाठी 'निराला'
5. छायावादोत्तर हिंदी कविता
6. हिन्दी की राष्ट्रीय काव्यधारा
7. हिंदी निबंध
8. रेखाचित्र तथा संस्मरण
9. प्रयोजनपरक हिंदी

(उपर्युक्त में से कोई चार पाठ्यक्रम)

1. लोक साहित्य

लोक साहित्य— परिभाषा एवं स्वरूप, लोक साहित्य के विशिष्ट अध्येता, लोक संस्कृति — अवधारणा, लोक संस्कृति और साहित्य, लोक साहित्य के अध्ययन की प्रक्रिया, लोक साहित्य के संकलन की समस्याएँ।

लोक साहित्य के प्रमुख रूप— लोक गीत, लोक नाट्य, लोक कथा, लोकगाथा, लोकोक्ति

लोकगीत — संस्कार गीत, व्रतगीत, श्रम परिहार गीत, ऋतुगीत।

लोकनाट्य — रामलीला, स्वांग, यक्षगान, भवाई, माच, तमाशा, नौटंकी, जात्रा, कथकली।

लोककथा — व्रतकथा, परीकथा, नागकथा, बोधकथा। कथानक रूढ़ियाँ एवं अभिप्राय, लोककथा निर्माण में अभिप्राय

लोकगाथा — लोकगाथा की भारतीय परम्परा, लोकगाथा की सामान्य प्रवृत्तियाँ, लोकगाथा प्रस्तुति।

प्रसिद्ध लोकगाथाएँ — ढोला—मारू, गोपीचन्द—भरथरी, लोरिकायन, नल—दमयन्ती, लैला—मजनूँ, हीरा—राँझा, सोहनी—महीवाल।

2. कबीरदास

पाठ्य पुस्तक : कबीर ग्रंथावली (सम्पादक—श्यामसुन्दर दास) अथवा

कबीर : आचार्य हजारी प्रसाद द्विवेदी

विश्वविद्यालय साखियों एवं पदों का चयन उपर्युक्त पुस्तकों में से कर सकते हैं।

3. तुलसीदास

1. रामचरित मानस : अयोध्याकाण्ड (दोहा संख्या 67 से 185 तक) गीताप्रेस, गोरखपुर
2. कवितावली गीताप्रेस, गोरखपुर (केवल उत्तर काण्ड, 30 छंद) छंद संख्या 29,35, 37, 44, 45, 60, 67, 73, 74, 84, 88, 89, 102, 103, 108, 119, 122, 126, 132, 134, 136, 140, 141, 146, 153, 155, 161, 165, 182, 229
3. गीतावली (केवल बालकाण्ड 20 पद) गीताप्रेस गोरखपुर — पद संख्या 7, 8, 9, 10, 18, 24, 26, 31, 33, 36, 44, 73, 95, 97, 101, 104, 105, 106, 107, 110
4. विनय पत्रिका—गीताप्रेस गोरखपुर (चुने हुए कुल 40 पद) पद संख्या 1, 5, 17, 30, 36, 41, 45, 72, 78, 79, 85, 89, 90, 94, 100, 101, 102, 103, 104, 105, 111, 113, 114, 115, 121, 159, 160, 164, 165, 166, 167, 182, 201, 269, 272

4. सूर्यकांत त्रिपाठी 'निराला'

कविताएँ

1. सखि, वसन्त आया
2. जुही की कली
3. जागो फिर एक बार : 2
4. बादल-राग - 6
5. वर दे वीणावादिनी वर दे!
6. भारति, जय विजय करे!
7. तोड़ती पत्थर
8. बाहर मैं कर दिया गया हूँ
9. स्नेह-निर्झर बह गया है
10. गहन है यह अन्धकारा

कथा साहित्य-बिल्लेसुर बकरिहा

5. छायावादोत्तर हिंदी कविता

1. सच्चिदानंद हीरानंद वात्स्यायन 'अज्ञेय'
 - कलगी बाजरे की
 - यह दीप अकेला
2. गजानन माधव मुक्तिबोध
 - भूल गलती
 - एक रंग का राग
3. नागार्जुन
 - अकाल और उसके बाद
 - कालिदास
4. शमशेर बहादुर सिंह
 - सूना सूना पथ है, उदास झरना
 - वह सलोना जिस्म
5. भवानी प्रसाद मिश्र
 - कहीं नहीं बचे
 - गीत फरोश
6. कुँवर नारायण
 - नचिकेता
7. सर्वेश्वरदयाल सक्सेना
 - मैंने कब कहा
 - हम ले चलेंगे
8. केदारनाथ सिंह
 - रचना की आधीरात
 - फर्क नहीं पड़ता

6. हिंदी की राष्ट्रीय काव्यधारा

1. मैथिलीशरण गुप्त
2. माखनलाल चतुर्वेदी
3. बालकृष्ण शर्मा 'नवीन'
4. सोहनलाल द्विवेदी
5. रामधारी सिंह 'दिनकर'
6. श्याम नारायण पाण्डेय
7. सुभद्रा कुमारी चौहान

विश्वविद्यालय अपनी आवश्यकता एवं अपेक्षा के अनुरूप इन कवियों की रचनाएँ चयनित कर सकते हैं।

7. हिंदी निबंध

1. बालकृष्ण भट्ट – साहित्य जनसमूह के हृदय का विकास है
2. चन्द्रधर शर्मा गुलेरी – कछुआ धरम
3. रामचन्द्र शुक्ल – कविता क्या है?
4. हजारी प्रसाद द्विवेदी – अशोक के फूल
5. महादेवी वर्मा – जीने की कला
6. रामधारी सिंह 'दिनकर' – भारत की सांस्कृतिक एकता
7. हरिशंकर परसाई – पगडण्डियों का जमाना
8. विद्यानिवास मिश्र – अस्ति की पुकार हिमालय
9. निर्मल वर्मा – अतीत : एक आत्म-मन्थन
10. कुबेरनाथ राय – एक महाकाव्य का जन्म

8. रेखाचित्र तथा संस्मरण

रेखाचित्र	शिवपूजन सहाय – महाकवि जयशंकर प्रसाद सेठ गोविन्ददास – मकदूम बख्श बनारसी चतुर्वेदी – बाईस वर्ष बाद हजारी प्रसाद द्विवेदी – एक कुत्ता और एक मैना विष्णुकांत शास्त्री – ये हैं प्रोफेसर शशांक
संस्मरण :	अज्ञेय – स्मरण का स्मृतिकार (राय कृष्णदास) नगेन्द्र – दादा स्व. पं. बालकृष्ण शर्मा नवीन माखनलाल चतुर्वेदी – तुम्हारी स्मृति महादेवी वर्मा – निराला भाई

9. प्रयोजनपरक हिंदी

- प्रयोजनपरक हिन्दी : अवधारणा और विविध क्षेत्र
- प्रयोजनपरक हिन्दी के सर्जनात्मक आयाम

माध्यम लेखन :

- विविध संचार माध्यम : परिचय एवं कार्यविधि
 - श्रव्य माध्यम : रेडियो
 - श्रव्य-दृश्य माध्यम : टेलीविजन और फिल्म
 - तकनीकी माध्यम : इंटरनेट
 - मिश्र माध्यम : विज्ञापन
 - समाचार पत्र
- संचार माध्यमों की प्रकृति और चरित्र
- रेडियो-लेखन : उद्घोषणा, कार्यक्रम-संयोजन (कंपेयरिंग) समाचार, धारावाहिक, फीचर, रिपोर्ट, रेडियो नाटक, अवयव, रूप और प्रविधि।
- इंटरनेट : सामग्री-सृजन, संयोजन एवं प्रेषण।

अनुवाद :

- अनुवाद की परिभाषा, स्वरूप और महत्त्व
- अनुवाद के प्रकार

B.A. (PROGRAMME) HINDI
GENERIC ELECTIVE COURSE (GEC)

1. कला और साहित्य
2. संगीत एवं साहित्य
3. पाश्चात्य दार्शनिक चिंतन एवं हिन्दी साहित्य
4. आधुनिक भारतीय कविता
5. आधुनिक भारतीय साहित्य
6. संपादन प्रक्रिया और साज सज्जा
7. सर्जनात्मक लेखन के विविध क्षेत्र
8. हिन्दी की सांस्कृतिक पत्रकारिता

(उपर्युक्त में से कोई दो पाठ्यक्रम)

1. कला और साहित्य

- कला और साहित्य का अंतस्संबंध
- कला और समाज का अंतस्संबंध
- कला में दीर्घजीविता के तत्व और उपकरण
- भारतीय कला का विकास
- भारतीय कला का सौंदर्यशास्त्रीय महत्व
- कला और हिन्दी साहित्य के सम्बंध की परंपरा
- लोक-कला और साहित्य
- साहित्य के मूल्यांकन में कला का महत्व
- भारतीय नाट्य कला

2. संगीत एवं साहित्य

- साहित्य और संगीत के अंतस्संबंध
- वैदिक संगीत: सामान्य परिचय
- हिन्दुस्तानी और कर्नाटक संगीत : सामान्य परिचय
- आचार्य भरत और संगीत
- राग और रागनियों तथा उनका गायन समय
- मध्यकालीन वाद्य यंत्र
- सूफी साहित्य और संगीत
- संत साहित्य का संगीतात्मक ग्रंथन विधान
- गुरु ग्रंथ साहिब और संगीत परंपरा
- वैष्णव साहित्य और संगीत
- प्रसाद और निराला के काव्य में संगीतात्मकता

3. पाश्चात्य दार्शनिक चिंतन एवं हिंदी साहित्य

- अभिव्यंजनावाद
- स्वच्छंदतावाद
- अस्तित्त्ववाद
- मनोविश्लेषणवाद
- मार्क्सवाद
- आधुनिकतावाद
- संरचनावाद
- कल्पना, बिंब, फैंटेसी
- मिथक एवं प्रतीक

4. आधुनिक भारतीय कविता

असमिया

- नवकान्त बरुआ
- नीलमणि फूकन
- उर्दू
- गालिब
- फ़िराक़ गोरखपुरी
- तमिल
- सुब्रमण्यम भारती
- वैरमुत्तु
- बांग्ला
- रवीन्द्रनाथ ठाकुर
- काज़ी नज़रुल इस्लाम
- संस्कृत
- श्रीधर भास्कर वर्णेकर
- राधावल्लभ त्रिपाठी
- गुजराती
- उमाशंकर जोशी
- संस्कृति रानी देसाई
- कश्मीरी
- रहमान राही
- चंद्रकांता

विश्वविद्यालय अपनी आवश्यकता एवं अपेक्षा के अनुसार इनकी कविताओं का चयन कर सकते हैं।

5. आधुनिक भारतीय साहित्य

- स्वाधीनता संग्राम और भारतीय नवजागरण तथा उसका भारतीय साहित्य पर प्रभाव
- भारतीय साहित्य और राष्ट्रीयता
- महात्मा गांधी और महर्षि अरविंद का भारतीय साहित्य पर प्रभाव
- मार्क्सवाद एवं अस्तित्ववाद का भारतीय साहित्य पर प्रभाव
- पाठ्यपुस्तकें (उपन्यास) –
आनंद मठ – बंकिम चंद्र
मृत्युंजय – शिवाजी सावंत
आवरण – भैरप्पा
- सुब्रमण्यम भारती की कविताएँ
विश्वविद्यालय अपनी अपेक्षानुसार चयनित कर सकते हैं।

6. संपादन प्रक्रिया और साज-सज्जा

- संपादन : अवधारणा, उद्देश्य, आधारभूत तत्त्व, निष्पक्षता और सामाजिक संदर्भ, समाचार विश्लेषण, संपादन-कला के सामान्य सिद्धान्त।
- संपादक और उपसंपादक : योग्यता, दायित्व और महत्त्व।
- समाचार मूल्य, लीड, आमुख, शीर्षक-लेखन आदि प्रत्येक दृष्टि से चयनित सामग्री का मूल्यांकन और संपादन। संपादन चिह्न और वर्तनी पुस्तिका। प्रिंट मीडिया की प्रयोजनपरक शब्दावली।
- संपादकीय लेखन : प्रमुख तत्त्व एवं प्रविधि। संपादकीय का सामाजिक प्रभाव।
- समाचार पत्र और पत्रिका के विविध स्तम्भों की योजना और उनका संपादन। साहित्य और कला जगत की सामग्री के संपादन की विशेषताएँ। छायाचित्र, कार्टून, रेखाचित्र, ग्राफिक्स आदि का संपादन।
- हिन्दी के राष्ट्रीय और प्रांतीय समाचार पत्रों की भाषा, आंचलिक प्रभाव और वर्तनी की समस्याएँ।
- साज-सज्जा और तैयारी : ग्राफिक्स और आकल्पन के मूलभूत सिद्धान्त। मुद्रण के तरीके, दैनिक समाचार पत्र का पृष्ठ-निर्माण (डमी), पत्रिका की साज-सज्जा, रंग-संयोजन।

7. सर्जनात्मक लेखन के विविध क्षेत्र

- रिपोर्ताज : अर्थ, स्वरूप, रिपोर्ताज एवं अन्य गद्य रूप, रिपोर्ताज और फीचर लेखन—प्रविधि।
- फीचर लेखन : विषय—चयन, सामग्री—निर्धारण, लेखन—प्रविधि। सामाजिक, आर्थिक, सांस्कृतिक, विज्ञान, पर्यावरण, खेलकूद से सम्बद्ध विषयों पर फीचर लेखन।
- साक्षात्कार (इण्टरव्यू/भेंटवार्ता) : उद्देश्य, प्रकार, साक्षात्कार—प्रविधि, महत्त्व।
- स्तंभ लेखन : समाचार पत्र के विविध स्तंभ, स्तंभ लेखन की विशेषताएँ, समाचार पत्र और सावधि पत्रिकाओं के लिए समसामयिक, ज्ञानवर्धक और मनोरंजक सामग्री का लेखन। सप्ताहांत अतिरिक्त सामग्री और परिशिष्ट।
- दृश्य—सामग्री (छायाचित्र, कार्टून, रेखाचित्र, ग्राफिक्स आदि) से संबन्धित लेखन।
- बाजार, खेलकूद, फिल्म, पुस्तक और कला समीक्षा।
- आर्थिक पत्रकारिता, खेल पत्रकारिता, ग्रामीण और विकास पत्रकारिता, फोटो पत्रकारिता।

8. हिन्दी की सांस्कृतिक पत्रकारिता

- सांस्कृतिक पत्रकारिता : अवधारणा, अर्थ और महत्त्व। परम्परागत, आधुनिक और उत्तर आधुनिक समाज। संस्कृति, लोकसंस्कृति, लोकप्रिय संस्कृति, अपसंस्कृति। बाजार, संस्कृति और संचार माध्यम।
- सांस्कृतिक संवाद : अर्थ, भेद और विशेषताएँ। सांस्कृतिक संवाददाता की योग्यताएँ : आस्वादन, अन्वीक्षण, कल्पनाशीलता आदि। सांस्कृतिक संवाद के क्षेत्रों का परिचय – मंचकला, पर्यटन, पुरातत्व संग्रहालय आदि।
- मंचकला और पत्रकारिता : रंगमंच; संगीत—गायन, वादन (ताल वाद्य, तंत्र वाद्य) और नृत्य के कार्यक्रम संवाद लेखन और समीक्षा। चित्रकला (पेंटिंग, ग्राफिक, टेक्सटाल डिजाइन), शिल्पकला, स्थापत्य कला के कार्यक्रम : संवाद लेखन और समीक्षा।
- पर्यटन पत्रकारिता – प्रमुख धार्मिक स्थलों, स्मारकों और प्राकृतिक सम्पदाओं का परिचय : संवाद लेखन और समीक्षा। छायाचित्र (फोटोग्राफी) और चित्र पत्रकारिता: जनसंचार माध्यम के रूप में छायाचित्र, छायाचित्र लेने की तरीके, उपकरण और प्रयोग की विधि।
- चित्र पत्रकारिता : सिद्धान्त और व्यवहार, चित्र सम्पादन, सचित्र रूपक (फीचर), प्रदर्शनी।
- चलचित्र (छायाछवि/फिल्म) पत्रकारिता: संचार माध्यम के रूप में फिल्म और विडियो, लघुफिल्म, वृत्तचित्र, धारावाहिक : परिचय और विकास; फिल्म पृष्ठ का आकल्पन और अभिविन्यास।

Structure of B.A./B.Com. under CBCS

English

Semester 1

AECC: English Communication Skills/MIL/EVS

DSC 1A: The Individual and Society. Eds

Semester 2

AECC: English Communication Skills/MIL/EVS

DSC 1B: Selections (poems, short stories) from Modern Indian Literature

Semester 3

DSC 1C: British Literature

Novel

Play

AEEC -1: Creative Writing, Book and Media Reviews

Semester 4

DSC 1D: Literary Cross Currents

Selections from Living Literatures-An Anthology of Prose and Poetry Eds.Vinay Sood, et al. Orient Longman

Novella

Play

AEEC-2: Translation Studies and Principles of Translation

Semester 5

AEEC-3: Technical Writing

DSE-1A: Soft Skills

GE-1: Gender and Human Rights/Contemporary India: Women and Empowerment

Semester 6

AEEC- 4: Business Communication

DSE-1B: Academic Writing

GE -2: Cultural Diversity

Detailed Syllabus

DSC 1-A: The Individual and Society. Selections from Vinod Sood, et. al., eds., *The Individual and Society: Essays, Stories and Poems* (Delhi: Pearson, 2005).

1-B: Cultural Diversity. Eds. Sukrita Paul Kumar, Macmillan

1-C: Charles Dickens: *Oliver Twist*

William Shakespeare: *The Merchant of Venice*

1-D: Selections from *Modern Indian Literature* ed. Dept. of English /Living

Literatures ed .Macmillan

Short Stories: Premchand, 'The Holy Panchayat'

R.K. Narayan, 'The M.C.C.'

Vaikom Muhammad Basheer , 'The Card-Sharper's Daughter'

Saadat Hasan Manto, 'Toba Tek Singh'

Ambai, 'Squirrel'

Ismat Chughtai, 'Lihaaf' /'The sacred Duty'

Play: Vijay Tendulkar---*Silence, The Court is in Session*

Novella: Rohinton Mistry---*Such a Long Journey*

Compulsory: English/MIL Communication

English Communication

Credits: 2

Preamble:

The purpose of this course is to introduce students to the theory, fundamentals and tools of communication and to develop in them vital communication skills which should be integral to personal, social and professional interactions. One of the critical links among human beings and an important thread that binds society together is the ability to share thoughts, emotions and ideas through various means of communication: both verbal and non-verbal. In the context of rapid globalization and increasing recognition of social and cultural pluralities, the significance of clear and effective communication has substantially enhanced.

The present course hopes to address some of these aspects through an interactive mode of teaching-learning processes and by focusing on various dimensions of communication skills. Some of these are:

Language of communication, various speaking skills such as personal communication, social interactions and communication in professional situations such as interviews, group discussions and office environments, important reading skills as well as writing skills such as report writing, note-taking etc.

While, to an extent, the art of communication is natural to all living beings, in today's world of complexities, it has also acquired some elements of science. It is hoped that after studying this course, students will find a difference in their personal and professional interactions.

The recommended readings given at the end are only suggestive; the students and teachers have the freedom to consult other materials on various units/topics given below. Similarly, the questions in the examination will be aimed towards assessing the skills learnt by the students rather than the textual content of the recommended books.

Units:

Introduction: Theory of Communication, Types and modes of Communication

Language of Communication:

- Verbal and Non-verbal
(Spoken and Written)
- Personal, Social and Business
- Barriers and Strategies
- Intra Personal, Inter Personal and Group Communication

Speaking Skills:

- Monologue
- Dialogue
- Group Discussion
- Effective Communication/ Mis- Communication
- Interview
- Public Speech

Reading and Understanding

- Close Reading
- Comprehension
- Summary Paraphrasing
- Analysis and Interpretation
- Translation(from Indian language to English and vice-versa)
Literary/Knowledge Texts

Writing Skills

- Documenting
- Report Writing
- Making notes
- Letter Writing

The Communicative Language Course in English is a **three-tiered** structure, addressing different levels of language learning acquired in school. The three streams **A, B** and **C** are offered to students who have studied English up to class XII, class X and class VIII **respectively**.

Following is a list of **Recommended Readings** to engage with various genres as part of the process of enhancing Listening, Reading, Writing and Speaking skills.

Stream A (For students who have studied English up to Class XII):

1. *Language through Literature* (forthcoming) ed. Dr. Gauri Mishra, Dr Ranjana Kaul, Dr Brat iBiswas
2. Fluency in English Part II Oxford University Press, 2006
3. *Business English*, Pearson, 2008.

Stream B: (For students who have studied English upto Class X)

1. Language Literature and Creativity, Editorial Board, Orient BlackSwan, 2013.
2. Developing Language Skills-2 Ed. S.C. Sood et al. Spantech, Delhi 1992

Stream C: (For students who have studied English upto class VIII)

1. Foundation English, Book II and III, Edited by Tara Chadha and Others, Publication Division, Delhi University.
2. Developing Language Skills-1 Ed. S.C. Sood et al. Spantech, Delhi 1991

Further recommendations for Language structures and functional English the following may be used across all streams:

1. Fluency in English Part 1
2. English at the Workplace Parts 1 and 2, Edited by Promodini Varma and Others, Oxford University Press, 2006.
3. Strengthen Your English, M. Bhaskaran and D. Horsburgh, Oxford University Press, Delhi 1973

Any other related Reading which has worked well in interactive pedagogy may be recommended and circulated through U.G.C.

Proposed Syllabus and Scheme of Examination

for

B.Sc. with Mathematics

submitted to

*University Grants Commission
New Delhi*

under the

Choice Based Credit System

May 2015

**Proposed Scheme for Choice Based Credit System in
B.Sc. with Mathematics**

Semester	Core Course (12)	Ability Enhancement Compulsory Course (AECC) (2)	Skill Enhancement Course (SEC) (2)	Discipline Specific Elective (DSE) (6)
1	Differential Calculus	AECC1		
	C2A			
	C3A			
2	Differential Equations	AECC2		
	C2B			
	C3B			
3	Real Analysis		SEC1	
	C2C			
	C3C			
4	Algebra		SEC2	
	C2D			
	C3D			
5			SEC3	DSE1A
				DSE2A
				DSE3A
6			SEC4	DSE1B
				DSE2B
				DSE3B

Discipline Specific Electives (DSE)

DSE 1A (choose one)

1. Matrices
2. Mechanics
3. Linear Algebra

DSE 1B (choose one)

1. Numerical Methods
2. Complex Analysis
3. Linear Programming

Skill Enhancement Course (SEC)

SEC 1 (choose one)

1. Logic and Sets
2. Analytical Geometry
3. Integral Calculus

SEC 2 (choose one)

1. Vector Calculus
2. Theory of Equations
3. Number Theory

SEC 3 (choose one)

1. Probability and Statistics
2. Mathematical Finance
3. Mathematical Modeling

SEC 4 (choose one)

1. Boolean Algebra
2. Transportation and Game Theory
3. Graph Theory

Details of Courses under B.Sc. with Mathematics

Course	*Credits	
	Theory + Practical	Theory + Tutorials
I. Core Course (12 Papers) 04 Courses from each of the 03 disciplines of choice	$12 \times 4 = 48$	$12 \times 5 = 60$
Core Course Practical / Tutorial* (12 Practical/ Tutorials*) 04 Courses from each of the 03 Disciplines of choice	$12 \times 2 = 24$	$12 \times 1 = 12$
II. Elective Course (6 Papers) Two papers from each discipline of choice including paper of interdisciplinary nature.	$6 \times 4 = 24$	$6 \times 5 = 30$
Elective Course Practical / Tutorials* (6 Practical / Tutorials*) Two Papers from each discipline of choice including paper of interdisciplinary nature	$6 \times 2 = 12$	$6 \times 1 = 6$
• Optional Dissertation or project work in place of one Discipline elective paper (6 credits) in 6th Semester		
III. Ability Enhancement Courses		
1. Ability Enhancement Compulsory (2 Papers of 2 credits each) Environmental Science English/MIL Communication	$2 \times 2 = 4$	$2 \times 2 = 4$

2. Skill Enhancement Course $4 \times 2 = 8$
(Skill Based) (4 Papers of 2 credits each)

$4 \times 2 = 8$

Total credit = 120

Total credit = 120

Institute should evolve a system/ policy about ECA/ General Interest/ Hobby/ Sports/ NCC/ NSS/ related courses on its own.

***wherever there is practical there will be no tutorials and vice -versa**

Core 1.1: Differential Calculus

Limit and Continuity (ϵ and δ definition), Types of discontinuities, Differentiability of functions, Successive differentiation, Leibnitz's theorem, Partial differentiation, Euler's theorem on homogeneous functions.

Tangents and normals, Curvature, Asymptotes, Singular points, Tracing of curves. Parametric representation of curves and tracing of parametric curves, Polar coordinates and tracing of curves in polar coordinates.

Rolle's theorem, Mean Value theorems, Taylor's theorem with Lagrange's and Cauchy's forms of remainder, Taylor's series, Maclaurin's series of $\sin x$, $\cos x$, e^x , $\log(1+x)$, $(1+x)^m$, Maxima and Minima, Indeterminate forms.

Books Recommended

1. H. Anton, I. Birens and S. Davis, *Calculus*, John Wiley and Sons, Inc., 2002.
2. G.B. Thomas and R.L. Finney, *Calculus*, Pearson Education, 2007.

Core 2.1: Differential Equations

First order exact differential equations. Integrating factors, rules to find an integrating factor. First order higher degree equations solvable for x , y , p . Methods for solving higher-order differential equations. Basic theory of linear differential equations, Wronskian, and its properties. Solving a differential equation by reducing its order.

Linear homogenous equations with constant coefficients, Linear non-homogenous equations, The method of variation of parameters, The Cauchy-Euler equation, Simultaneous differential equations, Total differential equations.

Order and degree of partial differential equations, Concept of linear and non-linear partial differential equations, Formation of first order partial differential equations, Linear partial differential equation of first order, Lagrange's method, Charpit's method.

Classification of second order partial differential equations into elliptic, parabolic and hyperbolic through illustrations only.

Books Recommended

1. Shepley L. Ross, *Differential Equations*, 3rd Ed., John Wiley and Sons, 1984.
2. I. Sneddon, *Elements of Partial Differential Equations*, McGraw-Hill, International Edition, 1967.

Core 3.1: Real Analysis

Finite and infinite sets, examples of countable and uncountable sets. Real line, bounded sets, suprema and infima, completeness property of \mathbb{R} , Archimedean property of \mathbb{R} , intervals. Concept of cluster points and statement of Bolzano-Weierstrass theorem.

Real Sequence, Bounded sequence, Cauchy convergence criterion for sequences. Cauchy's theorem on limits, order preservation and squeeze theorem, monotone sequences and their convergence (monotone convergence theorem without proof).

Infinite series. Cauchy convergence criterion for series, positive term series, geometric series, comparison test, convergence of p-series, Root test, Ratio test, alternating series, Leibnitz's test (Tests of Convergence without proof). Definition and examples of absolute and conditional convergence.

Sequences and series of functions, Pointwise and uniform convergence. M_n -test, M-test, Statements of the results about uniform convergence and integrability and differentiability of functions, Power series and radius of convergence.

Books Recommended

1. T. M. Apostol, *Calculus* (Vol. I), John Wiley and Sons (Asia) P. Ltd., 2002.
2. R.G. Bartle and D. R Sherbert, *Introduction to Real Analysis*, John Wiley and Sons (Asia) P. Ltd., 2000.
3. E. Fischer, *Intermediate Real Analysis*, Springer Verlag, 1983.
4. K.A. Ross, *Elementary Analysis- The Theory of Calculus Series-* Undergraduate Texts in Mathematics, Springer Verlag, 2003.

Core 4.1: Algebra

Definition and examples of groups, examples of abelian and non-abelian groups, the group Z_n of integers under addition modulo n and the group $U(n)$ of units under multiplication modulo n . Cyclic groups from number systems, complex roots of unity, circle group, the general linear group $GL_n(n, \mathbb{R})$, groups of symmetries of (i) an isosceles triangle, (ii) an equilateral triangle, (iii) a rectangle, and (iv) a square, the permutation group $\text{Sym}(n)$, Group of quaternions.

Subgroups, cyclic subgroups, the concept of a subgroup generated by a subset and the commutator subgroup of group, examples of subgroups including the center of a group. Cosets, Index of subgroup, Lagrange's theorem, order of an element, Normal subgroups: their definition, examples, and characterizations, Quotient groups.

Definition and examples of rings, examples of commutative and non-commutative rings: rings from number systems, Z_n the ring of integers modulo n , ring of real quaternions, rings of matrices, polynomial rings, and rings of continuous functions. Subrings and ideals, Integral domains and fields, examples of fields: Z_p , \mathbb{Q} , \mathbb{R} , and \mathbb{C} . Field of rational functions.

Books Recommended

1. John B. Fraleigh, *A First Course in Abstract Algebra*, 7th Ed., Pearson, 2002.
2. M. Artin, *Abstract Algebra*, 2nd Ed., Pearson, 2011.
3. Joseph A Gallian, *Contemporary Abstract Algebra*, 4th Ed., Narosa, 1999.
4. George E Andrews, *Number Theory*, Hindustan Publishing Corporation, 1984.

DSE 1A.1: Matrices

\mathbb{R} , \mathbb{R}^2 , \mathbb{R}^3 as vector spaces over \mathbb{R} . Standard basis for each of them. Concept of Linear Independence and examples of different bases. Subspaces of \mathbb{R}^2 , \mathbb{R}^3 .

Translation, Dilation, Rotation, Reflection in a point, line and plane. Matrix form of basic geometric transformations. Interpretation of eigen values and eigen vectors for such transformations and eigen spaces as invariant subspaces.

Types of matrices. Rank of a matrix. Invariance of rank under elementary transformations. Reduction to normal form, Solutions of linear homogeneous and non-homogeneous equations with number of equations and unknowns upto four.

Matrices in diagonal form. Reduction to diagonal form upto matrices of order 3. Computation of matrix inverses using elementary row operations. Rank of matrix. Solutions of a system of linear equations using matrices. Illustrative examples of above concepts from Geometry, Physics, Chemistry, Combinatorics and Statistics.

Books Recommended

1. A.I. Kostrikin, *Introduction to Algebra*, Springer Verlag, 1984.
2. S. H. Friedberg, A. L. Insel and L. E. Spence, *Linear Algebra*, Prentice Hall of India Pvt. Ltd., New Delhi, 2004.
3. Richard Bronson, *Theory and Problems of Matrix Operations*, Tata McGraw Hill, 1989.

DSE 1A.2: Mechanics

Conditions of equilibrium of a particle and of coplanar forces acting on a rigid Body, Laws of friction, Problems of equilibrium under forces including friction, Centre of gravity, Work and potential energy. Velocity and acceleration of a particle along a curve: radial and transverse components (plane curve), tangential and normal components (space curve), Newton's Laws of motion, Simple harmonic motion, Simple Pendulum, Projectile Motion.

Books Recommended

1. A.S. Ramsay, *Statics*, CBS Publishers and Distributors (Indian Reprint), 1998.
2. A.P. Roberts, *Statics and Dynamics with Background in Mathematics*, Cambridge University Press, 2003.

DSE 1A.3: Linear Algebra

Vector spaces, subspaces, algebra of subspaces, quotient spaces, linear combination of vectors, linear span, linear independence, basis and dimension, dimension of subspaces.

Linear transformations, null space, range, rank and nullity of a linear transformation, matrix representation of a linear transformation, algebra of linear transformations. Dual Space, Dual Basis, Double Dual, Eigen values and Eigen vectors, Characteristic Polynomial.

Isomorphisms, Isomorphism theorems, invertibility and isomorphisms, change of coordinate matrix.

Books Recommended

1. Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence, *Linear Algebra*, 4th Ed., Prentice-Hall of India Pvt. Ltd., New Delhi, 2004.
2. David C. Lay, *Linear Algebra and its Applications*, 3rd Ed., Pearson Education Asia, Indian Reprint, 2007.
3. S. Lang, *Introduction to Linear Algebra*, 2nd Ed., Springer, 2005.
4. Gilbert Strang, *Linear Algebra and its Applications*, Thomson, 2007.

DSE 1B.1: Numerical Methods

Algorithms, Convergence, Bisection method, False position method, Fixed point iteration method, Newton's method, Secant method, LU decomposition, Gauss-Jacobi, Gauss-Siedel and SOR iterative methods.

Lagrange and Newton interpolation: linear and higher order, finite difference operators. Numerical differentiation: forward difference, backward difference and central Difference. Integration: trapezoidal rule, Simpson's rule, Euler's method.

Recommended Books

1. B. Bradie, *A Friendly Introduction to Numerical Analysis*, Pearson Education, India, 2007.
2. M.K. Jain, S.R.K. Iyengar and R.K. Jain, *Numerical Methods for Scientific and Engineering Computation*, 5th Ed., New age International Publisher, India, 2007.

DSE 1B.2: Complex Analysis

Limits, Limits involving the point at infinity, continuity. Properties of complex numbers, regions in the complex plane, functions of complex variable, mappings. Derivatives, differentiation formulas, Cauchy-Riemann equations, sufficient conditions for differentiability.

Analytic functions, examples of analytic functions, exponential function, Logarithmic function, trigonometric function, derivatives of functions, definite integrals of functions. Contours, Contour integrals and its examples, upper bounds for moduli of contour integrals. Cauchy-Goursat theorem, Cauchy integral formula.

Liouville's theorem and the fundamental theorem of algebra. Convergence of sequences and series, Taylor series and its examples.

Laurent series and its examples, absolute and uniform convergence of power series.

Books Recommended

1. James Ward Brown and Ruel V. Churchill, *Complex Variables and Applications*, 8th Ed., McGraw – Hill International Edition, 2009.
2. Joseph Bak and Donald J. Newman, *Complex analysis*, 2nd Ed., Undergraduate Texts in Mathematics, Springer-Verlag New York, Inc., New York, 1997.

DSE 1B.3: Linear Programming

Linear Programming Problems, Graphical Approach for Solving some Linear Programs. Convex Sets, Supporting and Separating Hyperplanes. Theory of simplex method, optimality and unboundedness, the simplex algorithm, simplex method in tableau format, introduction to artificial variables, two-phase method, Big-M method and their comparison.

Duality, formulation of the dual problem, primal- dual relationships, economic interpretation of the dual, sensitivity analysis.

Recommended Books

1. Mokhtar S. Bazaraa, John J. Jarvis and Hanif D. Sherali, *Linear programming and Network Flows*, 2nd Ed., John Wiley and Sons, India, 2004.
2. F.S. Hillier and G.J. Lieberman, *Introduction to Operations Research*, 8th Ed., Tata McGraw Hill, Singapore, 2004.
3. Hamdy A. Taha, *Operations Research, An Introduction*, 8th Ed., Prentice-Hall India, 2006.

SEC 1.1: Logic and Sets

Introduction, propositions, truth table, negation, conjunction and disjunction. Implications, biconditional propositions, converse, contra positive and inverse propositions and precedence of logical operators. Propositional equivalence: Logical equivalences. Predicates and quantifiers: Introduction, Quantifiers, Binding variables and Negations.

Sets, subsets, Set operations, the laws of set theory and Venn diagrams. Examples of finite and infinite sets. Finite sets and counting principle. Empty set, properties of empty set. Standard set operations. Classes of sets. Power set of a set.

Difference and Symmetric difference of two sets. Set identities, Generalized union and intersections. Relation: Product set, Composition of relations, Types of relations, Partitions, Equivalence Relations with example of congruence modulo relation.

Book Recommended

1. R.P. Grimaldi, *Discrete Mathematics and Combinatorial Mathematics*, Pearson Education, 1998.
2. P.R. Halmos, *Naive Set Theory*, Springer, 1974.
3. E. Kamke, *Theory of Sets*, Dover Publishers, 1950.

SEC 1.2: Analytical Geometry

Techniques for sketching parabola, ellipse and hyperbola. Reflection properties of parabola, ellipse and hyperbola. Classification of quadratic equations representing lines, parabola, ellipse and hyperbola. Spheres, Cylindrical surfaces. Illustrations of graphing standard quadric surfaces like cone, ellipsoid.

Books Recommended

1. G.B. Thomas and R.L. Finney, *Calculus*, 9th Ed., Pearson Education, Delhi, 2005.
2. H. Anton, I. Bivens and S. Davis, *Calculus*, John Wiley and Sons (Asia) Pvt. Ltd., 2002.
3. S.L. Loney, *The Elements of Coordinate Geometry*, McMillan and Company, London.
4. R.J.T. Bill, *Elementary Treatise on Coordinate Geometry of Three Dimensions*, McMillan India Ltd., 1994.

SEC 1.3: Integral Calculus

Integration by Partial fractions, integration of rational and irrational functions. Properties of definite integrals. Reduction formulae for integrals of rational, trigonometric, exponential and logarithmic functions and of their combinations.

Areas and lengths of curves in the plane, volumes and surfaces of solids of revolution. Double and Triple integrals.

Books Recommended

1. G.B. Thomas and R.L. Finney, *Calculus*, 9th Ed., Pearson Education, Delhi, 2005.
2. H. Anton, I. Bivens and S. Davis, *Calculus*, John Wiley and Sons (Asia) P. Ltd., 2002.

SEC 2.1: Vector Calculus

Differentiation and partial differentiation of a vector function. Derivative of sum, dot product and cross product of two vectors.

Gradient, divergence and curl.

Books Recommended

1. G.B. Thomas and R.L. Finney, *Calculus*, 9th Ed., Pearson Education, Delhi, 2005.
2. H. Anton, I. Bivens and S. Davis, *Calculus*, John Wiley and Sons (Asia) P. Ltd. 2002.
3. P.C. Matthew's, *Vector Calculus*, Springer Verlag London Limited, 1998.

SEC 2.2: Theory of Equations

General properties of polynomials, Graphical representation of a polynomials, maximum and minimum values of a polynomials, General properties of equations, Descarte's rule of signs positive and negative rule, Relation between the roots and the coefficients of equations.

Symmetric functions, Applications symmetric function of the roots, Transformation of equations. Solutions of reciprocal and binomial equations. Algebraic solutions of the cubic and biquadratic. Properties of the derived functions.

Books Recommended

1. W.S. Burnside and A.W. Panton, *The Theory of Equations*, Dublin University Press, 1954.
2. C. C. MacDuffee, *Theory of Equations*, John Wiley & Sons Inc., 1954.

SEC 2.3: Number Theory

Division algorithm, Lamé's theorem, linear Diophantine equation, fundamental theorem of arithmetic, prime counting function, statement of prime number theorem, Goldbach conjecture, binary and decimal representation of integers, linear congruences, complete set of residues.

Number theoretic functions, sum and number of divisors, totally multiplicative functions, definition and properties of the Dirichlet product, the Möbius inversion formula, the greatest integer function, Euler's phi-function.

Books Recommended:

1. David M. Burton, *Elementary Number Theory* 6th Ed., Tata McGraw-Hill Edition, Indian reprint, 2007.
2. Richard E. Klima, Neil Sigmon, Ernest Stitzinger, *Applications of Abstract Algebra with Maple*, CRC Press, Boca Raton, 2000.
3. Neville Robinns, *Beginning Number Theory*, 2nd Ed., Narosa Publishing House Pvt. Limited, Delhi, 2007.

SEC 3.1: Probability and Statistics

Sample space, probability axioms, real random variables (discrete and continuous), cumulative distribution function, probability mass/density functions, mathematical expectation, moments, moment generating function, characteristic function, discrete distributions: uniform, binomial, Poisson, continuous distributions: uniform, normal, exponential.

Joint cumulative distribution function and its properties, joint probability density functions, marginal and conditional distributions, expectation of function of two random variables, conditional expectations, independent random variables.

Books Recommended:

1. Robert V. Hogg, Joseph W. McKean and Allen T. Craig, *Introduction to Mathematical Statistics*, Pearson Education, Asia, 2007.
2. Irwin Miller and Marylees Miller, John E. Freund, *Mathematical Statistics with Application*, 7th Ed., Pearson Education, Asia, 2006.
3. Sheldon Ross, *Introduction to Probability Model*, 9th Ed., Academic Press, Indian Reprint, 2007.

SEC 3.2: Mathematical Finance

Basic principles: Comparison, arbitrage and risk aversion, Interest (simple and compound, discrete and continuous), time value of money, inflation, net present value, internal rate of return (calculation by bisection and Newton-Raphson methods), comparison of NPV and IRR. Bonds, bond prices and yields. Floating-rate bonds, immunization.

Asset return, short selling, portfolio return, (brief introduction to expectation, variance, covariance and correlation), random returns, portfolio mean return and variance, diversification, portfolio diagram, feasible set, Markowitz model (review of Lagrange multipliers for 1 and 2 constraints).

Books Recommended:

1. David G. Luenberger, *Investment Science*, Oxford University Press, Delhi, 1998.
2. John C. Hull, Options, *Futures and Other Derivatives*, 6th Ed., Prentice-Hall India, Indian reprint, 2006.
3. Sheldon Ross, *An Elementary Introduction to Mathematical Finance*, 2nd Ed., Cambridge University Press, USA, 2003.

SEC 3.3: Mathematical Modeling

Applications of differential equations: the vibrations of a mass on a spring, mixture problem, free damped motion, forced motion, resonance phenomena, electric circuit problem, mechanics of simultaneous differential equations.

Applications to Traffic Flow. Vibrating string, vibrating membrane, conduction of heat in solids, gravitational potential, conservation laws.

Books Recommended:

1. Shepley L. Ross, *Differential Equations*, 3rd Ed., John Wiley and Sons, 1984.
2. I. Sneddon, *Elements of Partial Differential Equations*, McGraw-Hill, International Edition, 1967.

SEC 4.1: Boolean Algebra

Definition, examples and basic properties of ordered sets, maps between ordered sets, duality principle, maximal and minimal elements, lattices as ordered sets, complete lattices, lattices as algebraic structures, sublattices, products and homomorphisms.

Definition, examples and properties of modular and distributive lattices, Boolean algebras, Boolean polynomials, minimal forms of Boolean polynomials, Quinn-McCluskey method, Karnaugh diagrams, switching circuits and applications of switching circuits.

Books Recommended:

1. B A. Davey and H. A. Priestley, *Introduction to Lattices and Order*, Cambridge University Press, Cambridge, 1990.
2. Rudolf Lidl and Günter Pilz, *Applied Abstract Algebra*, 2nd Ed., Undergraduate Texts in Mathematics, Springer (SIE), Indian reprint, 2004.

SEC 4.2: Transportation and Game Theory

Transportation problem and its mathematical formulation, northwest-corner method, least cost method and Vogel approximation method for determination of starting basic solution, algorithm for solving transportation problem, assignment problem and its mathematical formulation, Hungarian method for solving assignment problem.

Game theory: formulation of two person zero sum games, solving two person zero sum games, games with mixed strategies, graphical solution procedure.

Books Recommended:

1. Mokhtar S. Bazaraa, John J. Jarvis and Hanif D. Sherali, *Linear Programming and Network Flows*, 2nd Ed., John Wiley and Sons, India, 2004.
2. F. S. Hillier and G. J. Lieberman, *Introduction to Operations Research*, 9th Ed., Tata McGraw Hill, Singapore, 2009.
3. Hamdy A. Taha, *Operations Research, An Introduction*, 8th Ed., Prentice-Hall India, 2006.

SEC4.3: Graph Theory

Definition, examples and basic properties of graphs, pseudographs, complete graphs, bi-partite graphs, isomorphism of graphs, paths and circuits, Eulerian circuits, Hamiltonian cycles, the adjacency matrix, weighted graph, travelling salesman's problem, shortest path, Dijkstra's algorithm, Floyd-Warshall algorithm.

Books Recommended:

1. Edgar G. Goodaire and Michael M. Parmenter, *Discrete Mathematics with Graph Theory* 2nd Ed., Pearson Education (Singapore) P. Ltd., Indian Reprint, 2003.
2. Rudolf Lidl and Günter Pilz, *Applied Abstract Algebra*, 2nd Ed., Undergraduate Texts in Mathematics, Springer (SIE), Indian reprint, 2004.

CHOICE BASED CREDIT SYSTEM

B. SC. WITH PHYSICS

Details of Courses Under Undergraduate Program (B.Sc.)

Course	*Credits	
	Theory+ Practical	Theory+Tutorials
<u>I. Core Course</u>	12X4= 48	12X5=60
(12 Papers)		
04 Courses from each of the 03 disciplines of choice		
Core Course Practical / Tutorial*	12X2=24	12X1=12
(12 Practical/ Tutorials*)		
04 Courses from each of the 03 Disciplines of choice		
<u>II. Elective Course</u>	6x4=24	6X5=30
(6 Papers)		
Two papers from each discipline of choice including paper of interdisciplinary nature.		
Elective Course Practical / Tutorials*	6 X 2=12	6X1=6
(6 Practical / Tutorials*)		
Two Papers from each discipline of choice including paper of interdisciplinary nature		
<ul style="list-style-type: none"> • Optional Dissertation or project work in place of one Discipline elective paper (6 credits) in 6th Semester 		

Proposed scheme for choice based credit system in B. Sc. with Physics

	CORE COURSE (12)	Ability Enhancement Compulsory Course (AECC) (2)	Skill Enhancement Course (SEC) (2)	Discipline Specific Elective DSE (6)
I	Mechanics	(English/MIL Communication)/ Environmental Science		
	DSC- 2 A			
	DSC- 3 A			
II	Electricity, Magnetism and EMT	Environmental Science /(English/MIL Communication)		
	DSC- 2 B			
	DSC- 3 B			
III	Thermal Physics and Statistical Mechanics		SEC-1	
	DSC- 2 C			
	DSC- 3 C			
IV	Waves and Optics		SEC -2	
	DSC- 2 D			
	DSC- 3 D			
V			SEC -3	DSE-1 A
				DSE-2 A
				DSE-3 A

VI			SEC -4	DSE-1 B
				DSE-2 B
				DSE-3 B

SEMESTER	COURSE OPTED	COURSE NAME	Credits
I	Ability Enhancement Compulsory Course-I	English/MIL communications/ Environmental Science	2
	Core course-I	Mechanics	4
	Core Course-I Practical/Tutorial	Mechanics Lab	2
	Core course-II	DSC 2A	6
	Core Course-III	DSC 3A	6
II	Ability Enhancement Compulsory Course-II	English/MIL communications/ Environmental Science	2
	Core course-IV	Electricity, Magnetism and EMT	4
	Core Course-IV Practical/Tutorial	Electricity, Magnetism and EMT Lab	2
	Core course-V	DSC 2B	6
	Core Course-VI	DSC 3B	6
III	Core course-VII	Thermal Physics and Statistical Mechanics	4
	Core Course-VII Practical/Tutorial	Thermal Physics and Statistical Mechanics Lab	2
	Core course-VIII	DSC 2C	6
	Core Course-IX	DSC 3C	6
	Skill Enhancement Course -1	SEC-1	2
IV	Core course-X	Waves and Optics	4
	Course-X Practical/Tutorial	Waves and Optics Lab	2
	Core course-XI	DSC 2D	6
	Core course-XII	DSC 3D	6
	Skill Enhancement Course -2	SEC -2	2
V	Skill Enhancement Course -3	SEC -3	2
	Discipline Specific Elective -1	DSE-1A	6
	Discipline Specific Elective -2	DSE-2A	6
	Discipline Specific Elective -3	DSE-3A	6
VI	Skill Enhancement Course -4	SEC -4	2
	Discipline Specific Elective -4	DSE-1B	6
	Discipline Specific Elective -5	DSE-2B	6
	Discipline Specific Elective-6	DSE-3B	6
Total Credits			120

B.Sc. Physical Science

Core papers Physics (Credit: 06 each) (CP 1-4):

1. Mechanics (4) + Lab (4)
2. Electricity and Magnetism (4) + Lab (4)

3. Thermal Physics and Statistical Mechanics (4) + Lab (4)
4. Waves and Optics (4) + Lab (4)

Discipline Specific Elective papers (Credit: 06 each) (DSE 1, DSE 2): Choose 2

1. Digital, Analog and Instrumentation (4) + Lab (4)
2. Elements of Modern Physics (4) + Lab (4)
3. Mathematical Physics (4) + Lab (4)
4. Solid State Physics (4) + Lab (4)
5. Quantum Mechanics (4) + Lab (4)
6. Embedded System: Introduction to microcontroller (4) + Lab (4)
7. Nuclear and Particle Physics (5) + Tut (1)
8. Medical Physics (4) + Lab (4)
9. Dissertation

Note: Universities may include more options or delete some from this list

Skill Enhancement Course (any four) (Credit: 02 each)- SEC 1 to SEC 4

1. Physics Workshop Skills
2. Computational Physics Skills
3. Electrical circuits and Network Skills
4. Basic Instrumentation Skills
5. Renewable Energy and Energy harvesting
6. Technical Drawing
7. Radiology and Safety
8. Applied Optics
9. Weather Forecasting

Note: Universities may include more options or delete some from this list

Important:

1. **Each University/Institute should provide a brief write-up about each paper outlining the salient features, utility, learning objectives and prerequisites.**
2. **University/Institute can add/delete some experiments of similar nature in the Laboratory papers.**
3. **The size of the practical group for practical papers is recommended to be 12-15 students.**
4. **University/Institute can add to the list of reference books given at the end of each paper.**

Semester I

PHYSICS-DSC 1 A: MECHANICS

(Credits: Theory-04, Practicals-02)

Theory: 60 Lectures

Vectors: Vector algebra. Scalar and vector products. Derivatives of a vector with respect to a parameter. **(4 Lectures)**

Ordinary Differential Equations: 1st order homogeneous differential equations. 2nd order homogeneous differential equations with constant coefficients. **(6 Lectures)**

Laws of Motion: Frames of reference. Newton's Laws of motion. Dynamics of a system of particles. Centre of Mass. **(10 Lectures)**

Momentum and Energy: Conservation of momentum. Work and energy. Conservation of energy. Motion of rockets. **(6 Lectures)**

Rotational Motion: Angular velocity and angular momentum. Torque. Conservation of angular momentum. **(5 Lectures)**

Gravitation: Newton's Law of Gravitation. Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant). Kepler's Laws (statement only). Satellite in circular orbit and applications. Geosynchronous orbits. Weightlessness. Basic idea of global positioning system (GPS). **(8 Lectures)**

Oscillations: Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages. Damped oscillations. **(6 Lectures)**

Elasticity: Hooke's law - Stress-strain diagram - Elastic moduli-Relation between elastic constants - Poisson's Ratio-Expression for Poisson's ratio in terms of elastic constants - Work done in stretching and work done in twisting a wire - Twisting couple on a cylinder - Determination of Rigidity modulus by static torsion - Torsional pendulum-Determination of Rigidity modulus and moment of inertia - q , η and σ by Searles method **(8 Lectures)**

Special Theory of Relativity: Constancy of speed of light. Postulates of Special Theory of Relativity. Length contraction. Time dilation. Relativistic addition of velocities. **(7 Lectures)**

Note: Students are not familiar with vector calculus. Hence all examples involve differentiation either in one dimension or with respect to the radial coordinate.

Reference Books:

- University Physics. FW Sears, MW Zemansky and HD Young 13/e, 1986. Addison-Wesley
 - Mechanics Berkeley Physics course, v.1: Charles Kittel, et. Al. 2007, Tata McGraw-Hill.
 - Physics – Resnick, Halliday & Walker 9/e, 2010, Wiley
 - Engineering Mechanics, Basudeb Bhattacharya, 2nd edn., 2015, Oxford University Press
 - University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
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PHYSICS LAB: DSC 1A LAB: MECHANICS

60 Lectures

1. Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope.
2. To determine the Height of a Building using a Sextant.
3. To determine the Moment of Inertia of a Flywheel.
4. To determine the Young's Modulus of a Wire by Optical Lever Method.
5. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.
6. To determine the Elastic Constants of a Wire by Searle's method.
7. To determine g by Bar Pendulum.
8. To determine g by Kater's Pendulum.
9. To determine g and velocity for a freely falling body using Digital Timing Technique
10. To study the Motion of a Spring and calculate (a) Spring Constant (b) Value of g

Reference Books:

- Advanced Practical Physics for students, B.L.Flint and H.T.Worsnop, 1971, Asia Publishing House.
 - Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.
 - Engineering Practical Physics, S.Panigrahi & B.Mallick, 2015, Cengage Learning India Pvt. Ltd.
 - A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.
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Semester II

PHYSICS-DSC 2A: ELECTRICITY AND MAGNETISM

(Credits: Theory-04, Practicals-02)

Theory: 60 Lectures

Vector Analysis: Review of vector algebra (Scalar and Vector product), gradient, divergence, Curl and their significance, Vector Integration, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors (statement only). **(12 Lectures)**

Electrostatics: Electrostatic Field, electric flux, Gauss's theorem of electrostatics. Applications of Gauss theorem- Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor. Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere. Calculation of electric field from potential. Capacitance of an isolated spherical conductor. Parallel plate, spherical and cylindrical condenser. Energy per unit volume in electrostatic field. Dielectric medium, Polarisation, Displacement vector. Gauss's theorem in dielectrics. Parallel plate capacitor completely filled with dielectric.

(22 Lectures)

Magnetism:

Magnetostatics: Biot-Savart's law & its applications- straight conductor, circular coil, solenoid carrying current. Divergence and curl of magnetic field. Magnetic vector potential. Ampere's circuital law.

Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of dia-, para- and ferro-magnetic materials.

(10 Lectures)

Electromagnetic Induction: Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils. Energy stored in magnetic field.

(6 Lectures)

Maxwell's equations and Electromagnetic wave propagation: Equation of continuity of current, Displacement current, Maxwell's equations, Poynting vector, energy density in electromagnetic field, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves, polarization. **(10 Lectures)**

Reference Books:

- Electricity and Magnetism, Edward M. Purcell, 1986, McGraw-Hill Education..
- Electricity and Magnetism, J.H. Fewkes & J. Yarwood. Vol. I, 1991, Oxford Univ. Press.
- Electricity and Magnetism, D C Tayal, 1988, Himalaya Publishing House.
- University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.

- D.J. Griffiths, Introduction to Electrodynamics, 3rd Edn, 1998, Benjamin Cummings.
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PHYSICS LAB- DSC 2A LAB: ELECTRICITY AND MAGNETISM

60 Lectures

1. To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, and (d) checking electrical fuses.
2. Ballistic Galvanometer:
 - (i) Measurement of charge and current sensitivity
 - (ii) Measurement of CDR
 - (iii) Determine a high resistance by Leakage Method
 - (iv) To determine Self Inductance of a Coil by Rayleigh's Method.
3. To compare capacitances using De'Sauty's bridge.
4. Measurement of field strength B and its variation in a Solenoid (Determine dB/dx).
5. To study the Characteristics of a Series RC Circuit.
6. To study the a series LCR circuit and determine its (a) Resonant Frequency, (b) Quality Factor
7. To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q
8. To determine a Low Resistance by Carey Foster's Bridge.
9. To verify the Thevenin and Norton theorem
10. To verify the Superposition, and Maximum Power Transfer Theorem

Reference Books

- Advanced Practical Physics for students, B.L.Flint & H.T.Worsnop, 1971, Asia Publishing House.
 - A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.
 - Engineering Practical Physics, S.Panigrahi & B.Mallick,2015, Cengage Learning India Pvt. Ltd.
 - Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
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Semester III

PHYSICS-DSC 3A: THERMAL PHYSICS AND STATISTICAL MECHANICS

(Credits: Theory-04, Practicals-02)

Theory: 60 Lectures

Laws of Thermodynamics:

Thermodynamic Description of system: Zeroth Law of thermodynamics and temperature. First law and internal energy, conversion of heat into work, Various Thermodynamical Processes, Applications of First Law: General Relation between C_p & C_v , Work Done during Isothermal and Adiabatic Processes, Compressibility & Expansion Coefficient, Reversible & irreversible processes, Second law & Entropy, Carnot's cycle & theorem, Entropy changes in reversible & irreversible processes, Entropy-temperature diagrams, Third law of thermodynamics, Unattainability of absolute zero. **(22 Lectures)**

Thermodynamic Potentials: Enthalpy, Gibbs, Helmholtz and Internal Energy functions, Maxwell's relations & applications - Joule-Thompson Effect, Clausius-Clapeyron Equation, Expression for $(C_p - C_v)$, C_p/C_v , TdS equations. **(10 Lectures)**

Kinetic Theory of Gases: Derivation of Maxwell's law of distribution of velocities and its experimental verification, Mean free path (Zeroth Order), Transport Phenomena: Viscosity, Conduction and Diffusion (for vertical case), Law of equipartition of energy (no derivation) and its applications to specific heat of gases; mono-atomic and diatomic gases. **(10 Lectures)**

Theory of Radiation: Blackbody radiation, Spectral distribution, Concept of Energy Density, Derivation of Planck's law, Deduction of Wien's distribution law, Rayleigh-Jeans Law, Stefan Boltzmann Law and Wien's displacement law from Planck's law. **(6 Lectures)**

Statistical Mechanics: Phase space, Macrostate and Microstate, Entropy and Thermodynamic probability, Maxwell-Boltzmann law - distribution of velocity - Quantum statistics - Fermi-Dirac distribution law - electron gas - Bose-Einstein distribution law - photon gas - comparison of three statistics. **(12 Lectures)**

Reference Books:

- Thermal Physics, S. Garg, R. Bansal and C. Ghosh, 1993, Tata McGraw-Hill.
- A Treatise on Heat, Meghnad Saha, and B.N. Srivastava, 1969, Indian Press.
- Thermodynamics, Enrico Fermi, 1956, Courier Dover Publications.
- Heat and Thermodynamics, M.W.Zemasky and R. Dittman, 1981, McGraw Hill

- Thermodynamics, Kinetic theory & Statistical thermodynamics, F.W.Sears & G.L.Salinger. 1988, Narosa
 - University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
 - Thermal Physics, A. Kumar and S.P. Taneja, 2014, R. chand Publications.
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PHYSICS LAB-DSC 3A LAB: THERMAL PHYSICS AND STATISTICAL MECHANICS

60 Lectures

1. To determine Mechanical Equivalent of Heat, J, by Callender and Barne's constant flow method.
2. Measurement of Planck's constant using black body radiation.
3. To determine Stefan's Constant.
4. To determine the coefficient of thermal conductivity of copper by Searle's Apparatus.
5. To determine the Coefficient of Thermal Conductivity of Cu by Angstrom's Method.
6. To determine the coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method.
7. To determine the temperature co-efficient of resistance by Platinum resistance thermometer.
8. To study the variation of thermo emf across two junctions of a thermocouple with temperature.
9. To record and analyze the cooling temperature of an hot object as a function of time using a thermocouple and suitable data acquisition system
10. To calibrate Resistance Temperature Device (RTD) using Null Method/Off-Balance Bridge

Reference Books:

- Advanced Practical Physics for students, B.L.Flint & H.T.Worsnop, 1971, Asia Publishing House.
 - Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
 - A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.
 - A Laboratory Manual of Physics for Undergraduate Classes, D.P. Khandelwal, 1985, Vani Publication.
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Semester IV

PHYSICS-DSC 4A: WAVES AND OPTICS

(Credits: Theory-04, Practicals-02)

Theory: 60 Lectures

Superposition of Two Collinear Harmonic oscillations: Linearity and Superposition Principle. (1) Oscillations having equal frequencies and (2) Oscillations having different frequencies (Beats). **(4 Lectures)**

Superposition of Two Perpendicular Harmonic Oscillations: Graphical and Analytical Methods. Lissajous Figures with equal and unequal frequency and their uses. **(2 Lectures)**

Waves Motion- General: Transverse waves on a string. Travelling and standing waves on a string. Normal Modes of a string. Group velocity, Phase velocity. Plane waves. Spherical waves, Wave intensity. **(7 Lectures)**

Fluids: Surface Tension: Synclastic and anticlastic surface - Excess of pressure - Application to spherical and cylindrical drops and bubbles - variation of surface tension with temperature - Jaeger's method. Viscosity: Viscosity - Rate flow of liquid in a capillary tube - Poiseuille's formula - Determination of coefficient of viscosity of a liquid - Variations of viscosity of a liquid with temperature lubrication. Physics of low pressure - production and measurement of low pressure - Rotary pump - Diffusion pump - Molecular pump - Knudsen absolute gauge - penning and pirani gauge - Detection of leakage. **(6 Lectures)**

Sound: Simple harmonic motion - forced vibrations and resonance - Fourier's Theorem - Application to saw tooth wave and square wave - Intensity and loudness of sound - Decibels - Intensity levels - musical notes - musical scale. Acoustics of buildings: Reverberation and time of reverberation - Absorption coefficient - Sabine's formula - measurement of reverberation time - Acoustic aspects of halls and auditoria. **(6 Lectures)**

Wave Optics: Electromagnetic nature of light. Definition and Properties of wave front. Huygens Principle. **(3 Lectures)**

Interference: Interference: Division of amplitude and division of wavefront. Young's Double Slit experiment. Lloyd's Mirror and Fresnel's Biprism. Phase change on reflection: Stokes' treatment. Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes). Newton's Rings: measurement of wavelength and refractive index. **(10 Lectures)**

Michelson's Interferometer: Idea of form of fringes (no theory needed), Determination of wavelength, Wavelength difference, Refractive index and Visibility of fringes. **(3 Lectures)**

Diffraction: Fraunhofer diffraction: Single slit; Double Slit. Multiple slits & Diffraction grating. Fresnel Diffraction: Half-period zones. Zone plate. Fresnel Diffraction pattern of a straight edge, a slit and a wire using half-period zone analysis. **(14 Lectures)**

Polarization: Transverse nature of light waves. Plane polarized light – production and analysis. Circular and elliptical polarization. **(5 Lectures)**

Reference Books:

- Fundamentals of Optics, F A Jenkins and H E White, 1976, McGraw-Hill
 - Principles of Optics, B.K. Mathur, 1995, Gopal Printing
 - Fundamentals of Optics, H.R. Gulati and D.R. Khanna, 1991, R. Chand Publication
 - University Physics. FW Sears, MW Zemansky and HD Young 13/e, 1986. Addison-Wesley
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PHYSICS LAB-DSC 4A LAB: WAVES AND OPTICS

60 Lectures

1. To investigate the motion of coupled oscillators
2. To determine the Frequency of an Electrically Maintained Tuning Fork by Melde's Experiment and to verify $\lambda^2 - T$ Law.
3. To study Lissajous Figures
4. Familiarization with Schuster's focussing; determination of angle of prism.
5. To determine the Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method). ☐
6. To determine the Refractive Index of the Material of a given Prism using Sodium Light.
7. To determine Dispersive Power of the Material of a given Prism using Mercury Light
8. To determine the value of Cauchy Constants of a material of a prism.
9. To determine the Resolving Power of a Prism.
10. To determine wavelength of sodium light using Fresnel Biprism.
11. To determine wavelength of sodium light using Newton's Rings.
12. To determine the wavelength of Laser light using Diffraction of Single Slit.
13. To determine wavelength of (1) Sodium & (2) spectrum of Mercury light using plane diffraction Grating
14. To determine the Resolving Power of a Plane Diffraction Grating.
15. To measure the intensity using photosensor and laser in diffraction patterns of single and double slits.

Reference Books:

- Advanced Practical Physics for students, B.L. Flint & H.T. Worsnop, 1971, Asia Publishing House.

- Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
- A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.

Discipline Specific Elective

Select two papers

PHYSICS- DSE: DIGITAL AND ANALOG CIRCUITS AND INSTRUMENTATION

(Credits: Theory-04, Practicals-02)

Theory: 60 Lectures

UNIT-1: Digital Circuits

Difference between Analog and Digital Circuits. Binary Numbers. Decimal to Binary and Binary to Decimal Conversion, AND, OR and NOT Gates (Realization using Diodes and Transistor). NAND and NOR Gates as Universal Gates. XOR and XNOR Gates.

(4 Lectures)

De Morgan's Theorems. Boolean Laws. Simplification of Logic Circuit using Boolean Algebra. Fundamental Products. Minterms and Maxterms. Conversion of a Truth Table into an Equivalent Logic Circuit by (1) Sum of Products Method and (2) Karnaugh Map.

(5 Lectures)

Binary Addition. Binary Subtraction using 2's Complement Method). Half Adders and Full Adders and Subtractors, 4-bit binary Adder-Subtractor.

(4 Lectures)

UNIT-2: Semiconductor Devices and Amplifiers:

Semiconductor Diodes: p and n type semiconductors. Barrier Formation in PN Junction Diode. Qualitative Idea of Current Flow Mechanism in Forward and Reverse Biased Diode. PN junction and its characteristics. Static and Dynamic Resistance. Principle and structure of (1) LEDs (2) Photodiode (3) Solar Cell.

(5 Lectures)

Bipolar Junction transistors: n-p-n and p-n-p Transistors. Characteristics of CB, CE and CC Configurations. Active, Cutoff, and Saturation Regions. Current gains α and β . Relations between α and β . Load Line analysis of Transistors. DC Load line and Q-point. Voltage Divider Bias Circuit for CE Amplifier. h-parameter Equivalent Circuit. Analysis of a single-stage CE amplifier using Hybrid Model. Input and Output

Impedance. Current, Voltage and Power Gains. Class A, B, and C Amplifiers.
(12 Lectures)

UNIT-3: Operational Amplifiers (Black Box approach):

Characteristics of an Ideal and Practical Op-Amp (IC 741), Open-loop & Closed-loop Gain. CMRR, concept of Virtual ground. Applications of Op-Amps: (1) Inverting and Non-inverting Amplifiers, (2) Adder, (3) Subtractor, (4) Differentiator, (5) Integrator, (6) Zero Crossing Detector.
(13 Lectures)

Sinusoidal Oscillators: Barkhausen's Criterion for Self-sustained Oscillations. Determination of Frequency of RC Oscillator
(5 Lectures)

UNIT-4: Instrumentations:

Introduction to CRO: Block Diagram of CRO. Applications of CRO: (1) Study of Waveform, (2) Measurement of Voltage, Current, Frequency, and Phase Difference.
(3 Lectures)

Power Supply: Half-wave Rectifiers. Centre-tapped and Bridge Full-wave Rectifiers Calculation of Ripple Factor and Rectification Efficiency, Basic idea about capacitor filter, Zener Diode and Voltage Regulation
(6 Lectures)

Timer IC: IC 555 Pin diagram and its application as Astable & Monostable Multivibrator
(3 Lectures)

Reference Books:

- Integrated Electronics, J. Millman and C.C. Halkias, 1991, Tata Mc-Graw Hill.
- Electronic devices and circuits, S. Salivahanan and N. Suresh Kumar, 2012, Tata Mc-Graw Hill.
- Microelectronic Circuits, M.H. Rashid, 2nd Edn., 2011, Cengage Learning.
- Modern Electronic Instrumentation & Measurement Tech., Helfrick & Cooper, 1990, PHI Learning
- Digital Principles & Applications, A.P. Malvino, D.P. Leach & Saha, 7th Ed., 2011, Tata McGraw Hill
- Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, 2014, 6th Edn., Oxford University Press.
- Fundamentals of Digital Circuits, A. Anand Kumar, 2nd Edition, 2009, PHI Learning Pvt. Ltd.
- OP-AMP and Linear Digital Circuits, R.A. Gayakwad, 2000, PHI Learning Pvt. Ltd.

PRACTICALS - DSE LAB: DIGITAL AND ANALOG CIRCUITS AND INSTRUMENTS

60 Lectures

1. To measure (a) Voltage, and (b) Frequency of a periodic waveform using a CRO
2. To verify and design AND, OR, NOT and XOR gates using NAND gates.
3. To minimize a given logic circuit.
4. Half adder, Full adder and 4-bit Binary Adder.

5. Adder-Subtractor using Full Adder I.C.
6. To design an astable multivibrator of given specifications using 555 Timer.
7. To design a monostable multivibrator of given specifications using 555 Timer.
8. To study IV characteristics of PN diode, Zener and Light emitting diode
9. To study the characteristics of a Transistor in CE configuration.
10. To design a CE amplifier of a given gain (mid-gain) using voltage divider bias.
11. To design an inverting amplifier of given gain using Op-amp 741 and study its frequency response.
12. To design a non-inverting amplifier of given gain using Op-amp 741 and study its Frequency Response.
13. To study a precision Differential Amplifier of given I/O specification using Op-amp.
14. To investigate the use of an op-amp as a Differentiator
15. To design a Wien Bridge Oscillator using an op-amp.

Reference Books:

- Basic Electronics: A text lab manual, P.B. Zbar, A.P. Malvino, M.A. Miller, 1994, Mc-Graw Hill.
 - Electronics: Fundamentals and Applications, J.D. Ryder, 2004, Prentice Hall.
 - OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edition, 2000, Prentice Hall.
 - Electronic Principle, Albert Malvino, 2008, Tata Mc-Graw Hill.
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PHYSICS- DSE: ELEMENTS OF MODERN PHYSICS

(Credits: Theory-04, Practicals-02)

Theory: 60 Lectures

Planck's quantum, Planck's constant and light as a collection of photons; Photo-electric effect and Compton scattering. De Broglie wavelength and matter waves; Davisson-Germer experiment. **(8 Lectures)**

Problems with Rutherford model- instability of atoms and observation of discrete atomic spectra; Bohr's quantization rule and atomic stability; calculation of energy levels for hydrogen like atoms and their spectra. **(4 Lectures)**

Position measurement- gamma ray microscope thought experiment; Wave-particle duality, Heisenberg uncertainty principle- impossibility of a particle following a trajectory; Estimating minimum energy of a confined particle using uncertainty principle; Energy-time uncertainty principle. **(4 Lectures)**

Two slit interference experiment with photons, atoms and particles; linear superposition principle as a consequence; Matter waves and wave amplitude; Schrodinger equation for non-relativistic particles; Momentum and Energy operators; stationary states; physical

interpretation of wavefunction, probabilities and normalization; Probability and probability current densities in one dimension. **(11 Lectures)**

One dimensional infinitely rigid box- energy eigenvalues and eigenfunctions, normalization; Quantum dot as an example; Quantum mechanical scattering and tunnelling in one dimension - across a step potential and across a rectangular potential barrier. **(12 Lectures)**

Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an electron being in the nucleus as a consequence of the uncertainty principle. Nature of nuclear force, NZ graph, semi-empirical mass formula and binding energy. **(6 Lectures)**

Radioactivity: stability of nucleus; Law of radioactive decay; Mean life & half-life; α decay; β decay - energy released, spectrum and Pauli's prediction of neutrino; γ -ray emission. **(11 Lectures)**

Fission and fusion - mass deficit, relativity and generation of energy; Fission - nature of fragments and emission of neutrons. Nuclear reactor: slow neutrons interacting with Uranium 235; Fusion and thermonuclear reactions. **(4 Lectures)**

Reference Books:

- Concepts of Modern Physics, Arthur Beiser, 2009, McGraw-Hill
- Modern Physics, John R. Taylor, Chris D. Zafiratos, Michael A. Dubson, 2009, PHI Learning
- Six Ideas that Shaped Physics: Particle Behave like Waves, Thomas A. Moore, 2003, McGraw Hill
- Quantum Physics, Berkeley Physics Course Vol.4. E.H. Wichman, 2008, Tata McGraw-Hill Co.
- Modern Physics, R.A. Serway, C.J. Moses, and C.A. Moyer, 2005, Cengage Learning
- Modern Physics, G. Kaur and G.R. Pickrell, 2014, McGraw Hill

PRACTICALS -DSE-1 LAB: ELEMENTS OF MODERN PHYSICS

60 Lectures

1. To determine value of Boltzmann constant using V-I characteristic of PN diode.
2. To determine work function of material of filament of directly heated vacuum diode.
3. To determine value of Planck's constant using LEDs of at least 4 different colours.
4. To determine the ionization potential of mercury.
5. To determine the wavelength of H-alpha emission line of Hydrogen atom.
6. To determine the absorption lines in the rotational spectrum of Iodine vapour.

7. To study the diffraction patterns of single and double slits using laser source and measure its intensity variation using Photosensor and compare with incoherent source – Na light.
8. Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light
9. To determine the value of e/m by magnetic focusing.
10. To setup the Millikan oil drop apparatus and determine the charge of an electron.

Reference Books:

- Advanced Practical Physics for students, B.L. Flint & H.T. Worsnop, 1971, Asia Publishing House.
 - Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
 - A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.
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PHYSICS-DSE: MATHEMATICAL PHYSICS

(Credits: Theory-04, Practicals-02)

Theory: 60 Lectures

The emphasis of the course is on applications in solving problems of interest to physicists. The students are to be examined entirely on the basis of problems, seen and unseen.

Calculus of functions of more than one variable: Partial derivatives, exact and inexact differentials. Integrating factor, with simple illustration. Constrained Maximization using Lagrange Multipliers. **(6 Lectures)**

Fourier Series: Periodic functions. Orthogonality of sine and cosine functions, Dirichlet Conditions (Statement only). Expansion of periodic functions in a series of sine and cosine functions and determination of Fourier coefficients. Complex representation of Fourier series. Expansion of functions with arbitrary period. Expansion of non-periodic functions over an interval. Even and odd functions and their Fourier expansions. Application. Summing of Infinite Series. **(10 Lectures)**

Frobenius Method and Special Functions: Singular Points of Second Order Linear Differential Equations and their importance. Frobenius method and its applications to differential equations. Legendre, Bessel, Hermite and Laguerre Differential Equations. Properties of Legendre Polynomials: Rodrigues Formula, Orthogonality. Simple recurrence relations. **(16 Lectures)**

Some Special Integrals: Beta and Gamma Functions and Relation between them. Expression of Integrals in terms of Gamma Functions. Error Function (Probability Integral). **(4 Lectures)**

Partial Differential Equations: Solutions to partial differential equations, using separation of variables: Laplace's Equation in problems of rectangular, cylindrical and spherical symmetry. **(10 Lectures)**

Complex Analysis: Brief Revision of Complex Numbers and their Graphical Representation. Euler's formula, De Moivre's theorem, Roots of Complex Numbers. Functions of Complex Variables. Analyticity and Cauchy-Riemann Conditions. Examples of analytic functions. Singular functions: poles and branch points, order of singularity, branch cuts. Integration of a function of a complex variable. Cauchy's Inequality. Cauchy's Integral formula.

(14 Lectures)

Reference Books:

- Mathematical Methods for Physicists: Arfken, Weber, 2005, Harris, Elsevier.
- Fourier Analysis by M.R. Spiegel, 2004, Tata McGraw-Hill.
- Mathematics for Physicists, Susan M. Lea, 2004, Thomson Brooks/Cole.
- An Introduction to Ordinary Differential Equations, Earl A Coddington, 1961, PHI Learning.
- Differential Equations, George F. Simmons, 2006, Tata McGraw-Hill.
- Essential Mathematical Methods, K.F. Riley and M.P. Hobson, 2011, Cambridge University Press
- Partial Differential Equations for Scientists and Engineers, S.J. Farlow, 1993, Dover Publications.
- Mathematical methods for Scientists and Engineers, D.A. McQuarrie, 2003, Viva Books.

PRACTICALS -DSE LAB: MATHEMATICAL PHYSICS

60 Lectures

The aim of this course is not just to teach computer programming and numerical analysis but to emphasize its role in solving problems in Physics.

- *Highlights the use of computational methods to solve physical problems*
- *Use of computer language as a tool in solving physics problems (applications)*
- *The course will consist of lectures (both theory and practical) in the Computer Lab*
- *Evaluation done not on the programming but on the basis of formulating the problem*
- *Aim at teaching students to construct the computational problem to be solved*
- *Students can use anyone operating system Linux or Microsoft Windows*

Topics	Description with Applications
Introduction and Overview	Computer architecture and organization, memory and Input/output devices

Basics of scientific computing	Binary and decimal arithmetic, Floating point numbers, algorithms, Sequence, Selection and Repetition, single and double precision arithmetic, underflow & overflow-emphasize the importance of making equations in terms of dimensionless variables, Iterative methods
Errors and error Analysis	Truncation and round off errors, Absolute and relative errors, Floating point computations.
Review of C & C++ Programming fundamentals	Introduction to Programming, constants, variables and data types, operators and Expressions, I/O statements, scanf and printf, c in and c out, Manipulators for data formatting, Control statements (decision making and looping statements) (<i>If-statement. If-else Statement. Nested if Structure. Else-if Statement. Ternary Operator. Goto Statement. Switch Statement. Unconditional and Conditional Looping. While-Loop. Do-While Loop. FOR Loop. Break and Continue Statements. Nested Loops</i>), Arrays (<i>1D&2D</i>) and strings, user defined functions, Structures and Unions, Idea of classes and objects
Programs: using C/C++ language	Sum & average of a list of numbers, largest of a given list of numbers and its location in the list, sorting of numbers in ascending-descending order, Binary search
Random number generation	Area of circle, area of square, volume of sphere, value of pi (π)
Solution of Algebraic and Transcendental equations by Bisection, Newton Raphson and Secant methods	Solution of linear and quadratic equation, solving $\alpha = \tan \alpha; I = I_0 \left(\frac{\sin \alpha}{\alpha} \right)^2$ in optics
Interpolation by Newton Gregory Forward and Backward difference formula, Error estimation of linear interpolation	Evaluation of trigonometric functions e.g. $\sin \theta, \cos \theta, \tan \theta, etc.$
Numerical differentiation (Forward and Backward difference formula) and Integration (Trapezoidal and Simpson rules), Monte Carlo method	Given Position with equidistant time data to calculate velocity and acceleration and vice-versa. Find the area of B-H Hysteresis loop

<p>Solution of Ordinary Differential Equations (ODE)</p> <p>First order Differential equation Euler, modified Euler and Runge-Kutta (RK) second and fourth order methods</p>	<p>First order differential equation</p> <ul style="list-style-type: none"> • Radioactive decay • Current in RC, LC circuits with DC source • Newton's law of cooling • Classical equations of motion <p>Attempt following problems using RK 4 order method:</p> <ul style="list-style-type: none"> • Solve the coupled differential equations $\frac{dx}{dt} = y + x - \frac{x^3}{3}; \frac{dy}{dx} = -x$ for four initial conditions $x(0) = 0, y(0) = -1, -2, -3, -4.$ Plot x vs y for each of the four initial conditions on the same screen for $0 \leq t \leq 15$ <p>The differential equation describing the motion of a pendulum is $\frac{d^2\vartheta}{dt^2} = -\sin(\vartheta)$. The pendulum is released from rest at an angular displacement α, i. e. $\vartheta(0) = \alpha$ and $\vartheta'(0) = 0$. Solve the equation for $\alpha = 0.1, 0.5$ and 1.0 and plot ϑ as a function of time in the range $0 \leq t \leq 8\pi$. Also plot the analytic solution valid for small ϑ ($\sin(\vartheta) = \vartheta$)</p>
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Reference Books:

- Introduction to Numerical Analysis, S.S. Sastry, 5thEdn., 2012, PHI Learning Pvt. Ltd.
- Schaum's Outline of Programming with C⁺⁺. J.Hubbard, 2000, McGraw-Hill Publications.
- Numerical Recipes in C⁺⁺: The Art of Scientific Computing, W.H. Press et al., 3rdEdn., 2007, Cambridge University Press.
- A first course in Numerical Methods, Uri M. Ascher and Chen Greif, 2012, PHI Learning
- Elementary Numerical Analysis, K.E. Atkinson, 3rdEdn., 2007, Wiley India Edition.
- Numerical Methods for Scientists and Engineers, R.W. Hamming, 1973, Courier Dover Pub.
- An Introduction to Computational Physics, T. Pang, 2ndEdn., 2006, Cambridge Univ. Press

PHYSICS-DSE: SOLID STATE PHYSICS
(Credits: Theory-04, Practicals-02)

Theory: 60 Lectures

Crystal Structure: Solids: Amorphous and Crystalline Materials. Lattice Translation Vectors. Lattice with a Basis – Central and Non-Central Elements. Unit Cell. Miller Indices. Reciprocal Lattice. Types of Lattices. Brillouin Zones. Diffraction of X-rays by Crystals. Bragg's Law. Atomic and Geometrical Factor.

(12 Lectures)

Elementary Lattice Dynamics: Lattice Vibrations and Phonons: Linear Monoatomic and Diatomic Chains. Acoustical and Optical Phonons. Qualitative Description of the Phonon Spectrum in Solids. Dulong and Petit's Law, Einstein and Debye theories of specific heat of solids. T^3 law

(10 Lectures)

Magnetic Properties of Matter: Dia-, Para-, Ferri- and Ferromagnetic Materials. Classical Langevin Theory of dia – and Paramagnetic Domains. Quantum Mechanical Treatment of Paramagnetism. Curie's law, Weiss's Theory of Ferromagnetism and Ferromagnetic Domains. Discussion of B-H Curve. Hysteresis and Energy Loss.

(12 Lectures)

Dielectric Properties of Materials: Polarization. Local Electric Field at an Atom. Depolarization Field. Electric Susceptibility. Polarizability. Clausius Mosotti Equation. Classical Theory of Electric Polarizability. Normal and Anomalous Dispersion. Cauchy and Sellmeier relations. Langevin-Debye equation. Complex Dielectric Constant. Optical Phenomena. Application: Plasma Oscillations, Plasma Frequency, Plasmons.

(10 Lectures)

Elementary band theory: Kronig Penny model. Band Gaps. Conductors, Semiconductors and insulators. P and N type Semiconductors. Conductivity of Semiconductors, mobility, Hall Effect, Hall coefficient.

(10 Lectures)

Superconductivity: Experimental Results. Critical Temperature. Critical magnetic field. Meissner effect. Type I and type II Superconductors, London's Equation and Penetration Depth. Isotope effect.

(6 Lectures)

Reference Books:

- Introduction to Solid State Physics, Charles Kittel, 8th Ed., 2004, Wiley India Pvt. Ltd.
- Elements of Solid State Physics, J.P. Srivastava, 2nd Ed., 2006, Prentice-Hall of India
- Introduction to Solids, Leonid V. Azaroff, 2004, Tata Mc-Graw Hill
- Solid State Physics, Neil W. Ashcroft and N. David Mermin, 1976, Cengage Learning
- Solid State Physics, Rita John, 2014, McGraw Hill

- Solid-state Physics, H. Ibach and H Luth, 2009, Springer
 - Elementary Solid State Physics, 1/e M. Ali Omar, 1999, Pearson India
 - Solid State Physics, M.A. Wahab, 2011, Narosa Publications
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PRACTICALS-DSE LAB: SOLID STATE PHYSICS

60 Lectures

1. Measurement of susceptibility of paramagnetic solution (Quinck's Tube Method)
2. To measure the Magnetic susceptibility of Solids.
3. To determine the Coupling Coefficient of a Piezoelectric crystal.
4. To measure the Dielectric Constant of a dielectric Materials with frequency
5. To determine the complex dielectric constant and plasma frequency of metal using Surface Plasmon resonance (SPR)
6. To determine the refractive index of a dielectric layer using SPR
7. To study the PE Hysteresis loop of a Ferroelectric Crystal.
8. To draw the BH curve of iron using a Solenoid and determine the energy loss from Hysteresis.
9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by four-probe method (from room temperature to 150 °C) and to determine its band gap.
10. To determine the Hall coefficient of a semiconductor sample.

Reference Books

- Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House.
 - Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
 - A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Ed., 2011, Kitab Mahal, New Delhi
 - Elements of Solid State Physics, J.P. Srivastava, 2nd Ed., 2006, Prentice-Hall of India
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PHYSICS-DSE: QUANTUM MECHANICS

(Credits: Theory-04, Practicals-02)

Theory: 60 Lectures

Time dependent Schrodinger equation: Time dependent Schrodinger equation and dynamical evolution of a quantum state; Properties of Wave Function. Interpretation of Wave Function Probability and probability current densities in three dimensions; Conditions for Physical Acceptability of Wave Functions. Normalization. Linearity and

Superposition Principles. Eigenvalues and Eigenfunctions. Position, momentum & Energy operators; commutator of position and momentum operators; Expectation values of position and momentum. Wave Function of a Free Particle.

(6 Lectures)

Time independent Schrodinger equation-Hamiltonian, stationary states and energy eigenvalues; expansion of an arbitrary wavefunction as a linear combination of energy eigenfunctions; General solution of the time dependent Schrodinger equation in terms of linear combinations of stationary states; Application to the spread of Gaussian wavepacket for a free particle in one dimension; wave packets, Fourier transforms and momentum space wavefunction; Position-momentum uncertainty principle.

(10 Lectures)

General discussion of bound states in an arbitrary potential- continuity of wave function, boundary condition and emergence of discrete energy levels; application to one-dimensional problem- square well potential; Quantum mechanics of simple harmonic oscillator-energy levels and energy eigenfunctions using Frobenius method.

(12 Lectures)

Quantum theory of hydrogen-like atoms: time independent Schrodinger equation in spherical polar coordinates; separation of variables for the second order partial differential equation; angular momentum operator and quantum numbers; Radial wavefunctions from Frobenius method; Orbital angular momentum quantum numbers l and m ; s, p, d,.. shells (idea only)

(10 Lectures)

Atoms in Electric and Magnetic Fields:- Electron Angular Momentum. Space Quantization. Electron Spin and Spin Angular Momentum. Larmor's Theorem. Spin Magnetic Moment. Stern-Gerlach Experiment. Zeeman Effect: Electron Magnetic Moment and Magnetic Energy, Gyromagnetic Ratio and Bohr Magneton.

(8 Lectures)

Atoms in External Magnetic Fields:- Normal and Anomalous Zeeman Effect.

(4 Lectures)

Many electron atoms:- Pauli's Exclusion Principle. Symmetric and Antisymmetric Wave Functions. Periodic table. Fine structure. Spin orbit coupling. Spectral Notations for Atomic States. Total Angular Momentum. Vector Model. Spin-orbit coupling in atoms-L-S and J-J couplings.

(10 Lectures)

Reference Books:

- A Text book of Quantum Mechanics, P.M. Mathews & K. Venkatesan, 2nd Ed., 2010, McGraw Hill
- Quantum Mechanics, Robert Eisberg and Robert Resnick, 2ndEdn., 2002, Wiley.
- Quantum Mechanics, Leonard I. Schiff, 3rdEdn. 2010, Tata McGraw Hill.
- Quantum Mechanics, G. Aruldas, 2ndEdn. 2002, PHI Learning of India.
- Quantum Mechanics, Bruce Cameron Reed, 2008, Jones and Bartlett Learning.

- Quantum Mechanics for Scientists & Engineers, D.A.B. Miller, 2008, Cambridge University Press

Additional Books for Reference

- Quantum Mechanics, Eugen Merzbacher, 2004, John Wiley and Sons, Inc.
- Introduction to Quantum Mechanics, David J. Griffith, 2nd Ed. 2005, Pearson Education
- Quantum Mechanics, Walter Greiner, 4thEdn., 2001, Springer

PRACTICAL-DSE LAB: QUANTUM MECHANICS

60 Lectures

Use C/C++/Scilab for solving the following problems based on Quantum Mechanics like

1. Solve the s-wave Schrodinger equation for the ground state and the first excited state of the hydrogen atom:

$$\frac{d^2y}{dr^2} = A(r)u(r), A(r) = \frac{2m}{\hbar^2} [V(r) - E] \text{ where } V(r) = -\frac{e^2}{r}$$

Here, m is the reduced mass of the electron. Obtain the energy eigenvalues and plot the corresponding wavefunctions. Remember that the ground state energy of the hydrogen atom is ≈ -13.6 eV. Take $e = 3.795$ (eVÅ)^{1/2}, $\hbar c = 1973$ (eVÅ) and $m = 0.511 \times 10^6$ eV/c².

2. Solve the s-wave radial Schrodinger equation for an atom:

$$\frac{d^2y}{dr^2} = A(r)u(r), A(r) = \frac{2m}{\hbar^2} [V(r) - E]$$

Where m is the reduced mass of the system (which can be chosen to be the mass of an electron), for the screened coulomb potential

$$V(r) = -\frac{e^2}{r} e^{-r/a}$$

Find the energy (in eV) of the ground state of the atom to an accuracy of three significant digits. Also, plot the corresponding wavefunction. Take $e = 3.795$ (eVÅ)^{1/2}, $m = 0.511 \times 10^6$ eV/c², and $a = 3$ Å, 5 Å, 7 Å. In these units $\hbar c = 1973$ (eVÅ). The ground state energy is expected to be above -12 eV in all three cases.

3. Solve the s-wave radial Schrodinger equation for a particle of mass m:

$$\frac{d^2y}{dr^2} = A(r)u(r), A(r) = \frac{2m}{\hbar^2} [V(r) - E]$$

For the anharmonic oscillator potential

$$V(r) = \frac{1}{2} kr^2 + \frac{1}{3} br^3$$

for the ground state energy (in MeV) of the particle to an accuracy of three significant digits. Also, plot the corresponding wave function. Choose $m = 940 \text{ MeV}/c^2$, $k = 100 \text{ MeV fm}^{-2}$, $b = 0, 10, 30 \text{ MeV fm}^{-3}$. In these units, $\hbar c = 197.3 \text{ MeV fm}$. The ground state energy I expected to lie between 90 and 110 MeV for all three cases.

4. Solve the s-wave radial Schrodinger equation for the vibrations of hydrogen molecule:

$$\frac{d^2y}{dr^2} = A(r)u(r), A(r) = \frac{2\mu}{\hbar^2} [V(r) - E]$$

where μ is the reduced mass of the two-atom system for the Morse potential

$$V(r) = D(e^{-2\alpha r'} - e^{-\alpha r'}), \quad r' = \frac{r - r_0}{r_0}$$

Find the lowest vibrational energy (in MeV) of the molecule to an accuracy of three significant digits. Also plot the corresponding wave function.

Take: $m = 940 \times 10^6 \text{ eV}/c^2$, $D = 0.755501 \text{ eV}$, $\alpha = 1.44$, $r_0 = 0.131349 \text{ \AA}$

Laboratory based experiments:

5. Study of Electron spin resonance- determine magnetic field as a function of the resonance frequency
6. Study of Zeeman effect: with external magnetic field; Hyperfine splitting
7. To study the quantum tunnelling effect with solid state device, e.g. tunnelling current in backward diode or tunnel diode.

Reference Books:

- Schaum's Outline of Programming with C++. J.Hubbard, 2000, McGraw-Hill Publications.
- Numerical Recipes in C: The Art of Scientific Computing, W.H.Press et al., 3rdEdn., 2007, Cambridge University Press.
- Elementary Numerical Analysis, K.E.Atkinson, 3rdEdn., 2007, Wiley India Edition.
- A Guide to MATLAB, B.R. Hunt, R.L. Lipsman, J.M. Rosenberg, 2014, 3rd Edn., Cambridge University Press
- Simulation of ODE/PDE Models with MATLAB®, OCTAVE and SCILAB: Scientific and Engineering Applications: A. Vande Wouwer, P. Saucez, C. V. Fernández.2014 Springer ISBN: 978-3319067896
- Scilab by example: M. Affouf 2012 ISBN: 978-1479203444
- Scilab (A Free Software to Matlab): H. Ramchandran, A.S. Nair. 2011 S. Chand and Company, New Delhi ISBN: 978-8121939706
- Scilab Image Processing: Lambert M. Surhone. 2010 Betascript Publishing ISBN: 978-6133459274A
- Quantum Mechanics, Leonard I. Schiff, 3rdEdn. 2010, Tata McGraw Hill.
- Quantum Mechanics, Bruce Cameron Reed, 2008, Jones and Bartlett Learning.

PHYSICS-DSE: EMBEDDED SYSTEM: INTRODUCTION TO MICROCONTROLLERS

(Credits: Theory-04, Practicals-02)

Theory: 60 Lectures

Embedded system introduction: Introduction to embedded systems and general purpose computer systems, architecture of embedded system, classifications, applications and purpose of embedded systems, challenges and design issues in embedded systems, operational and non-operational quality attributes of embedded systems, elemental description of embedded processors and microcontrollers.

(6 Lectures)

Review of microprocessors: Organization of Microprocessor based system, 8085 μ p pin diagram and architecture, concept of data bus and address bus, 8085 programming model, instruction classification, subroutines, stacks and its implementation, delay subroutines, hardware and software interrupts.

(4 Lectures)

8051 microcontroller: Introduction and block diagram of 8051 microcontroller, architecture of 8051, overview of 8051 family, 8051 assembly language programming, Program Counter and ROM memory map, Data types and directives, Flag bits and Program Status Word (PSW) register, Jump, loop and call instructions.

(12 Lectures)

8051 I/O port programming: Introduction of I/O port programming, pin out diagram of 8051 microcontroller, I/O port pins description and their functions, I/O port programming in 8051, (Using Assembly Language), I/O programming: Bit manipulation.

(4 Lectures)

Programming of 8051: 8051 addressing modes and accessing memory using various addressing modes, assembly language instructions using each addressing mode, arithmetic & logic instructions, 8051 programming in C:- for time delay and I/O operations and manipulation, for arithmetic & logic operations, for ASCII and BCD conversions.

(12 Lectures)

Timer and counter programming: Programming 8051 timers, counter programming.

(3 Lectures)

Serial port programming with and without interrupt: Introduction to 8051 interrupts, programming timer interrupts, programming external hardware interrupts and serial communication interrupt, interrupt priority in the 8051.

(6 Lectures)

Interfacing 8051 microcontroller to peripherals: Parallel and serial ADC, DAC interfacing, LCD interfacing.

(2 Lectures)

Programming Embedded Systems: Structure of embedded program, infinite loop, compiling, linking and locating, downloading and debugging.

(3 Lectures)

Embedded system design and development: Embedded system development environment, file types generated after cross compilation, disassembler/ decompiler, simulator, emulator and debugging, embedded product development life-cycle, trends in embedded industry.

(8 Lectures)

Reference Books:

- Embedded Systems: Architecture, Programming & Design, R. Kamal, 2008, Tata McGraw Hill
- The 8051 Microcontroller and Embedded Systems Using Assembly and C, M.A. Mazidi, J.G. Mazidi, and R.D. McKinlay, 2nd Ed., 2007, Pearson Education India.
- Embedded Microcomputer System: Real Time Interfacing, J.W. Valvano, 2000, Brooks/Cole
- Embedded Systems and Robots, Subrata Ghoshal, 2009, Cengage Learning
- Introduction to embedded system, K.V. Shibu, 1st Edition, 2009, McGraw Hill
- Microcontrollers in practice, I.Susnea and M.Mitescu, 2005, Springer.
- Embedded Systems: Design & applications, 1/e S.F. Barrett, 2008, Pearson Education India
- Embedded Microcomputer systems: Real time interfacing, J.W.Valvano 2011,Cengage Learning

**PRACTICALS- DSE LAB: EMBEDDED SYSTEM:
INTRODUCTION TO MICROCONTROLLERS
60 Lectures**

Following experiments using 8051:

1. To find that the given numbers is prime or not.
2. To find the factorial of a number.
3. Write a program to make the two numbers equal by increasing the smallest number and decreasing the largest number.
4. Use one of the four ports of 8051 for O/P interfaced to eight LED's. Simulate binary counter (8 bit) on LED's.
5. Program to glow first four LED then next four using TIMER application.
6. Program to rotate the contents of the accumulator first right and then left.
7. Program to run a countdown from 9-0 in the seven segment LED display.
8. To interface seven segment LED display with 8051 microcontroller and display 'HELP' in the seven segment LED display.
9. To toggle '1234' as '1324' in the seven segment LED.
10. Interface stepper motor with 8051 and write a program to move the motor through a given angle in clock wise or counter clockwise direction.
11. Application of embedded systems: Temperature measurement, some information on LCD display, interfacing a keyboard.

Reference Books:

- Embedded Systems: Architecture, Programming & Design, R. Kamal, 2008, Tata McGraw Hill
 - The 8051 Microcontroller and Embedded Systems Using Assembly and C, M.A. Mazidi, J.G. Mazidi, and R.D. McKinlay, 2nd Ed., 2007, Pearson Education India.
 - Embedded Microcomputer System: Real Time Interfacing, J.W. Valvano, 2000, Brooks/Cole
 - Embedded System, B.K. Rao, 2011, PHI Learning Pvt. Ltd.
 - Embedded Microcomputer systems: Real time interfacing, J.W.Valvano 2011,Cengage Learning
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PHYSICS-DSE: Nuclear & Particle Physics**(Credits: Theory-05, Tutorials-01)****Theory: 75 Lectures**

General Properties of Nuclei: Constituents of nucleus and their Intrinsic properties, quantitative facts about size, mass, charge density (matter energy), binding energy, average binding energy and its variation with mass number, main features of binding energy versus mass number curve, N/A plot, angular momentum, parity, magnetic moment, electric moments, nuclear excited states. **(10 Lectures)**

Nuclear Models: Liquid drop model approach, semi empirical mass formula and significance of various terms, condition of nuclear stability. Two nucleon separation energies, Fermi gas model (degenerate fermion gas, nuclear symmetry potential in Fermi gas), evidence for nuclear shell structure, nuclear magic numbers, basic assumption of shell model, concept of mean field, residual interaction, concept of nuclear force. **(12 Lectures)**

Radioactivity decay:(a) Alpha decay: basics of α -decay processes, theory of α -emission, Gamow factor, Geiger Nuttall law, α -decay spectroscopy. (b) β -decay: energy kinematics for β -decay, positron emission, electron capture, neutrino hypothesis. (c) Gamma decay: Gamma rays emission & kinematics, internal conversion. **(10 Lectures)**

Nuclear Reactions: Types of Reactions, Conservation Laws, kinematics of reactions, Q-value, reaction rate, reaction cross section, Concept of compound and direct reaction, resonance reaction, Coulomb scattering (Rutherford scattering). **(8 Lectures)**

Interaction of Nuclear Radiation with matter: Energy loss due to ionization (Bethe-Block formula), energy loss of electrons, Cerenkov radiation, Gamma ray interaction through matter, photoelectric effect, Compton scattering, pair production, neutron interaction with matter. **(8 Lectures)**

Detector for Nuclear Radiations: Gas detectors: estimation of electric field, mobility of particle, for ionization chamber and GM Counter. Basic principle of Scintillation

Detectors and construction of photo-multiplier tube (PMT). Semiconductor Detectors (Si & Ge) for charge particle and photon detection (concept of charge carrier and mobility).
(8 Lectures)

Particle Accelerators: Accelerator facility available in India: Van-de Graaff generator (Tandem accelerator), Linear accelerator, Cyclotron, Synchrotrons. **(5 Lectures)**

Particle physics: Particle interactions; basic features, types of particles and its families. Symmetries and Conservation Laws: energy and momentum, angular momentum, parity, baryon number, Lepton number, Isospin, Strangeness and charm, concept of quark model, color quantum number and gluons. **(14 Lectures)**

Reference Books:

- Introductory nuclear Physics by Kenneth S. Krane (Wiley India Pvt. Ltd., 2008).
 - Concepts of nuclear physics by Bernard L. Cohen. (Tata Mcgraw Hill, 1998).
 - Introduction to the physics of nuclei & particles, R.A. Dunlap. (Thomson Asia, 2004)
 - Introduction to Elementary Particles, D. Griffith, John Wiley & Sons
 - Quarks and Leptons, F. Halzen and A.D. Martin, Wiley India, New Delhi
 - Basic ideas and concepts in Nuclear Physics - An Introductory Approach by K. Heyde (IOP- Institute of Physics Publishing, 2004).
 - Radiation detection and measurement, G.F. Knoll (John Wiley & Sons, 2000).
 - Theoretical Nuclear Physics, J.M. Blatt & V.F. Weisskopf (Dover Pub.Inc., 1991) □
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PHYSICS-DSE: Medical Physics **(Credits: Theory-04, Practicals-02)** **Theory: 60 Lectures**

PHYSICS OF THE BODY-I

Basic Anatomical Terminology: Standard Anatomical Position, Planes. Familiarity with terms like- Superior, Inferior, Anterior, Posterior, Medial, Lateral, Proximal and Distal.

Mechanics of the body: Skeleton, forces, and body stability. Muscles and dynamics of body movement. Physics of Locomotors Systems: joints and movements, Stability and Equilibrium. **Energy household of the body:** Energy balance in the body, Energy consumption of the body, Heat losses of the body, Thermal Regulation. **Pressure system of body:** Physics of breathing, Physics of cardiovascular system. **(8 Lectures)**

PHYSICS OF THE BODY-II

Acoustics of the body: Nature and characteristics of sound, Production of speech, Physics of the ear, Diagnostics with sound and ultrasound. **Optical system of the body:** Physics of the eye. **Electrical system of the body:** Physics of the nervous system, Electrical signals and information transfer. **(10 Lectures)**

PHYSICS OF DIAGNOSTIC AND THERAPEUTIC SYSTEMS-I

X-RAYS: Electromagnetic spectrum, production of x-rays, x-ray spectra, Bremsstrahlung, Characteristic x-ray. **X-ray tubes & types:** Coolidge tube, x-ray tube design, tube cooling stationary mode, Rotating anode x-ray tube, Tube rating, quality and intensity of x-ray. X-ray generator circuits, half wave and full wave rectification, filament circuit, kilo voltage circuit, types of X-Ray Generator, high frequency generator, exposure timers and switches, HT cables, HT generation. **(7 Lectures)**

RADIATION PHYSICS: Radiation units exposure, absorbed dose, units: rad, gray, relative biological effectiveness, effective dose, inverse square law. Interaction of radiation with matter Compton & photoelectric effect, Rem & Sievert, linear attenuation coefficient. **Radiation Detectors:** Thimble chamber, condenser chambers, Geiger Muller counter, Scintillation counters and Solid State detectors, ionization chamber, Dosimeters, survey methods, area monitors, TLD, Semiconductor detectors.

(7 Lectures)

MEDICAL IMAGING PHYSICS: Evolution of Medical Imaging, X-ray diagnostics and imaging, Physics of nuclear magnetic resonance (NMR), NMR imaging, MRI Radiological imaging, Ultrasound imaging, Physics of Doppler with applications and modes, Vascular Doppler. Radiography: Filters, grids, cassette, X-ray film, film processing, fluoroscopy. **Computed tomography scanner-** principle & function, display, generations, mammography. Thyroid uptake system and Gamma camera (Only Principle, function and display). **(9 Lectures)**

RADIATION ONCOLOGY PHYSICS: External Beam Therapy (Basic Idea): Telecobalt, Conformal Radiation Therapy (CRT), 3DCRT, IMRT, Image Guided Radiotherapy, EPID, Rapid Arc, Proton Therapy, Gamma Knife, Cyber Knife. Contact Beam Therapy (Basic Idea): Brachytherapy-LDR and HDR, Intra Operative Brachytherapy. Radiotherapy, kilo voltage machines, deep therapy machines, Telecobalt machines, Medical linear accelerator. Basics of Teletherapy units, deep x-ray, Telecobalt units, medical linear accelerator, Radiation protection, external beam characteristics, dose maximum and build up – bolus, percentage depth dose, tissue maximum ratio and tissue phantom ratio, Planned target Volume and Gross Tumour Volume. **(9 Lectures)**

RADIATION AND RADIATION PROTECTION: Principles of radiation protection, protective materials-radiation effects, somatic, genetic stochastic and deterministic effect. Personal monitoring devices: TLD film badge, pocket dosimeter, OSL dosimeter. Radiation dosimeter. Natural radioactivity, Biological effects of radiation, Radiation monitors. Steps to reduce radiation to Patient, Staff and Public. Dose Limits for Occupational workers and Public. AERB: Existence and Purpose. **(5 Lectures)**

PHYSICS OF DIAGNOSTIC AND THERAPEUTIC SYSTEMS-II

Diagnostic nuclear medicine: Radiopharmaceuticals for radioisotope imaging,

Radioisotope imaging equipment, Single photon and positron emission tomography.
Therapeutic nuclear medicine: Interaction between radiation and matter Dose and isodose in radiation treatment.

Medical Instrumentation: Basic Ideas of Endoscope and Cautery, Sleep Apnea and Cpap Machines, Ventilator and its modes. **(5 Lectures)**

References:

- Medical Physics, J.R. Cameron and J.G. Skofronick, Wiley (1978)
- Basic Radiological Physics Dr. K. Thayalan - Jayapee Brothers Medical Publishing Pvt. Ltd. New Delhi (2003)
- Christensen's Physics of Diagnostic Radiology: Curry, Dowdey and Murry - Lippincot Williams and Wilkins (1990)
- Physics of Radiation Therapy: F M Khan - Williams and Wilkins, Third edition (2003)
- Physics of the human body, Irving P. Herman, Springer (2007).
- The essential physics of Medical Imaging: Bushberg, Seibert, Leidholdt and Boone Lippincot Williams and Wilkins, Second Edition (2002)
- Handbook of Physics in Diagnostic Imaging: R.S. Livingstone: B.I. Publication Pvt Ltd.
- The Physics of Radiology-H E Johns and Cunningham.

PRACTICALS -DSE LAB: Medical Physics

60 Lectures

1. Understanding the working of a manual Hg Blood Pressure monitor and measure the Blood Pressure.
2. Understanding the working of a manual optical eye-testing machine and to learn eye-testing.
3. Correction of Myopia (short sightedness) using a combination of lenses on an optical bench/breadboard.
4. Correction of Hypermetropia/Hyperopia (long sightedness) using a combination of lenses on an optical bench/breadboard.
5. To learn working of Thermoluminescent dosimeter (TLD) badges and measure the background radiation.
6. Familiarization with Geiger-Muller (GM) Counter and to measure background radiation.
7. Familiarization with Radiation meter and to measure background radiation.
8. Familiarization with the Use of a Vascular Doppler.

References:

- Basic Radiological Physics Dr. K. Thayalan - Jayapee Brothers Medical Publishing Pvt. Ltd. New Delhi (2003)
- Christensen's Physics of Diagnostic Radiology: Curry, Dowdey and Murry - Lippincot Williams and Wilkins (1990)
- Physics of Radiation Therapy: F M Khan - Williams and Wilkins, Third edition (2003)
- The essential physics of Medical Imaging: Bushberg, Seibert, Leidholdt and

- Boone Lippincot Williams and Wilkins, Second Edition (2002)
- The Physics of Radiology-H E Johns and Cunningham.
 - Advanced Practical Physics for students, B.L. Flint & H.T. Worsnop, 1971, Asia Publishing House.
 - Handbook of Physics in Diagnostic Imaging: Roshan S. Livingstone: B. I. Publications Pvt Ltd.
 - A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.
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Skill Enhancement Course (any four) (Credit: 02 each)- SEC1 to SEC4

PHYSICS WORKSHOP SKILL

(Credits: 02)

30 Lectures

The aim of this course is to enable the students to familiar and experience with various mechanical and electrical tools through hands-on mode

Introduction: Measuring units. conversion to SI and CGS. Familiarization with meter scale, Vernier calliper, Screw gauge and their utility. Measure the dimension of a solid block, volume of cylindrical beaker/glass, diameter of a thin wire, thickness of metal sheet, etc. Use of Sextant to measure height of buildings, mountains, etc. **(4 Lectures)**

Mechanical Skill: Concept of workshop practice. Overview of manufacturing methods: casting, foundry, machining, forming and welding. Types of welding joints and welding defects. Common materials used for manufacturing like steel, copper, iron, metal sheets, composites and alloy, wood. Concept of machine processing, introduction to common machine tools like lathe, shaper, drilling, milling and surface machines. Cutting tools, lubricating oils. Cutting of a metal sheet using blade. Smoothing of cutting edge of sheet using file. Drilling of holes of different diameter in metal sheet and wooden block. Use of bench vice and tools for fitting. Make funnel using metal sheet. **(10 Lectures)**

Electrical and Electronic Skill: Use of Multimeter. Soldering of electrical circuits having discrete components (R, L, C, diode) and ICs on PCB. Operation of oscilloscope. Making regulated power supply. Timer circuit, Electronic switch using transistor and relay. **(10 Lectures)**

Introduction to prime movers: Mechanism, gear system, wheel, Fixing of gears with motor axel. Lever mechanism, Lifting of heavy weight using lever. braking systems, pulleys, working principle of power generation systems. Demonstration of pulley experiment. **(6 Lectures)**

Reference Books:

- A text book in Electrical Technology - B L Theraja – S. Chand and Company.
- Performance and design of AC machines – M.G. Say, ELBS Edn.

- Mechanical workshop practice, K.C. John, 2010, PHI Learning Pvt. Ltd.
 - Workshop Processes, Practices and Materials, Bruce J Black 2005, 3rd Edn., Editor Newnes [ISBN: 0750660732]
 - New Engineering Technology, Lawrence Smyth/Liam Hennessy, The Educational Company of Ireland [ISBN: 0861674480]
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COMPUTATIONAL PHYSICS

(Credits: 02)

Theory: 30 Lectures

The aim of this course is not just to teach computer programming and numerical analysis but to emphasize its role in solving problems in Physics.

- *Highlights the use of computational methods to solve physical problems*
- *Use of computer language as a tool in solving physics problems (applications)*
- *Course will consist of hands on training on the Problem solving on Computers.*

Introduction: Importance of computers in Physics, paradigm for solving physics problems for solution. Usage of linux as an Editor. **Algorithms and Flowcharts:** Algorithm: Definition, properties and development. Flowchart: Concept of flowchart, symbols, guidelines, types. Examples: Cartesian to Spherical Polar Coordinates, Roots of Quadratic Equation, Sum of two matrices, Sum and Product of a finite series, calculation of $\sin(x)$ as a series, algorithm for plotting (1) lissajous figures and (2) trajectory of a projectile thrown at an angle with the horizontal. **(4 Lectures)**

Scientific Programming: Some fundamental Linux Commands (Internal and External commands). Development of FORTRAN, Basic elements of FORTRAN: Character Set, Constants and their types, Variables and their types, Keywords, Variable Declaration and concept of instruction and program. Operators: Arithmetic, Relational, Logical and Assignment Operators. Expressions: Arithmetic, Relational, Logical, Character and Assignment Expressions. Fortran Statements: I/O Statements (unformatted/formatted), Executable and Non-Executable Statements, Layout of Fortran Program, Format of writing Program and concept of coding, Initialization and Replacement Logic. Examples from physics problems. **(5 Lectures)**

Control Statements: Types of Logic (Sequential, Selection, Repetition), Branching Statements (Logical **IF**, Arithmetic IF, Block IF, Nested Block IF, SELECT CASE and ELSE IF Ladder statements), Looping Statements (DO-CONTINUE, DO-ENDDO, DO-WHILE, Implied and Nested DO Loops), Jumping Statements (Unconditional GOTO, Computed GOTO, Assigned GOTO) Subscripted Variables (Arrays: Types of Arrays, DIMENSION Statement, Reading and Writing Arrays), Functions and Subroutines (Arithmetic Statement Function, Function Subprogram and Subroutine), RETURN, CALL, COMMON and EQUIVALENCE Statements), Structure, Disk I/O Statements, open a file, writing in a file, reading from a file. Examples from physics problems.

Programming:

1. Exercises on syntax on usage of FORTRAN

2. Usage of GUI Windows, Linux Commands, familiarity with DOS commands and working in an editor to write sources codes in FORTRAN.
3. To print out all natural even/ odd numbers between given limits.
4. To find maximum, minimum and range of a given set of numbers.
5. Calculating Euler number using $\exp(x)$ series evaluated at $x=1$ (6 Lectures)

Scientific word processing: Introduction to LaTeX: TeX/LaTeX word processor, preparing a basic LaTeX file, Document classes, Preparing an input file for LaTeX, Compiling LaTeX File, LaTeX tags for creating different environments, Defining LaTeX commands and environments, Changing the type style, Symbols from other languages. **Equation representation:** Formulae and equations, Figures and other floating bodies, Lining in columns- Tabbing and tabular environment, Generating table of contents, bibliography and citation, Making an index and glossary, List making environments, Fonts, Picture environment and colors, errors. (6 Lectures)

Visualization: Introduction to graphical analysis and its limitations. Introduction to Gnuplot. importance of visualization of computational and computational data, basic Gnuplot commands: simple plots, plotting data from a file, saving and exporting, multiple data sets per file, physics with Gnuplot (equations, building functions, user defined variables and functions), Understanding data with Gnuplot

Hands on exercises:

1. To compile a frequency distribution and evaluate mean, standard deviation etc.
2. To evaluate sum of finite series and the area under a curve.
3. To find the product of two matrices
4. To find a set of prime numbers and Fibonacci series.
5. To write program to open a file and generate data for plotting using Gnuplot.
6. Plotting trajectory of a projectile projected horizontally.
7. Plotting trajectory of a projectile projected making an angle with the horizontally.
8. Creating an input Gnuplot file for plotting a data and saving the output for seeing on the screen. Saving it as an eps file and as a pdf file.
9. To find the roots of a quadratic equation.
10. Motion of a projectile using simulation and plot the output for visualization.
11. Numerical solution of equation of motion of simple harmonic oscillator and plot the outputs for visualization.
12. Motion of particle in a central force field and plot the output for visualization.

(9 Lectures)

Reference Books:

- Introduction to Numerical Analysis, S.S. Sastry, 5th Edn., 2012, PHI Learning Pvt. Ltd.
- Computer Programming in Fortran 77". V. Rajaraman (Publisher:PHI).
- LaTeX–A Document Preparation System", Leslie Lamport (Second Edition, Addison-Wesley, 1994).
- Gnuplot in action: understanding data with graphs, Philip K Janert, (Manning 2010)
- Schaum's Outline of Theory and Problems of Programming with Fortran, S Lipsdutz and A Poe, 1986Mc-Graw Hill Book Co.
- Computational Physics: An Introduction, R. C. Verma, et al. New Age International Publishers, New Delhi(1999)
- A first course in Numerical Methods, U.M. Ascher and C. Greif, 2012, PHI Learning
- Elementary Numerical Analysis, K.E. Atkinson, 3rd Edn., 2007, Wiley India Edition.

ELECTRICAL CIRCUITS AND NETWORK SKILLS **(Credits: 02)**

Theory: 30 Lectures

The aim of this course is to enable the students to design and trouble shoots the electrical circuits, networks and appliances through hands-on mode

Basic Electricity Principles: Voltage, Current, Resistance, and Power. Ohm's law. Series, parallel, and series-parallel combinations. AC Electricity and DC Electricity. Familiarization with multimeter, voltmeter and ammeter. **(3 Lectures)**

Understanding Electrical Circuits: Main electric circuit elements and their combination. Rules to analyze DC sourced electrical circuits. Current and voltage drop across the DC circuit elements. Single-phase and three-phase alternating current sources. Rules to analyze AC sourced electrical circuits. Real, imaginary and complex power components of AC source. Power factor. Saving energy and money. **(4 Lectures)**

Electrical Drawing and Symbols: Drawing symbols. Blueprints. Reading Schematics. Ladder diagrams. Electrical Schematics. Power circuits. Control circuits. Reading of circuit schematics. Tracking the connections of elements and identify current flow and voltage drop. **(4 Lectures)**

Generators and Transformers: DC Power sources. AC/DC generators. Inductance, capacitance, and impedance. Operation of transformers. **(3 Lectures)**

Electric Motors: Single-phase, three-phase & DC motors. Basic design. Interfacing DC or AC sources to control heaters & motors. Speed & power of ac motor. **(4 Lectures)**

Solid-State Devices: Resistors, inductors and capacitors. Diode and rectifiers. Components in Series or in shunt. Response of inductors and capacitors with DC or AC sources **(3 Lectures)**

Electrical Protection: Relays. Fuses and disconnect switches. Circuit breakers. Overload devices. Ground-fault protection. Grounding and isolating. Phase reversal. Surge protection. Interfacing DC or AC sources to control elements (relay protection device) **(4 Lectures)**

Electrical Wiring: Different types of conductors and cables. Basics of wiring-Star and delta connection. Voltage drop and losses across cables and conductors. Instruments to measure current, voltage, power in DC and AC circuits. Insulation. Solid and stranded cable. Conduit. Cable trays. Splices: wirenuts, crimps, terminal blocks, split bolts, and solder. Preparation of extension board. **(5 Lectures)**

Reference Books:

- A text book in Electrical Technology - B L Theraja - S Chand & Co.
- A text book of Electrical Technology - A K Theraja

- Performance and design of AC machines - M G Say ELBS Edn.
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BASIC INSTRUMENTATION SKILLS

(Credits: 02)

Theory: 30 Lectures

This course is to get exposure with various aspects of instruments and their usage through hands-on mode. Experiments listed below are to be done in continuation of the topics.

Basic of Measurement: Instruments accuracy, precision, sensitivity, resolution range etc. Errors in measurements and loading effects. **Multimeter:** Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance. **(4 Lectures)**

Electronic Voltmeter: Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity. Principles of voltage measurement (block diagram only). Specifications of an electronic Voltmeter/Multimeter and their significance. **AC millivoltmeter:** Type of AC millivoltmeters: Amplifier- rectifier, and rectifier- amplifier. Block diagram ac millivoltmeter, specifications and their significance. **(4 Lectures)**

Cathode Ray Oscilloscope: Block diagram of basic CRO. Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation only– no mathematical treatment), brief discussion on screen phosphor, visual persistence & chemical composition. Time base operation, synchronization. Front panel controls. Specifications of a CRO and their significance. **(6 Lectures)**

Use of CRO for the measurement of voltage (dc and ac frequency, time period. Special features of dual trace, introduction to digital oscilloscope, probes. Digital storage Oscilloscope: Block diagram and principle of working. **(3 Lectures)**

Signal Generators and Analysis Instruments: Block diagram, explanation and specifications of low frequency signal generators. pulse generator, and function generator. Brief idea for testing, specifications. Distortion factor meter, wave analysis. **(4 Lectures)**

Impedance Bridges & Q-Meters: Block diagram of bridge. working principles of basic (balancing type) RLC bridge. Specifications of RLC bridge. Block diagram & working principles of a Q- Meter. Digital LCR bridges. **(3 Lectures)**

Digital Instruments: Principle and working of digital meters. Comparison of analog & digital instruments. Characteristics of a digital meter. Working principles of digital voltmeter. **(3 Lectures)**

Digital Multimeter: Block diagram and working of a digital multimeter. Working principle of time interval, frequency and period measurement using universal counter/frequency counter, time- base stability, accuracy and resolution. **(3 Lectures)**

The test of lab skills will be of the following test items:

1. Use of an oscilloscope.

2. CRO as a versatile measuring device.
3. Circuit tracing of Laboratory electronic equipment,
4. Use of Digital multimeter/VTVM for measuring voltages
5. Circuit tracing of Laboratory electronic equipment,
6. Winding a coil / transformer.
7. Study the layout of receiver circuit.
8. Trouble shooting a circuit
9. Balancing of bridges

Laboratory Exercises:

1. To observe the loading effect of a multimeter while measuring voltage across a low resistance and high resistance.
2. To observe the limitations of a multimeter for measuring high frequency voltage and currents.
3. To measure Q of a coil and its dependence on frequency, using a Q- meter.
4. Measurement of voltage, frequency, time period and phase angle using CRO.
5. Measurement of time period, frequency, average period using universal counter/ frequency counter.
6. Measurement of rise, fall and delay times using a CRO.
7. Measurement of distortion of a RF signal generator using distortion factor meter.
8. Measurement of R, L and C using a LCR bridge/ universal bridge.

Open Ended Experiments:

1. Using a Dual Trace Oscilloscope
2. Converting the range of a given measuring instrument (voltmeter, ammeter)

Reference Books:

- A text book in Electrical Technology - B L Theraja - S Chand and Co.
 - Performance and design of AC machines - M G Say ELBS Edn.
 - Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
 - Logic circuit design, Shimon P. Vingron, 2012, Springer.
 - Digital Electronics, Subrata Ghoshal, 2012, Cengage Learning.
 - Electronic Devices and circuits, S. Salivahanan & N. S.Kumar, 3rd Ed., 2012, Tata Mc-Graw Hill
 - Electronic circuits: Handbook of design and applications, U.Tietze, Ch.Schenk, 2008, Springer
 - Electronic Devices, 7/e Thomas L. Floyd, 2008, Pearson India
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**RENEWABLE ENERGY AND ENERGY HARVESTING
(Credits: 02)**

Theory: 30 Lectures

The aim of this course is not just to impart theoretical knowledge to the students but to provide them with exposure and hands-on learning wherever possible

Fossil fuels and Alternate Sources of energy: Fossil fuels and Nuclear Energy, their limitation, need of renewable energy, non-conventional energy sources. An overview of developments in Offshore Wind Energy, Tidal Energy, Wave energy systems, Ocean Thermal Energy Conversion, solar energy, biomass, biochemical conversion, biogas generation, geothermal energy tidal energy, Hydroelectricity. **(3 Lectures)**

Solar energy: Solar energy, its importance, storage of solar energy, solar pond, non convective solar pond, applications of solar pond and solar energy, solar water heater, flat plate collector, solar distillation, solar cooker, solar green houses, solar cell, absorption air conditioning. Need and characteristics of photovoltaic (PV) systems, PV models and equivalent circuits, and sun tracking systems. **(6 Lectures)**

Wind Energy harvesting: Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines, Power electronic interfaces, and grid interconnection topologies. **(3 Lectures)**

Ocean Energy: Ocean Energy Potential against Wind and Solar, Wave Characteristics and Statistics, Wave Energy Devices. **(3 Lectures)**

Tide characteristics and Statistics, Tide Energy Technologies, Ocean Thermal Energy, Osmotic Power, Ocean Bio-mass. **(2 Lectures)**

Geothermal Energy: Geothermal Resources, Geothermal Technologies. **(2 Lectures)**

Hydro Energy: Hydropower resources, hydropower technologies, environmental impact of hydro power sources. **(2 Lectures)**

Piezoelectric Energy harvesting: Introduction, Physics and characteristics of piezoelectric effect, materials and mathematical description of piezoelectricity, Piezoelectric parameters and modeling piezoelectric generators, Piezoelectric energy harvesting applications, Human power **(4 Lectures)**

Electromagnetic Energy Harvesting: Linear generators, physics mathematical models, recent applications **(2 Lectures)**

Carbon captured technologies, cell, batteries, power consumption **(2 Lectures)**

Environmental issues and Renewable sources of energy, sustainability. **(1 Lecture)**

Demonstrations and Experiments

1. Demonstration of Training modules on Solar energy, wind energy, etc.
2. Conversion of vibration to voltage using piezoelectric materials
3. Conversion of thermal energy into voltage using thermoelectric modules.

Reference Books:

- Non-conventional energy sources - G.D Rai - Khanna Publishers, New Delhi
 - Solar energy - M P Agarwal - S Chand and Co. Ltd.
 - Solar energy - Suhas P Sukhative Tata McGraw - Hill Publishing Company Ltd.
 - Godfrey Boyle, "Renewable Energy, Power for a sustainable future", 2004, Oxford University Press, in association with The Open University.
 - Dr. P Jayakumar, Solar Energy: Resource Assesment Handbook, 2009
 - J.Balfour, M.Shaw and S. Jarosek, Photovoltaics, Lawrence J Goodrich (USA).
 - http://en.wikipedia.org/wiki/Renewable_energy
-

TECHNICAL DRAWING

(Credits: 02)

Theory: 30 Lectures

Introduction: Drafting Instruments and their uses. lettering: construction and uses of various scales: dimensioning as per I.S.I. 696-1972. Engineering Curves: Parabola: hyperbola: ellipse: cycloids, involute: spiral: helix and loci of points of simple moving mechanism. 2D geometrical construction. Representation of 3D objects. Principles of projections. **(4 Lectures)**

Projections: Straight lines, planes and solids. Development of surfaces of right and oblique solids. Section of solids. **(6 Lectures)**

Object Projections: Orthographic projection. Interpenetration and intersection of solids. Isometric and oblique parallel projection of solids. **(4 Lectures)**

CAD Drawing: Introduction to CAD and Auto CAD, precision drawing and drawing aids, Geometric shapes, Demonstrating CAD- specific skills (graphical user interface. Create, retrieve, edit, and use symbol libraries. Use inquiry commands to extract drawing data). Control entity properties. Demonstrating basic skills to produce 2-D and 3-D drawings. 3D modeling with Auto CAD (surfaces and solids), 3D modeling with sketch up, annotating in Auto CAD with text and hatching, layers, templates & design center, advanced plotting (layouts, viewports), office standards, dimensioning, internet and collaboration, Blocks, Drafting symbols, attributes, extracting data. basic printing, editing tools, Plot/Print drawing to appropriate scale. **(16 Lectures)**

Reference Books:

- K. Venugopal, and V. Raja Prabhu. Engineering Graphic, New Age International
 - AutoCAD 2014 & AutoCAD 2014/Donnie Gladfelter/Sybex/ISBN:978-1-118-57510-9
 - Architectural Design with Sketchup/Alexander Schreyer/John Wiley & Sons/ISBN: 978-1-118-12309-6
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Radiation Safety

(Credits: 02)

Theory: 30 Lectures

The aim of this course is for awareness and understanding regarding radiation hazards and safety. The list of laboratory skills and experiments listed below the course are to be done in continuation of the topics

Basics of Atomic and Nuclear Physics: Basic concept of atomic structure; X rays characteristic and production; concept of bremsstrahlung and auger electron, The composition of nucleus and its properties, mass number, isotopes of element, spin, binding energy, stable and unstable isotopes, law of radioactive decay, Mean life and

half life, basic concept of alpha, beta and gamma decay, concept of cross section and kinematics of nuclear reactions, types of nuclear reaction, Fusion, fission. **(6 Lectures)**

Interaction of Radiation with matter: Types of Radiation: Alpha, Beta, Gamma and Neutron and their sources, sealed and unsealed sources, **Interaction of Photons** - Photoelectric effect, Compton Scattering, Pair Production, Linear and Mass Attenuation Coefficients, **Interaction of Charged Particles:** Heavy charged particles - Beth-Bloch Formula, Scaling laws, Mass Stopping Power, Range, Straggling, Channeling and Cherenkov radiation. Beta Particles- Collision and Radiation loss (Bremsstrahlung), **Interaction of Neutrons-** Collision, slowing down and Moderation. **(7 Lectures)**

Radiation detection and monitoring devices: Radiation Quantities and Units: Basic idea of different units of activity, KERMA, exposure, absorbed dose, equivalent dose, effective dose, collective equivalent dose, Annual Limit of Intake (ALI) and derived Air Concentration (DAC). **Radiation detection:** Basic concept and working principle of *gas detectors* (Ionization Chambers, Proportional Counter, Multi-Wire Proportional Counters (MWPC) and Gieger Muller Counter), *Scintillation Detectors* (Inorganic and Organic Scintillators), *Solid States Detectors* and *Neutron Detectors*, *Thermo luminescent Dosimetry*. **(7 Lectures)**

Radiation safety management: *Biological effects of ionizing radiation*, Operational limits and basics of radiation hazards evaluation and control: radiation protection standards, International Commission on Radiological Protection (ICRP) principles, justification, optimization, limitation, introduction of safety and risk management of radiation. Nuclear waste and disposal management. Brief idea about Accelerator driven Sub-critical system (ADS) for waste management. **(5 Lectures)**

Application of nuclear techniques: Application in medical science (e.g., MRI, PET, Projection Imaging Gamma Camera, radiation therapy), Archaeology, Art, Crime detection, Mining and oil. *Industrial Uses:* Tracing, Gauging, Material Modification, Sterization, Food preservation. **(5 Lectures)**

Experiments:

1. Study the background radiation levels using Radiation meter

Characteristics of Geiger Muller (GM) Counter:

- 2) Study of characteristics of GM tube and determination of operating voltage and plateau length using background radiation as source (without commercial source).
- 3) Study of counting statistics using background radiation using GM counter.
- 4) Study of radiation in various materials (e.g. KSO₄ etc.). Investigation of possible radiation in different routine materials by operating GM at operating voltage.
- 5) Study of absorption of beta particles in Aluminum using GM counter.
- 6) Detection of α particles using reference source & determining its half life using spark counter
- 7) Gamma spectrum of Gas Light mantle (Source of Thorium)

Reference Books:

1. W.E. Burcham and M. Jobs – Nuclear and Particle Physics – Longman (1995)

2. G.F.Knoll, Radiation detection and measurements
 3. Thermoluminescence Dosimetry, Mcknlly, A.F., Bristol, Adam Hilger (Medical Physics Handbook 5)
 4. W.J. Meredith and J.B. Massey, "Fundamental Physics of Radiology". John Wright and Sons, UK, 1989.
 5. J.R. Greening, "Fundamentals of Radiation Dosimetry", Medical Physics Hand Book Series, No.6, Adam Hilger Ltd., Bristol 1981.
 6. Practical Applications of Radioactivity and Nuclear Radiations, G.C. Lowental and P.L. Airey, Cambridge University Press, U.K., 2001
 7. A. Martin and S.A. Harbisor, An Introduction to Radiation Protection, John Willey & Sons, Inc. New York, 1981.
 8. NCRP, ICRP, ICRU, IAEA, AERB Publications.
 9. W.R. Hendee, "Medical Radiation Physics", Year Book – Medical Publishers Inc. London, 1981
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APPLIED OPTICS

(Credits: 02)

THEORY: 30 Lectures

Theory includes only qualitative explanation. Minimum five experiments should be performed covering minimum three sections.

<p>(i) Sources and Detectors (9 Periods) Lasers, Spontaneous and stimulated emissions, Theory of laser action, Einstein's coefficients, Light amplification, Characterization of laser beam, He-Ne laser, Semiconductor lasers.</p>
<p>Experiments on Lasers:</p> <ol style="list-style-type: none"> a. Determination of the grating radial spacing of the Compact Disc (CD) by reflection using He-Ne or solid state laser. b. To find the width of the wire or width of the slit using diffraction pattern obtained by a He-Ne or solid state laser. c. To find the polarization angle of laser light using polarizer and analyzer d. Thermal expansion of quartz using laser <p>Experiments on Semiconductor Sources and Detectors:</p> <ol style="list-style-type: none"> a. V-I characteristics of LED b. Study the characteristics of solid state laser c. Study the characteristics of LDR d. Photovoltaic Cell e. Characteristics of IR sensor

(ii)	Fourier Optics	(6 Periods)
<p>Concept of Spatial frequency filtering, Fourier transforming property of a thin lens</p>		
Experiments on Fourier Optics:		
<p>a. Fourier optic and image processing</p> <ol style="list-style-type: none"> 1. Optical image addition/subtraction 2. Optical image differentiation 3. Fourier optical filtering 4. Construction of an optical 4f system 		
<p>b. Fourier Transform Spectroscopy</p> <p>Fourier Transform Spectroscopy (FTS) is a powerful method for measuring emission and absorption spectra, with wide application in atmospheric remote sensing, NMR spectrometry and forensic science.</p>		
Experiment:		
<p>To study the interference pattern from a Michelson interferometer as a function of mirror separation in the interferometer. The resulting interferogram is the Fourier transform of the power spectrum of the source. Analysis of experimental interferograms allows one to determine the transmission characteristics of several interference filters. Computer simulation can also be done.</p>		

(iii)	Holography	(6 Periods)
<p>Basic principle and theory: coherence, resolution, Types of holograms, white light reflection hologram, application of holography in microscopy, interferometry, and character recognition</p>		
Experiments on Holography and interferometry:		
<ol style="list-style-type: none"> 1. Recording and reconstructing holograms 2. Constructing a Michelson interferometer or a Fabry Perot interferometer 3. Measuring the refractive index of air 4. Constructing a Sagnac interferometer 5. Constructing a Mach-Zehnder interferometer 6. White light Hologram 		

(iv)	Photonics: Fibre Optics	(9 Periods)
<p>Optical fibres and their properties, Principal of light propagation through a fibre, The numerical aperture, Attenuation in optical fibre and attenuation limit, Single mode and multimode fibres, Fibre optic sensors: Fibre Bragg Grating</p>		
Experiments on Photonics: Fibre Optics		
<ol style="list-style-type: none"> a. To measure the numerical aperture of an optical fibre b. To study the variation of the bending loss in a multimode fibre c. To determine the mode field diameter (MFD) of fundamental mode in a single-mode fibre by measurements of its far field Gaussian pattern d. To measure the near field intensity profile of a fibre and study its refractive index profile e. To determine the power loss at a splice between two multimode fibre 		

Reference Books:

- Fundamental of optics, F. A. Jenkins & H. E. White, 1981, Tata McGraw hill.

- LASERS: Fundamentals & applications, K.Thyagrajan & A.K.Ghatak, 2010, Tata McGraw Hill
 - Fibre optics through experiments, M.R.Shenoy, S.K.Khijwania, et.al. 2009, Viva Books
 - Nonlinear Optics, Robert W. Boyd, (Chapter-I), 2008, Elsevier.
 - Optics, Karl Dieter Moller, Learning by computing with model examples, 2007, Springer.
 - Optical Systems and Processes, Joseph Shamir, 2009, PHI Learning Pvt. Ltd.
 - Optoelectronic Devices and Systems, S.C. Gupta, 2005, PHI Learning Pvt. Ltd.
 - Optical Physics, A.Lipson, S.G.Lipson, H.Lipson, 4th Edn., 1996, Cambridge Univ. Press
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WEATHER FORECASTING

(Credits: 02)

Theory: 30 Lectures

The aim of this course is not just to impart theoretical knowledge to the students but to enable them to develop an awareness and understanding regarding the causes and effects of different weather phenomenon and basic forecasting techniques

Introduction to atmosphere: Elementary idea of atmosphere: physical structure and composition; compositional layering of the atmosphere; variation of pressure and temperature with height; air temperature; requirements to measure air temperature; temperature sensors: types; atmospheric pressure: its measurement; cyclones and anticyclones: its characteristics. **(9 Periods)**

Measuring the weather: Wind; forces acting to produce wind; wind speed direction: units, its direction; measuring wind speed and direction; humidity, clouds and rainfall, radiation: absorption, emission and scattering in atmosphere; radiation laws. **(4 Periods)**

Weather systems: Global wind systems; air masses and fronts: classifications; jet streams; local thunderstorms; tropical cyclones: classification; tornadoes; hurricanes. **(3 Periods)**

Climate and Climate Change: Climate: its classification; causes of climate change; global warming and its outcomes; air pollution; aerosols, ozone depletion, acid rain, environmental issues related to climate. **(6 Periods)**

Basics of weather forecasting: Weather forecasting: analysis and its historical background; need of measuring weather; types of weather forecasting; weather forecasting methods; criteria of choosing weather station; basics of choosing site and exposure; satellites observations in weather forecasting; weather maps; uncertainty and predictability; probability forecasts. **(8 Periods)**

Demonstrations and Experiments:

1. Study of synoptic charts & weather reports, working principle of weather station.
2. Processing and analysis of weather data:

- (a) To calculate the sunniest time of the year.
 - (b) To study the variation of rainfall amount and intensity by wind direction.
 - (c) To observe the sunniest/driest day of the week.
 - (d) To examine the maximum and minimum temperature throughout the year.
 - (e) To evaluate the relative humidity of the day.
 - (f) To examine the rainfall amount month wise.
- 3. Exercises in chart reading: Plotting of constant pressure charts, surfaces charts, upper wind charts and its analysis.
 - 4. Formats and elements in different types of weather forecasts/ warning (both aviation and non aviation)

Reference books:

- 1. Aviation Meteorology, I.C. Joshi, 3rd edition 2014, Himalayan Books
 - 2. The weather Observers Hand book, Stephen Burt, 2012, Cambridge University Press.
 - 3. Meteorology, S.R. Ghadekar, 2001, Agromet Publishers, Nagpur.
 - 4. Text Book of Agrometeorology, S.R. Ghadekar, 2005, Agromet Publishers, Nagpur.
 - 5. Why the weather, Charls Franklin Brooks, 1924, Chpraman & Hall, London.
 - 6. Atmosphere and Ocean, John G. Harvey, 1995, The Artemis Press.
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B.A. (Program) Sociology
Scheme of Courses and Syllabus

Under Choice Based Credit System (CBCS)

Delhi University

June 2015

**PROPOSED SCHEME FOR CHOICE BASED CREDIT SYSTEM IN
B.A. Programme**

	CORE COURSE (12)	Ability Enhancement Compulsory Course (AECC) (2)	Skill Enhancement Course (SEC) (2)	Discipline Specific Elective DSE (4)	Generic Elective GE (2)
I	English/MIL-1	(English/MIL Communication) / Environmental Science			
	DSC- 1 A				
	DSC- 2 A				
II	MIL/English-1	Environmental Science/ (English/MIL Communication)			
	DSC- 1 B				
	DSC- 2 B				
III	English/MIL-2		SEC -1		
	DSC- 1 C				
	DSC- 2 C				
IV	MIL/English-2		SEC -2		
	DSC- 1 D				
	DSC- 2 D				
V			SEC -3	DSE-1 A	GE-1
				DSE-2 A	
VI			SEC -4	DSE-1 B	GE-2
				DSE-2 B	

Details of Courses Under Undergraduate Programme (B.A)

Course

***Credits**

<u>I. Core Course</u>	Paper+ Practical	Paper + Tutorial
(12 Papers)	12X4= 48	12X5=60
Two papers – English		
Two papers – MIL		
Four papers – Discipline 1.		
Four papers – Discipline 2.		
Core Course Practical / Tutorial*	12X2=24	12X1=12
(12 Practicals)		
<u>II. Elective Course</u>	6x4=24	6X5=30
(6 Papers)		
Two papers- Discipline 1 specific		
Two papers- Discipline 2 specific		
Two papers- Inter disciplinary		
Two papers from each discipline of choice and two papers of interdisciplinary nature.		
Elective Course Practical / Tutorials*	6 X 2=12	6X1=6
(6 Practical/ Tutorials*)		
Two papers- Discipline 1 specific		
Two papers- Discipline 2 specific		
Two papers- Generic (Inter disciplinary)		
Two papers from each discipline of choice including papers of interdisciplinary nature.		
<ul style="list-style-type: none"> • Optional Dissertation or project work in place of one elective paper (6 credits) in 6th Semester 		
<u>III. Ability Enhancement Courses</u>		
1. Ability Enhancement Compulsory Courses (AECC)	2 X 2=4	2 X 2=4
(2 Papers of 2 credits each)		
Environmental Science		
English Communication/MIL		
2. Skill Enhancement Courses (SEC)	4 X 2=8	4 X 2=8
(4 Papers of 2 credits each)		
	<hr/>	<hr/>
	Total credit= 120	Total = 120
Institute should evolve a system/policy about ECA/ General Interest/Hobby/Sports/NCC/NSS/related courses on its own.		
*wherever there is a practical there will be no tutorial and vice-versa.		

Scheme For Courses For BA (Program) Sociology under CBCS

Semester	(A) CORE COURSES (4 Courses) (5 Lectures+ 1 Tutorial per Course) 6 Credits per Course 4x6=24 Credits	(B) Ability Enhancement Courses (AECC) (2 Courses) 2 Credits per Course 2x2=4 Credits	(C) Skill Enhancement Course (SEC) (4 Courses) (2 Lectures) (2 Credits per Course) 2x4=8 Credits	(D) Elective: Discipline Specific (DSE) (2 Courses) (5 Lectures+1 Tutorial Per Course) 4x6=24 Credits (One course to be Chosen from two on offer each semester)	(E) Elective: Generic Elective (GE) (2 Courses) (5 Lectures+1 Tutorial Per Course) 2x6=12 Credits
I	<u>Sociology Core 01</u> Introduction to Sociology	(English/ MIL Communication)/ Environmental Science			
II	<u>Sociology Core 02</u> Sociology of India	(English/ MIL Communication)/ Environmental Science			
III	<u>Sociology Core 03</u> Sociological Theories		<u>Sociology SEC 01</u> Techniques of Social Research		
IV	<u>Sociology Core 04</u> Methods of Sociological Enquiry		<u>Sociology SEC 02</u> Gender Sensitization		
V			<u>Sociology SEC 03</u> Society through the Visual	<u>Sociology DSE 01</u> Religion and Society <u>Sociology DSE 02</u> Marriage, Family and Kinship	<u>Sociology GE 01</u> Polity and Society in India
VI			<u>Sociology SEC 04</u> Theory and Practice of Development	<u>Sociology DSE 03</u> Social Stratification <u>Sociology DSE 04</u> Gender and Sexuality	<u>Sociology GE 02</u> Economy and Society

BA (Program) Sociology under CBCS

Contents

S. No	Name of the Course	Page Numbers
	Core Courses	
C 01	Introduction to Sociology	1-2
C 02	Sociology of India	3-5
C 03	Sociological Theories	6-7
C 04	Methods of Sociological Enquiry	8-10
	Discipline Specific Electives(DSE)	
DSE 01	Religion and Society	11-13
DSE 02	Marriage, Family and Kinship	14-16
DSE 03	Social Stratification	17-19
DSE 04	Gender and Sexuality	20-22
	Generic Electives (GE)	
GE 01	Polity and Society in India	23-25
GE 02	Economy and Society	26-27
	Skill Enhancement courses	
SEC 01	Techniques of Social Research	28-30
SEC 02	Gender Sensitization	31-34
SEC 03	Society through the Visual	35-36
SEC 04	Theory and Practice of Development	37-40

BA (Program)

Core Course 01

Introduction to Sociology

Course Objective:

This course is a broad introduction to the discipline of sociology. It familiarizes the students with the history and some of the fundamental concepts and concerns of the discipline.

Outline: 1. Nature and Scope of Sociology

- 1.1 History of Sociology
- 1.2 Relationship of Sociology with other Social Sciences:
 - 1.2.1 Anthropology
 - 1.2.2 Psychology
 - 1.2.3 History

2. Sociological Concepts

- 2.1 Status and Role
- 2.2 Groups
- 2.3 Culture
- 2.4 Socialization
- 2.5. Structure and Function
- 2.6. Social Control and Change

COURSE CONTENTS AND ITINERARY

1. Nature and Scope of Sociology (6 Weeks)

1.1 History of Sociology

1.1.1 Giddens, A., 2006 (5th ed.), *Sociology*, London: Oxford University Press, Chapter 1, pp. 2-29.

1.1.2 Relationship of Sociology with other Social Sciences: Anthropology, Psychology and History.

1.1.3 Beattie, J., 1951, *Other Cultures*, New York: The Free Press, Chapter 2, pp. 16-34.

2. Sociological Concepts (8 Weeks)

2.1 Status and Role

2.1.1 Bierstedt, R., 1974, *The Social Order*, New York: McGraw Hill, Chapter 9, pp. 250-279.

2.1.2 Linton, R., 1936, *The Study of Man*, New York: Appleton Century Crofts, Chapter 8, pp. 113-131.

2.2 Groups

2.2.1 Bierstedt, R., 1974, *The Social Order*, New York: McGraw Hill, Chapter 10, pp. 280-309.

2.3 Culture

2.3.1 Bierstedt, R., 1974, *The Social Order*, New York: McGraw Hill, Chapter 5 & 6, pp. 125- 187 .

2.4 Socialization

2.4.1 Horton, P.B. and C.L. Hunt, 1985, *Sociology*, New York: McGraw Hill, Chapter 4, pp. 79-103.

2.5 Structure and Function

2.5.1 Radcliffe-Brown, A.R., 1976, *Structure and Function in Primitive Society*, London: Cohen and West, Chapter 9 & 10, pp. 178-204.

2.6. Social Control and Change

2.6.1 Horton, P.B. and C.L. Hunt, 1985, *Sociology*, New York: McGraw Hill, Chapter 7 & 20, pp. 154-181, 509-540.

B.A (Program)
CORE COURSE 02

Sociology of India

Course Objective:

This paper aims to provide an outline of the institutions and processes of Indian society. The central objective is to encourage students to view the Indian reality through a sociological lens.

Outline:

- 1. India as a Plural Society**
- 2. Social Institutions and Practices**
 - 2.1 Caste**
 - 2.2 Tribe**
 - 2.3 Class**
 - 2.4 Village**
 - 2.5 Family and Kinship**
- 3. Identities and Change**
 - 3.1 Dalits' Movement**
 - 3.2 Women's Movement**
- 4. Challenges to State and Society**
 - 4.1 Communalism**
 - 4.2 Secularism**

COURSE CONTENTS AND ITINERARY

1. India as a Plural Society (2 Weeks)

- 1.1 Mason, Philip 1967. "Unity and Diversity : An Introductory Review" in Philip Mason(ed.) India and Ceylon: Unity and Diversity. London: Oxford University Press, Introduction.

1.2 Stern, Robert W. 2003. *Changing India*. Cambridge: CUP. Introduction. Change, societies of India and Indian Society. pp. 1 – 31.

2. Social Institutions and Practices (8 Weeks)

2.1 Caste

2.1.1 Srinivas, M.N., 1969, “The Caste System in India”, in A. Beteille (ed.) *Social Inequality: Selected Readings*. Harmondsworth: Penguin Books, pp.265-272.

2.1.2 Srinivas, M.N., 1956, “A Note on Sanskritization and Westernization”, *The Far Eastern Quarterly*, Volume 15, No. 4, pp 481-496.

2.1.3 Alavi, Hamaza and John Harriss (eds.) 1989. *Sociology of ‘Developing Societies’: South Asia*. London: Macmillan. John Harriss, ‘The Formation of Indian society: Ideology and Power’. pp. 126 – 133.

2.2 Tribe

2.2.1 Haimendorf, C.V.F., 1967, ‘The Position of Tribal Population in India’, in Philip Mason (ed.), *India and Ceylon : Unity and Diversity*, New York: Oxford University Press, Chapter 9.

2.3 Class

2.3.1 Thorner, Daniel, 1992. ‘Agrarian Structure’ in Dipankar Gupta (ed.), *Social Stratification in India*, New Delhi: Oxford University Press, pp. 261-270.

2.3.2 Deshpande, Satish, 2003, *Contemporary India : A Sociological View*. New Delhi; Viking, pp. 125-150.

2.4 Village

2.4.1 Srinivas, M.N., 1987, *The Dominant Caste and Other Essays*, Delhi: Oxford University Press, pp.20-59.

2.5 Family and Kinship

2.5.1 Shah, A. M., 1998, *The Family in India: Critical Essays*. New Delhi: Orient Longman, pp.52-63.

2.5.2 Karve, Iravati. 1994, 'The Kinship map of India', in Patricia Uberoi(ed.) *Family, kinship and marriage in India*. Delhi: Oxford University Press, pp.50-73.

3. Identities and Change (2 Weeks)

3.1 Shah, Ghanshyam. 2001, *Dalit identity and politics*. Delhi: Sage Publications, Chapter 1 and 7.

3.2 Kumar, Radha. 1999, 'From Chipko to sati: The Contemporary women's movement', in Nivedita Menon (ed.) *Gender and Politics in India*. Delhi: Oxford University Press, pp. 342-369.

4. Challenges to State and Society (2 Weeks)

4.1 Madan, T.N., 1997, *Modern Myths and Locked Minds*. Delhi: Oxford University Press, Chapter 8.

4.2 Dumont, L. 1997, *Religion, Politics and History in India*. Paris: Mouton, Chapter 5.

B.A.(Progam)
Core Course 03

Sociological Theories

Objective:

The course introduces the students to the classical sociological thinkers, whose work has shaped the discipline of sociology.

Outline:

1. Karl Marx

- 1.1 Materialist Conception of History
- 1.2 Class and Class Struggle

2. Emile Durkheim

- 2.1 Social Fact
- 2.2 Forms of Solidarity

3. Max Weber

- 3.1 Ideal Types and Social Action
- 3.2 Types of Authority

COURSE CONTENTS AND ITINERARY

1. Karl Marx (5 Weeks)

1.1 Materialist Conception of History

1.2 Class and Class Struggle

- 1.1.1 Marx, K. and Friedrich Engels. 2002. *The Communist Manifesto*. Harmondsworth :Penguin.
- 1.1.2 Aron, R. 1967. *Main Currents in Sociological Thought*. London: Weidenfield and Nicholson, Vol. 1. pp. 107-180.

1.1.3 Calhoun, J. Craig, 2007. *Classical Sociological Theory*. 2nd Edition Blackwell, pp. 73-130.

1.1.4 Jayapalan, N. 2001. *Sociological Theories*. Atlantic Publisher, pp.35-69.

2. **Emile Durkheim (5 Weeks)**

2.1 **Social Fact**

2.1.1 Durkheim, E. 1958. *The Rules of Sociological Method*. Glencoe: Free Press, Chapters 1 and 3.

2.1.2 Jones R.A. 1986, *Emile Durkheim: An Introduction to Four Major Works*. London: Sage. Chapters 3 and 4.

2.2 **Forms of Solidarity**

2.2.1 Aron, R. 1967. *Main Currents in Sociological Thought* London: Weidenfield and Nicholson, Vol. 2, pp. 11-97.

2.2.2 Calhoun, J. Craig, 2007. *Classical Sociological Theory* 2nd Edition. Blackwell, pp.131-180.

2.2.3 Jayapalan, N. 2001. *Sociological Theories*. Atlantic Publisher, pp.146-178.

3 **Max Weber (4 Weeks)**

3.1 **Ideal Types and Social Action**

3.2 **Types of Authority**

3.1.1 Gerth, H.H. and C. Wright Mills (eds.) 1948. *From Max Weber: Essays in Sociology*. London: Routledge and Kegan Paul, Introduction.

3.1.2 Aron, R. 1967. *Main Currents in Sociological Thought*. London: Weidenfield and Nicholson, Vol. 2, pp.177-252.

3.1.3 Calhoun, J. Craig, 2007. *Classical Sociological Theory*. 2nd Edition. Blackwell, pp.205-274.

3.1.4 Jayapalan, N. 2001. *Sociological Theories*. Atlantic Publisher, pp.97-115.

B.A (Program)
CORE COURSE 04

Methods of Sociological Enquiry

Course Objective:

The course is a general introduction to the methodologies of sociological research methods. It will provide the student with some elementary knowledge of the complexities and philosophical underpinnings of research.

Outline: 1. The Logic of Social Research

- 1.1 What is Sociological Research?
- 1.2 Objectivity in the Social Sciences
- 1.3 Reflexivity

2. Methodological Perspectives

- 2.1 The Comparative Method
- 2.2 The Ethnographic Method

3. Modes of Enquiry

- 3.1 Theory and Research
- 3.2 Analyzing Data: Quantitative and Qualitative

COURSE CONTENTS AND ITINERARY

1. The Logic of Social Research (7 Weeks)

1.1 What is Sociological Research?

1.1.1 Mills, C. W. 1959, *The Sociological Imagination*, London: Oxford University Press, Chapter 1, pp. 3-24.

1.1.2 Gluckman, M. 1978, 'Introduction', in A. L. Epstein (ed.), *The Craft of Social Anthropology*, Delhi: Hindustan Publishing Corporation, pp. xv-xxiv.

1.2. Objectivity in the Social Sciences

1.2.1. Durkheim, E. 1958, *The Rules of Sociological Method*, New York: The Free Press, Chapter 1& 2, pp. 1-46.

1.2.2. Weber, Max. 1949, *The Methodology of the Social Sciences*, New York: The Free Press, Foreword, pp. iii- x.

1.3. Reflexivity

1.3.1 Gouldner, Alvin. 1970, *The Coming Crisis of Western Sociology*, New York: Basic Books, Chapter 13, pp. 481-511.

2. Methodological Perspectives (3 Weeks)

2.1. The Comparative Method

2.1.1. Radcliffe-Brown, A. R. 1958, *Methods in Social Anthropology*, Delhi: Asia Publishing Corporation, Chapter 5, pp. 91-108.

2.1.2. Béteille, A. 2002, *Sociology: Essays on Approach and Method*, New Delhi: Oxford University Press, Chapter 4, pp. 72-94.

2.2. The Ethnographic Method

2.2.1 Geertz, Clifford. 1973. *Interpretation of Cultures*, New York: Basic Books. Chapter 1, pp. 3-30.

3. Modes of Enquiry (4 Weeks)

3.1. Theory and Research

3.1.1 Merton, R. K. 1972, *Social Theory and Social Structure*, Delhi: Arvind Publishing House, Chapters 4 & 5, pp. 139-171.

3.1.2 Bryman, Alan. 2004, *Quantity and Quality in Social Research*, New York: Routledge, Chapter 2 & 3, pp. 11-70.

3.2 Constructing the Object of Research

3.2.1 Srinivas, M.N. et. al. 2002(reprint), *The Fieldworker and the Field: Problems and Challenges in Sociological Investigation*, New Delhi: OUP, Introduction, pp. 1-14.

BA (Program)
Discipline Specific Elective 01
Religion and Society

Objective:

This course acquaints students with a sociological understanding of religion. It examines some forms of religion in India and its role in modern society.

Outline:

1. Understanding Religion

1.1. Sociology of Religion: Meaning and Scope

1.2. Sacred and Profane

1.3 Religion and Rationalization

1.4 Rites of Passage

2. Religion in India

2.1. Hinduism

2.2. Islam

2.3. Christianity

2.4. Sikhism

2.5. Buddhism

3. Secularism & Communalism

COURSE CONTENTS AND ITINERARY

1. Understanding Religion: (5 Weeks)

1.1 Sociology of Religion: Meaning and Scope

1.1.1 Béteille, A. 2002. *Sociology: Essays on Approach and Method*. OUP: New Delhi, pp134-150.

1.1.2 Berger. 1967. *The Sacred Canopy*. Garden City: New York, pp175-186.

1.1.3 Asad. T. 1993. *Genealogies of Religion: Discipline and Reasons of Power in Christianity and Islam*, John Hopkins Press: Baltimore, pp 27-54.

1.2 Sacred and Profane

1.2.1 Durkheim, E. 2001. *The Elementary Forms of the Religious Life*. Carol Cosman (trans). Oxford: Oxford University Press, pp 25-46; 87-100; 153-182.

1.3 Religion and Rationalization

1.3.1 Weber Max. 1905. *The Protestant Ethic and the Spirit of Capitalism*, New York: Free Press, pp 39– 50.

1.4 Rites of Passage

1.4.1 Gennep A. V, 1960. *Rites of Passage*. London: Routledge and Kegan and Paul, pp 1 - 14; 65-70; 74-77; 85-90; 101-107; 116-128; 130- 135&141-165.

2. Religion in India: (5 Weeks)

2.1.1 Sontheimer, Gunther-Dietz, and Hermann Kulke. *Hinduism Reconsidered*. New Delhi: Manohar, 2001. *Hinduism: The Five Components and their Interaction*. pp. 305 – 322.

2.1.2 Fuller, C. J. 2004, *The Camphor Flame: Popular Hinduism and Society in India*, New Jersey: Princeton University Press, Introduction.

2.1.3 Srinivas, M.N. 1952. *Religion and Society among the Coorgs of South India*, Clarendon: Oxford, pp 100-122.

2.2 Momin. A.R., 2004. 'The Indo-Islamic Tradition' in Robinson, R. (ed.) *Sociology of Religion in India*. New Delhi: Sage. pp 84-99.

2.3. Robinson, R. 2003. 'Christianity in the Context of Indian Society and Culture' in Das Veena (ed.), *Oxford Indian Companion to Sociology and Social Anthropology*, OUP: New Delhi, pp. 884- 907.

2.4. Uberoi, J.P.S. 1991. 'The Five Symbols of Sikhism' in Madan, T.N. (ed.) *Religion in India*. New Delhi : OUP, pp 320 -333.

2.5. Omvedt, G. 2003. *Buddhism in India: Challenging Brahmanism and Caste*, New Delhi : Sage, pp 23-53.

3. Secularism and Communalism (3 Weeks)

3.1. Chadwick, Owen. *The Secularization of the European Mind in the Nineteenth Century*. Cambridge: Cambridge University Press, 1975, pp 1-20.

3.2 Madan, T.N. 1991. 'Secularism in its Place' in T. N. Madan, T.N. (ed.) *Religion in India*. New Delhi : OUP, pp 394 -413.

3.3. Saberwal, S. 1991. 'Elements of Communalism' in T. N. Madan, (ed.) *Religion in India*. OUP: New Delhi, pp 339 -350.

BA (Program)
Discipline Specific Elective 02
Marriage, Family and Kinship

Course Objective:

This course aims to highlight and critically examine contemporary concerns in the fields of marriage, family and kinship. It considers theoretical issues and ethnographies with particular emphasis on diversity of practices.

Outline: 1. Introduction: Kinship, Critique and the Reformulation

- 1.1. Biological and Social Kinship
- 1.2. Cultural Kinship

2. Descent, Alliance

- 2.1. Descent, Filiation, Complementary Filiation
- 2.2. Marriage, Alliance, Prestations

3. Family and Household

- 3.1. Structure and Change
- 3.2. Reimagining Families

4. Contemporary Issues in Marriage, Family and Kinship

- 4.1. Choice and Regulation in Marriage
- 4.2. Power and Discrimination in the Family
- 4.3. New Reproductive Technologies
- 4.4. Marriage Migration

COURSE CONTENTS AND ITINERARY

1. Introduction: Kinship, Critique and the Reformulation (3 Weeks)

1.1. Biological and Social Kinship

1.1.1 Parkin, R. and L. Stone, 2004, 'General Introduction', in R. Parkin and L. Stone (eds.), *Kinship and Family: An Anthropological Reader*, U.S.A.: Blackwell, pp. 1–23.

1.2. Cultural Kinship

1.2.1 Schneider, D. M., 2004(1972), 'What is Kinship All About?', in R. Parkin and L. Stone (eds.), *Kinship and Family: An Anthropological Reader*, U.S.A.: Blackwell, pp. 257–274.

1.2.2 Carsten, J., 2004, 'Introduction' in *After Kinship*, Cambridge: Cambridge University Press, pp.1–30.

2. Descent and Alliance: (5 Weeks)

2.1. Descent, Filiation, Complementary Filiation

2.1.1 Radcliffe-Brown, A. R. and D. Forde (eds.), 1950, *African Systems of Kinship and Marriage*, London: Oxford University Press, Introduction, pp.1–39.

2.1.2 Fortes, M., 1970, 'The Structure of Unilineal Descent Groups', in M. Fortes, *Time and Social Structure and Other Essays*, University of London: The Athlone Press, pp. 67–95.

2.2. Marriage, Alliance, Prestations

2.2.1 Leach, E.R., 1961, 'Polyandry, Inheritance and the Definition of Marriage with Particular Reference to Sinhalese Customary Law', in E. R. Leach (ed.), *Rethinking Anthropology*, London: The Athlone Press, pp. 105–113.

2.2.2 Dumont, L., 1968, 'Marriage Alliance', in D. Shills (ed.), *International Encyclopedia of the Social Sciences*, U.S.A.: Macmillan and Free Press, pp. 19–23.

2.2.3 Sharma, U., 1993, 'Dowry in North India: Its Consequences for Women', in Patricia Uberoi (ed.), *Family, Kinship and Marriage in India*. Delhi: Oxford University Press, pp. 341–356.

3. Family and Household: (2 Weeks)

3.1. Shah, A.M., 1998, 'Changes in the Indian Family: An Examination of Some Assumptions', in A.M. Shah, *The Family in India: Critical Essays*, New Delhi: Orient Longman, pp.52–63.

3.2. Simpson, B., 2004, 'Gays, Paternity and Polyandry: Making Sense of New Family Forms in Contemporary Srilanka', in R. Chopra, C. Osella and F. Osella (eds.), *South Asian Masculinities: Context of Change, Sites of Continuity*, Delhi: Kali for Women, pp. 160–174.

4. Contemporary Issues in Marriage, Family and Kinship: (4 Weeks)

1.1. Choice and Regulation in Marriage

Chowdhry, P., 1998, 'Enforcing Cultural Codes: Gender and Violence in Northern India', in M. E. John and J. Nair (eds.), *A Question of Silence: The Sexual Economies of Modern India*, New Delhi: Kali for Women, pp. 332–67.

1.2. Power and Discrimination in the Family

John, M. E. et.al., 2008, 'Structural Contexts of Adverse Sex Ratios' in M. E. John et.al., *Planning Families, Planning Gender: The Adverse Child Sex Ratio in Selected Districts of Madhya Pradesh, Rajasthan, Himachal Pradesh, Haryana and Punjab*, New Delhi: Action Aid, pp. 68–78.

1.3. New Reproductive Technologies

Carsten, J., 2004, 'Assisted Reproduction' in *After Kinship*, Cambridge: Cambridge University Press, pp. 163–183.

1.4. Marriage Migration

Charsley, K., 2005, 'Unhappy Husbands: Masculinity and Migration in Transnational Pakistani Marriages', *Journal of the Royal Anthropological Institute*, (N.S.) 11, pp. 85–105.

BA (Program)
Discipline Specific Elective 03

Social Stratification

Objective:

The course introduces the student to various ideas of Social inequality and their sociological study. The different forms and institutional manifestations of social stratification are explored here both theoretically and through case studies.

Outline:

1. Social Stratification: Concepts and Approaches

2. Forms of Social Stratification

2.1 Race and Ethnicity

2.2 Caste and Class

2.3 Gendering Inequality

2.4 Poverty and Social Exclusion

3. Social Mobility

COURSE CONTENTS AND ITINERARY

1. Social Stratification: Concepts and Approaches (2 weeks)

1.1. Beteille, A. 1983. 'Introduction in Andre Beteille (ed.): *Equality and Inequality: Theory and Practice*; Delhi: Oxford University Press. pp.1- 27.

1.2. Gupta, D. 1991. 'Hierarchy and Difference' in Dipankar Gupta (ed.): *Social Stratification* Delhi: Oxford University Press , pp 1-21.

2. Forms of Stratification (9 Weeks)

- 2.1.1. William, Jutius Wilson 1978, *The Declining Significance of Race: Blacks and Changing American Institution*. University of Chicago Press, pp. 1 – 23 & 183-188.
- 2.1.2. Joe, R. Feagin 'The Continuing Significance of Race' *American Sociological Review*, 56, (Feb-91) pp 101-116.
- 2.1.3. McClintock, Anne, and George Robertson. 'Soft-soaping Empire: Commodity Racism and Imperial Advertising' In Nicholas Mirzoeff (ed) *The Visual Culture Reader: Second Edition*. 2002. Routledge Taylor & Francis Group, 304-316
- 2.1.4. Barth, F. (ed), *Ethnic Groups and Boundaries*, Little Brown and Co. Boston, 1969, pp-10-16.
- 2.1.5. Immanuel, Maurice Wallerstein, *The Construction of Peoplehood, Racism, Nationalism, Ethnicity*, 1991, London Press, pp-71-85.
- 2.2.1. Béteille, A. *Caste, Class and Power* Chapter: 1, Oxford University Press, 1971.
- 2.2.2. Sharma, Ursula. 1999. *Caste*. Open University Press, pp.1-94.
- 2.2.3. Debe, Leela. 1996 "Caste and Women" in M.N. Srinivas (ed.) *Caste: Its Twentieth Century Avatar*, New Delhi: Penguin.
- 2.3.1 Maria Charles and David B. Grusky. *Occupational Ghettos: The Worldwide Separation of Women and Men*, Stanford University Press, 2004 pp 389-402.
- 2.3.2 Papanek, Hanna. 1990. "To Each Less Than She Needs, From Each More Than She Can Do: Allocations, Entitlements and Value" in Irene Tinker (ed.), *Persisting Inequality: Women World Development*, Oxford: Clarendon Press, pp. 121-164.

- 2.4.1 Timothy Smeeding, 'Poorer by Comparison; Poverty, Work and Public Policy in Comparative Perspective', *Pathways Magazine*, Stanford Center for the Study of Poverty and Inequality, Winter 2008, pp1-25.
- 2.4.2 Newman, K. S and Victor Tan Chen.2007. *The Missing Class: Portraits of the Near Poor in America*, Boston: Beacon Press Book, pp 1-10.

3. Social Mobility (3 weeks)

- 3.1 Breigher,R.L.(ed)1990. *Social Mobility and Social Structure*. New York; Cambridge University Press, Ch. 5, pp.103-30.
- 3.2 Grusky, D.V. 1994. *Social Stratification Perspective*. Boulder: Westview Press, Part I V, pp 245-264.
- 3.3.Macleod, Jay. 1987. 'Leveled Aspirations: Social Reproduction Takes its Toll', in *Ain't No Makin It: Aspirations and Attainment in a Low Income Neighbourhood*. USA: Westview Press, pp. 112-136.
- 3.4.Bettie, Julie. 2003. *Women without Class: Girls, Race, and Identity*. California: University of California Press, pp 57-94.

BA (Program)
Discipline Specific Elective 04

Gender and Sexuality

Course Objective:

This course aims to introduce students to a basic understanding of gender by interrogating the categories of gender, sex and sexuality. The complexity of gender relations in contemporary societies are further explored by looking in the areas of work and family.

Course Outline:

1. Gendering Sociology

2. Gender as a Social Construct

2.1. Gender, Sex, Sexuality

2.2. Production of gender and sexuality

3. Gender: Differences and Inequalities

3.1. Class, Caste

3.2. Family, Work

4. Politics of Gender

4.1. Resistance and Movements

COURSE CONTENTS AND ITINERARY

1. Gendering Sociology: (1 Week)

1. 1 S. Jackson and S. Scott (eds.) 2002 *Gender: A Sociological Reader*, London: Routledge, pp. 1-26.

1.2 Liz Stanley. 2002. "Should Sex Really be Gender or Gender Really be Sex" in S. Jackson and S. Scott (eds.) *Gender: A Sociological Reader*, London: Routledge, pp. 31-41.

2. Gender as a Social Construct (6 Weeks)

2.1 Gender, Sex, Sexuality

2.1.1 Oakley, Ann, 1972. *Sex, Gender and Society*. London: Temple Smith, pp 99-127, 158-172.

2.1.2 Ortner, Sherry. 1974. "Is male to female as nature is to culture?" M.Z. Rosaldo and L. Lamphere (eds.) *Women, Culture and Society*. Stanford: Stanford University Press, pp. 67- 87.

2.1.3 Newton, Esther. 2000. "Of Yams, Grinders and Gays: The Anthropology of Homosexuality" in *Margaret Mead Made Me Gay: Personal Essays, Public Ideas*. London: Duke University Press, pp 229- 237.

2.2 Production of Gender and Sexuality

2.2.1 Alter, Joseph. 1992. *The Wrestler's Body: Identity and Ideology in North India*. California: University of California Press, pp 163-194.

2.2.2 Nanda, Serena. 1999. *Neither Man nor Woman*. Belmont CA: Wadsworth, pp 1-23 & 128-149.

3. Differences and Inequalities (4 Weeks)

3.1 Class, Caste

3.1.1 Walby, Sylvia. 2002. "Gender, Class and Stratification: Towards a new approach" in S. Jackson and S. Scott (eds.) *Gender: A Sociological reader*. London: Routledge, pp 93-96.

3.1.2 Bernard, Jessie. 2002. "The Husband's marriage and the wife's marriage" in S. Jackson and S. Scott (eds.) *Gender: A Sociological Reader*. London: Routledge, pp 207- 210.

3.1.3 Dube, Leela 1996 "Caste and Women" in M.N.Srinivas (ed.) *Caste: Its Twentieth Century Avatar*, New Delhi: Penguin, pp 1-27.

3.1.4 Rege, S. 1998. "Dalit Women Talk Differently: A Critique of 'Difference' and Towards a Dalit Feminist Standpoint Position." *Economic and Political Weekly, Vol. 33, No. 44*, (Oct.31-Nov. 6, 1998), pp 39-48.

3.2 Family, Work

3.2.1 Papanek, Hanna. 1979. Family Status production: the work and non-work of women *Signs* Volume 4 No. 4, pp 775-81.

3.2.2. Pineda, Javier, 2001. "Partners in Women Headed Households: Emerging Masculinities?" in Cecile Jackson (ed.) *Men at Work: Labour, Masculinities, Development*. London: Frank Cass, pp. 72-92.

3.2.3 Agarwal, Bina. 1988. Who Sows, who reaps? Women and land rights in India *Journal of Peasant Studies* 15(4), pp 531-81.

4. Politics of Gender (3 Weeks)

4.1. Resistance and Movements

4.1.1 Candace West and Don H. Zimmerman. 2002. "Doing Gender" in S.Jackson and S. Scott (eds.) *Gender: A Sociological Reader*. London: Routledge, pp 42-47.

4.1.2 Davis, Angela Y. 1981. *Women, Race and Class*. London: Women's Press. pp 30-42.

4.1.3 Kandiyoti, Deniz. 1991 "Bargaining with Patriarchy" in Judith Lorber and Susan A. Farrell (eds.) *The Social Construction of Gender*, New Delhi: Sage Publications, pp.104-118.

4.1.4 Kumar, Radha. 1999. "From Chipko to Sati: The Contemporary Indian Women's Movement" In Nivedita Menon (ed.) *Gender and Politics in India*. New Delhi: Oxford University Press, pp342-369.

BA (Program)

Generic Elective 01

Polity and Society in India

Objective:

This course seeks to introduce the students to the study of Indian politics from a sociological Perspective. In the process, it attempts to give the students theories, categories and conceptual tools to understand politics in relation to society in general.

Outline:

- 1. On Studying Politics and Society in India**
- 2. Themes in Politics and Society in India**
 - 2.1 Political Economy**
 - 2.2 Political Machine**
 - 2.3 Political Identities**
 - 2.4 Political Processes**
- 3. Protest and Resistance in Indian Politics**

1. On Studying Politics and Society in India (4 Weeks)

1.1 Chatterjee, Partha, 1997. *State and Politics in India*. Delhi: Oxford University Press, Introduction: A Political History of Independent India. pp. 1-39

1.2 Brass, Paul R, 1998. 'India: Democratic Progress and Problems' in Slig S. Harrison et al (ed.) *India and Pakistan: The First Fifty Years*. Woodrow Wilson Center Press, pp. 23-44

1.3 Spencer, Jonathan, 2007. *Anthropology, Politics and the State: Democracy and Politics in South Asia*. Cambridge: Cambridge University Press, Chapter 2. Locating the Political. pp. 19-47

1.4 Kaviraj, Sudipta. 1991. 'On State, Society and Discourse in India', in James Manor (ed.) *Rethinking Third World Politics*, London: Longman. pp. 72-99

2. Themes in Politics and Society in India: (9 Weeks)

2.1 Political Economy

2.1.1 Rudolph, Lloyd I, and Susanne Hoeber Rudolph, 1987. *In Pursuit Of Lakshmi*. Chicago: University of Chicago Press. Introduction, Chapter 1 & 7. pp. 1-59, 211-219

2.1.2 Vanaik, A. 2000, 'The Social Character of the Indian State', in Z. Hasan (ed.), *Politics and the State in India*, New Delhi: Sage, pp.89-107

2.2 Political Machine

2.2.1 Bailey, F.G. 1968, 'Para-Political Systems', in M. J. Schwartz (ed.), *Local level Politics: Social and Cultural Perspectives*, London: University of London Press, pp.281-94

2.2.2 Gould, H. A. 1971, 'Local government roots of contemporary Indian politics', *Economic and Political Weekly*, vol.6 (7), pp.457-64

2.3 Political Identities: Nation, Caste, Religion and Ethnicity

2.3.1 Sathyamurthy, T.V. 1997, 'Indian Nationalism: State of the Debate', in *Economic and Political Weekly*, vol.32 (14), p.715-721

2.3.2 Weiner, Myron. 2001, 'The Struggle for Equality: Caste in Indian Politics', in A. Kohli (ed.), *The Success of India's Democracy*, Cambridge: Cambridge University Press, pp.193-225

2.3.3 Baruah, Sanjib. 'Politics of Subnationalism: Society versus State in Assam', From Partha Chatterjee (ed.) *State and Politics in India*, Delhi:OUP. pp. 496 – 520

2.4 Political Institutions and Democratic Processes

2.4.1 Manor, James. 1988, 'Parties and the Party System', in A. Kohli (ed.), *India's Democracy*, Princeton: Princeton University Press, pp. 62-98

2.4.2 Michelutti, Lucia. 2007, 'The Vernacularization of Democracy: Political Participation and Popular Politics in North India', *The Journal of the Royal Anthropological Institute*, vol.13 (3), pp. 639-656

3. Protest and Resistance in Indian Politics (1 Week)

Shah, Ghanshyam. 'Grassroots Mobilizations in Indian Politics', in A. Kohli (ed.), *India's Democracy*, Princeton: Princeton University Press, pp. 262-304

B.A. (Program)
Generic Elective 02

Economy and Society

Objective:

The course introduces the students to the complex ways in which economic activity is embedded in social relations from a sociological view point.

Course Outline:

1. Sociological Aspects of Economic Phenomenon (5 Weeks)

- 1.1 Approaches: Formalism and Substantivism
- 1.2 Sociological Aspect of Economic Processes

2. Modes of Production (6 weeks)

- 2.1 Domestic Mode of Production
- 2.2 Peasants
- 2.3 Capitalism
- 2.4 Socialism

3. Contemporary Issues (3 Weeks)

- 3.1 Globalization
- 3.2 Development

COURSE CONTENTS AND ITINERARY

1. Sociological Aspects of Economic Phenomenon (5 Weeks)

1.1 Approaches: Formalism and Substantivism

- 1.1.1 Wilk, R. and L. Cliggett. 2007. *Economies and Cultures: Foundations of Economic Anthropology*. Chapter 1 pp. 1-14

1.1.2 Polanyi, K. 1958. “ Economy as an Instituted Process” in M. Grammoter and R. Swedberg (eds.) 1992 *The Sociology of Economic Life* Boulder Colorado, West View Press. pp. 27-50

1.2 Sociological Aspect of Economic Processes

Smelser, Neil 2013 *The Sociology of Economic Life* Quid Pro Books (2nd Edition). New Orleans, Louisiana University Press

2. Modes of Production (6 weeks)

2.1 Domestic Mode of Production

2.1.1 Sahlins, M-1974 *Stone Age Economics*. London, Tavistock, Chapter 2-3

2.2 Peasants

2.2.1 Wolf, Eric 1966 *Peasants*. New Jersey Prentice Hall, Chapter-1

2.3 Capitalism

2.3.1 Swedberg, R 2003 *The Economic Sociology of Capitalism: An Introduction and An Agenda*, Cornell University

2.4 Socialism

2.4.1 Verdery, Kathrine 1996 ‘*What was Socialism, And what Comes Next?*’ Princeton N.J. Princeton University. Press. Chapter-1, pp. 19-38

3. Contemporary Issues (3 Weeks)

3.1 Globalization

3.1.1 Ritzer 2004 *The McDonaldisation of Society*. Pine Forge press Chapter- Introduction, 1,2.

3.1.2 Howes, David (ed) 1996 *Cross Cultural Consumption: global Markets and Local Realities*. London: Routledge, pp. 1-16

3.2Development

3.2.1 Hulme, David and mark M. Turner *Sociology and Development: Theories, Policies and Practices*, Prentice Hall Chapter-3 pp. 33-67

BA (Program)

Skill Enhancement Course 01

Techniques of Social Research

Course Objective:

This course aims to enhance the skills of students to understand and use techniques employed by social scientists to investigate social phenomena. With emphasis on formulating research design, methods of data collection, and data analysis, it will provide students with some elementary knowledge on how to conduct both, quantitative and qualitative research. The focus is on understanding through suggested exercises.

Outline:

1. Research Design

1.1 Concepts & Hypotheses

1.2 Measurement, Reliability & Validity

1.3 Quantitative & Qualitative: Surveys & Ethnographies

1.4 Sampling Frameworks

2. Data Collection

2.1 Primary Sources

2.2 Secondary Sources

3. Data Analysis

3.1 Content Analysis

3.2 Narrative Analysis

3.3 Statistical Analysis: frequency distribution, cross tabulation, measures of central tendency, measures of dispersion, correlation

4. Framing a Research Question

COURSE CONTENTS AND ITINERARY

The course will be based on exercises to be done in groups.

1. Research Design (Week 1- 4)

1.1.1. Bryman, A. 2008, *Social Research Methods*, Oxford: Oxford University Press, Chapter 2, 3, 4 & 5, pp. 29-136

1.1.2. Amir B. Marvasti, 2004, *Qualitative Research in Sociology*, London: Sage, Chapter 2, 3, 4, 5, 6 & 7, pp. 14-144

Suggested Assignments:

- a) Design a survey on factors effecting marriage choices of young people.
- b) Visit a shopping mall and observe the interaction between employees and customers/visitors. Identify themes based on your observation and prepare a questionnaire based on this experience.
- c) Visit the college canteen/ administrative office/a bus stop/ area outside the metro station and observe all that happens for an hour or more and write a descriptive note on it. Discussions on these notes to follow.
- d) Visit a police station/ hospital/court and spend a few hours observing the scene. Write a short essay on issues of access to the field, rapport building and your role as an ethnographer.

2. Data Collection (Weeks 5-8)

2.1.1 Lofland J. and Lofland L. 1984, *Analysing Social Settings: A Guide to Qualitative Observation and Experiment*, California: Wadsworth

2.1.2 Morgan, David L. 1996, "Focus Groups", *Annual Review of Sociology* 22, pp. 29-52

Suggested Assignments:

- a) Conduct a structured Interview with close ended options and a relatively unstructured interview on the same topic (of your choice) with similar sets of people. Observe and note the differences.
- b) Look at NSS/NFHS/Census Data and write notes on the themes of how you can interpret the data.
- c) Look at a set of published letters of Gandhi, Nehru, C.F. Andrews, Tagore etc. and identify key social issues that are discussed in the contents of the letters.
- d) Collect 3 oral testimonies/ life histories of people who have witnessed and experienced any traumatic event in their lives.

3. Data Analysis (Weeks 9-13)

(Students will be introduced to the use of Statistical Software Packages)

Suggested Assignments/Exercise:

- a) Choose a theme of your interest- for e.g., crime, technology environmental concerns or any other and look through the Sunday editorials of any national daily of the last 3 months to locate related articles.
- b) Do a content analysis of advertisements of any one consumer product/service, which have appeared over one year in a leading national daily.
- c) Analyse the oral testimonies you have collected in Exercise 2(d). Discuss the issues and challenges in using testimony as evidence.
- d) Students will be provided with data sets to run them in a software program.

4. Framing a Research Question (Week 14)

Choose a research question, identify statement(s), hypothesis and concepts. Operationalize concepts and match the methods and tools for data collection.

BA (Program)
Skill Enhancement Course 02
Gender Sensitization

Course Objective:

This course will sensitise students to issues related to gender and equality among all sexes. It will provide them with the tools and skills to develop and integrate a gendered perspective in work and life. In particular, students will be acquainted with laws that have an immediate bearing on gender relations.

Outline:

1. Sex, Gender and Sexuality

- 1.1 Introduction to debates on the social construction of sex and gender
- 1.2 Cultural construction of masculinity and femininity
- 1.3 Understanding sexual preference as a right

2. Gender, Family, Community and the State

3. Gender Rights and the Law

- 3.1 Right to property
- 3.2 Personal laws
- 3.3 Violence against women
 - 3.3.1 Sexual harassment
 - 3.3.2 Rape
 - 3.3.3 Domestic violence

4. Understanding Intersections of Gender, Caste, Class, Region, Religion and Disability

COURSE CONTENTS AND ITINERARY

The course will be based on exercises to be done in groups.

1. Sex and gender (Week 1- 4)

- 1.1 Geetha, V. 2002. *Gender*. Calcutta: Stree

1.2. Menon, Nivedita. 2012. *Seeing like a Feminist*. New Delhi: Zubaan/Penguin Books

1.3. Bhasin, Kamala. *Patriarchy*. New Delhi: Kali for Women

1.4. Murty, Laxmi and Rajshri Dasgupta. 2012. *'Our Pictures, Our Words - A Visual Journey Through The Women's Movement'*. New Delhi: Zubaan

1.5. **Films:** *Being Male Being Koti* Dir: Mahuya Bandyopadhyay *Many People Many Desires* Dir: T. Jayashree; *Boys Don't Cry* Dir: Kimberley Peirce

Suggested Assignments:

- a) Discussion around any two of the above-mentioned films. Students will be asked to write a short essay on the pressures they feel of the experience in performing masculinity or femininity.
- b) Presentations and discussions based around the essays.
- c) Role Play: Gender and its performance in everyday life. Students to form smaller groups and present skits to address this issue creatively. This will be followed by discussions.

2. Gender, Family, Community and the State (Weeks 5-7)

2.1. Shah, Chayanika et al. 2005. Marriage, Family and Community: A Feminist Dialogue. *Economic and Political Weekly February 19: 709 -722*

2.2. Films: *Izzatnagri ki Asabhya Betiyan* Dir: Nakul Singh Sawhney

Suggested Assignments/Exercise:

- a) Debate or discussion on 'Is the family the site of love and care' or 'Is the family democratic?'

- b) Look at NSS/NFHS/Census Data and write notes on the themes of how you can interpret the data
- c) Writing exercise: Does a gendered division of labour in the household deny women equal opportunities?
- d) Visit to a women's shelter/Nari Niketan followed by short essays on the experience and discussions based on the same.
- e) Visit to a family court followed by discussions.
- f) Role play: On how to address issues of gender discrimination within the family.

3. Gender Rights and the Law (Weeks 8-13)

3.1. For all the laws relating to women please refer to the following resource:
<http://ncw.nic.in/frmLLawsRelatedtoWomen.aspx>

3.2. Films: *Gulabi Gang* Dir: Nishtha Jain; *North Country* Dir: Niki Caro; *The Accused* Dir: Jonathan Kaplan

Suggested Assignments/Exercise:

- a) Debate on women's equal right to natal property.
- b) Discussion on what consent means. Students to be presented with different scenarios to enable them to problematise the notion of consent.
- c) Writing exercise: Take up any one law relating to women and critically examine one or two judgments pertaining to that law. This will be followed by class presentations.
- d) Reading of the Delhi University Ordinance against Sexual Harassment and discussions around it.
- e) Student projects (in smaller groups) on developing IEC material (Information, Education, Communication) on the Delhi University Ordinance against Sexual Harassment for students.
- f) Discussion on section 377 of the Indian Penal Code.
- g) Discussions on these laws with practicing lawyers.

4. Understanding Intersections of Gender, Caste, Class, Region, Religion and Disability. (Week 14)

4.1. Tharu, S. and Niranjana, T. 1999. “Problems for contemporary theory of gender” in Nivedita Menon, *Gender and Politics in India*. New Delhi: Oxford University Press.

4.2. Ghai, Anita. (2003). *(Dis)Embodied Form : Issues of Disabled Women*. New Delhi. Har-Anand Publications. (Selected chapters)

Suggested Assignments/Exercise:

- a) Debate on the Women’s Reservation in Parliament Bill.
- b) Writing exercise: Identify any one culturally specific gender stereotypes in the context of your own life and show how you negotiate it.
- c) Visits and discussion in some women’s organisations/groups in Delhi, where students will explore how organisations understand and negotiate these intersections in the larger context of women’s struggles, and struggles in the women’s movement.
- d) Students can discuss posters of the women’s movement from the book Murthy and Dasgupta (2012) and be asked to design posters for a particular campaign.

BA (Program)

Skill Enhancement Course 03

Society through the Visual

This course intends to train students in the specialized technique of conducting visual research and analysis of visual data. It focuses on the broad fields of Photography, Film and Multimedia as significant tools, used in contemporary research practices.

1. Introduction to the Sociological Study of the Visual
2. Sociology and the Practice of Photography
3. Video and Film in Sociology
4. Sociology, Multimedia and Hypermedia

1. Introduction to the Sociological Study of the Visual (Week 1-3)

- 1.1 Mead, Margaret, 1995. 'Visual Anthropology in a Discipline of Words' in *Principles of Visual Anthropology* (ed) Paul Hockings, Second Edition, Mouton de Gruyter, pp 3-10
- 1.2 Pink, Sarah. 2013. *Doing Visual Ethnography*, Sage Publications Limited, Chaps 1 and 2

2. Sociology and the Practice of Photography (Week 4 -7)

- 2.1 Collier, John and Malcom Collier. 1986. *Visual Anthropology: Photography as a Research Method*, University of New Mexico Press, Chaps 1, 2 and 3
- 2.2 Becker, Howard S. 'Visual Sociology, Documentary Photography, and Photojournalism: It's (Almost) All a Matter of Context' in *Image-Based Research: A sourcebook for Qualitative Researchers*, Jon Prosser ed., Falmer Press, pp. 74-85

2.3 Prosser, Jon & Dona Scwartz, 1998. 'Photographs within the Sociological Research Process' in *Image-Based Research: A sourcebook for Qualitative Researchers*, Jon Prosser ed., Falmer Press, pp. 101-115

3. Video and Film in Sociology (Week 8 -11)

3.1 Asch, Timothy and Patsy Asch, 1995. 'Film in Ethnographic Research' in *Principles of Visual Anthropology* (ed) Paul Hockings, Second Edition, Mouton de Gruyter, pp. 335-362

3.2 MacDougall, David. 2011. 'Anthropological Filmmaking: An Empirical Art.' in *Sage Handbook of Visual Research Methods*, Eric Margolis & Luc Pauwels, eds, pp. 99-113

3.3 Schaeffer, Joseph H, 1995. 'Videotape: New Techniques of Observation and Analysis in Anthropology' in *Principles of Visual Anthropology* (ed) Paul Hockings, Second Edition, Mouton de Gruyter, pp. 255-284

4. Sociology, Multimedia and Hypermedia (Week 12-14)

4.1 Harper, Douglas.2012. *Visual Sociology*, Routledge, Chaps 7,8 and 9

4.2 Pink, Sarah. 2004. 'Conversing Anthropologically: Hypermedia as Anthropological Text' in *Working Images: Visual Research and Representation in Ethnography*, Sarah Pink et al. eds, Routledge, pp. 164-181

4.3 Lewis, Rob W. 'Media Convergence and Social Research: The Hathaway Project' in *Image-Based Research: A sourcebook for Qualitative Researchers*, Jon Prosser ed., Falmer Press, pp. 143-156

Note: The prescribed readings are application and practice oriented, providing guidelines for conducting Visual Research. The students will be expected to carry out short field research exercises based on these guidelines.

BA (Program)
Skill Enhancement Course 04
Theory and Practice of Development

Course Objective:

This course aims to familiarise students with the arguments of development theory in the decades of 80s onwards and equip them with some of the methodology in development practices adopted since then.

Course Outline:

1. What is development?

2. Recent trends in Development

2.1 Neo-liberalism: Growth as Development

2.1a. Re-emergence of Neo-classical perspective

2.1b. SAP and its Critique

2.2 Post development Theory

2.2a. Knowledge as Power

2.2b. Participatory Development

2.2c. GAD

2.3 Sustainable Development Theory: UN Earth Charter 1992

2.3a. Hegemonic approach: PPP

2.3b. Environmental discourse

3. Human Development Theory: Growth vs. Development

Course Content and Itinerary

1. What is development? (1 Week)

1.1 McMichael, Philip. *Development And Social Change*. Thousand Oaks, Calif.: Pine Forge Press, 2000. pp. 1-40

2. Recent Trends in Development (10 Weeks)

2.1 Neo-Liberalism: Growth as Development

2.1 Re-emergence of Neo-classical perspective

2.1b. SAP and its Critique

2.1.1 Emmerij, Louis. 2005. Turning Points in Development Thinking and Practice. Conference Paper

2.1.2 Meilink, Henk. 2003. Structural Adjustment Programmes on the African Continent: The theoretical foundations of IMF/World Bank reform policies. ASC Working paper No. 53. pp 1-29

2.1.3 Sparr, Pamela. (ed.)1994. *Mortgaging Women's Lives: Feminist Critiques of Structural Adjustment*. London: Zed Books. pp 1-30

Exercises & Case Studies

Exercise: A bedtime Story for Grown Ups

Case Study: Jayaweera, Swarna. 1994. Structural Adjustment Policies, Industrial development and Women in Sri Lanka in Pamela Sparr (ed) *Mortgaging Women's Lives: Feminist Critiques of Structural Adjustment*. London: Zed Books. pp 96-111

2.2 Post-Development Theory:

2.2a. Knowledge as Power

2.2b Participatory Development

2.2c GAD

2.2.1 Sachs, Wolfgang. 2007(12th impression). *The Development Dictionary: A guide to Knowledge as Power*. London: Zed Books, Chap 1, 2 & pp 1-25, 264-274

2.1.2 Escobar, A. 2011. (paperback ed.) *Encountering development: The making and unmaking of the Third World* Princeton: Princeton Press, Chap 2 & 6, pp 21-54, 212-226

2.2.1 Dipholo, Kenneth B. 2002. Trends in participatory development, *Journal of Social Development in Africa* Vol 17. No.1, pp 59-79

2.3.1 Razavi Shahrashoub and Miller Carol 1995. From WID to GAD: Conceptual Shifts in the Women and development Discourse Occasional Paper 1 United Nations Research Institute for Social Development: UNDP
www.unrisd.org/unrisd/website/document.nsf/0/.../\$FILE/opb1.pdf

Exercises & Case Studies

Exercise1. Pass the Picture (from Stepping Stones, Action Aid Manual)

Exercise2. Make a Gender Audit Report of any organization

Case Study: Participatory Urban Planning in Porto Alegre, Brazil

2.3 Sustainable Development Theory: UN Earth Charter 1992

2.3a Hegemonic approach: PPP

2.3b Environmental discourse

Buse, Kent. and Harmer, Andrew. 2004. Power to the Partners? : The Politics of Public-Private Health Partnerships *Development*, 2004, 47(2), pp 49–56

Exercise: Assess the JNNURM Plans of Delhi, Mumbai and Kolkata, Ref: http://www.pria.org/Reforming_JNNURM.htm

3 Human Development Theory: Growth vs Development (3 Weeks)

Friere, Paulo. 1972. *Pedagogy of the Oppressed*. New York: Herder & Herder

Sen, Amartya. 1989. “Development as Capabilities Expansion.” *Journal of Development Planning* 19: 41 – 58.

Sen, Amartya. and Sudhir Anand. 1994. “Sustainable Human Development: Concepts and Priorities.” Background Paper for the Human Development Report 1994. New York: Human Development Report Office.

Fukuda-Parr, Sakiko. 2003. The human development paradigm: Operationalizing Sen’s ideas on Capabilities, *Feminist Economics* 9(2 – 3), 2003, 301 – 317

Exercises:

Exercise1. Assess the quality of a nearby MCD school

Exercise 2. Assess the quality of health care services in an urban PHC

Case Study: Tint, Piia and Reinhold, Karin. 2008. Safety & health through Redesign of Garment Worker's Workplaces in Amita Sahaya (ed) *Selected Readings IV International Congress Women Work and health* New Delhi: WWHI

Websites of Organizations for exercises and Case studies:

- Family Planning Organization, UNDP, ILO, PRAXIS, PRIA-Participatory Research In Asia
- www.iclei.org, www.infochangeindia.org

Proposed Syllabus and Scheme of Examination

For

B.A.

POLITICAL SCIENCE

Submitted

To

University Grants Commission

New Delhi

Under Choice Based Credit System

April 2015

PROPOSED SCHEME FOR CHOICE BASED CREDIT SYSTEM IN

B.A.

	CORE COURSE (12)	Ability Enhancement Compulsory Course (AECC) (2)	Skill Enhancement Course (SEC) (2)	Discipline Specific Elective DSE (4)	Generic Elective GE (2)
I	English/MIL-1	(English/MIL Communication) / Environmental Science			
	DSC- 1 A				
	DSC- 2 A				
II	MIL/English-1	Environmental Science/ (English/MIL Communication)			
	DSC- 1 B				
	DSC- 2 B				
III	English/MIL-2		SEC -1		
	DSC- 1 C				
	DSC- 2 C				
IV	MIL/English-2		SEC -2		
	DSC- 1 D				
	DSC- 2 D				
V			SEC -3	DSE-1 A	GE-1
				DSE-2 A	
VI			SEC -4	DSE-1 B	GE-2
				DSE-2 B	

Details of Courses Under Undergraduate Programme (B.A)

Course

***Credits**

<u>I. Core Course</u>	Paper+ Practical	Paper + Tutorial
(12 Papers)	12X4= 48	12X5=60
Two papers – English		
Two papers – MIL		
Four papers – Discipline 1.		
Four papers – Discipline 2.		
Core Course Practical / Tutorial*	12X2=24	12X1=12
(12 Practicals)		
<u>II. Elective Course</u>	6x4=24	6X5=30
(6 Papers)		
Two papers- Discipline 1 specific		
Two papers- Discipline 2 specific		
Two papers- Inter disciplinary		
Two papers from each discipline of choice and two papers of interdisciplinary nature.		
Elective Course Practical / Tutorials*	6 X 2=12	6X1=6
(6 Practical/ Tutorials*)		
Two papers- Discipline 1 specific		
Two papers- Discipline 2 specific		
Two papers- Generic (Inter disciplinary)		
Two papers from each discipline of choice including papers of interdisciplinary nature.		
<ul style="list-style-type: none"> • Optional Dissertation or project work in place of one elective paper (6 credits) in 6th Semester 		
<u>III. Ability Enhancement Courses</u>		
1. Ability Enhancement Compulsory Courses (AECC)	2 X 2=4	2 X 2=4
(2 Papers of 2 credits each)		
Environmental Science		
English Communication/MIL		
2. Skill Enhancement Courses (SEC)	4 X 2=8	4 X 2=8
(4 Papers of 2 credits each)		
	<hr/>	<hr/>
	Total credit= 120	Total = 120
Institute should evolve a system/policy about ECA/ General Interest/Hobby/Sports/NCC/NSS/related courses on its own.		
*wherever there is a practical there will be no tutorial and vice-versa.		

CHOICE BASED CREDIT SYSTEM

B.A. POLITICAL SCIENCE

LIST OF PAPERS AND COURSES

A) DISCIPLINE SPECIFIC CORE COURSE (4)

1. Paper I- Introduction to Political Theory
2. Paper-II - Indian Government and Politics
3. Paper-III- Comparative Government and Politics
4. Paper-IV- Introduction to International Relations

B) CORE/ FOUNDATION (Compulsory) (4)

- ENGLISH (2)
- MIL (2)

c) Ability Enhancement (Compulsory) (2)

- ENGLISH/MIL (Communication)
- ENVIRONMENTAL SCIENCE

D) Ability Enhancement (Elective) Skill Based (4)

- 1) Legislative Support
- 2) Public Opinion and Survey Research
- 3) Democratic Awareness with Legal Literacy
- 4) Conflict and Peace Building

E) Discipline Specific Elective Course(2)

- 1) Themes in Comparative Political Theory
- 2) Administration and Public Policy: Concepts and Theories
- 3) Democracy and Governance
- 4) Understanding Globalization

F) Generic Elective -2 (Interdisciplinary): (2)

- 1) Reading Gandhi
- 2) Human Rights Gender and Environment

Choice Based Credit System

B.A. POLITICAL SCIENCE

S.No	SEMESTER-I	COURSE	PAPER	
1.1	Subject-I Political Science-1	Discipline Specific Core	Introduction to Political Theory	DSC I A
1.2	Subject-II(Any Other)	Discipline Specific Core		DSC II A
1.3	ENGLISH	CORE (COMPULSORY)		CC
1.4	ENGLISH/MIL(Communication) / ENVIRONMENTAL SCIENCE	Ability Enhancement (Compulsory)		AEEC
	SEMESTER-II			
2.1	Subject-I Political Science-2	Discipline Specific Core	Indian Government and Politics	DSC I B
2.2	Subject-II(Any Other)	Discipline Specific Core		DSC II B
2.3	MIL	CORE (COMPULSORY)		CC
2.4	ENGLISH/MIL(Communication) / ENVIRONMENTAL SCIENCE	Ability Enhancement (Compulsory)		AEEC
	SEMESTER-III			
3.1	Subject-I Political Science-3	Discipline Specific Core	Comparative Government and Politics	DSC I C
3.2	Subject-II(Any Other)	Discipline Specific Core		DSC II C
3.3	ENGLISH	CORE(COMPULSORY)		CC
3.4	Skill Based-1	Ability Enhancement (Elective)	Legislative Support	AEEC (1)
	SEMESTER-IV			
4.1	Subject-I	Discipline Specific Core	Introduction to	DSC I D

	Political Science-4		International Relations	
4.2	Subject-II(Any Other)	Discipline Specific Core		DSC II D
4.3	MIL	CORE(COMPULSORY)		CC
4.4	Skill Based-2	Ability Enhancement (Elective)	Public Opinion and Survey Research	AEEC (2)
	SEMESTER-V			
5.1	Skill Based-3	Ability Enhancement (Elective)	Democratic Awareness Through Legal Literacy	AEEC (3)
5.2	Discipline Specific Elective Course-I Political Science	A) Themes in Comparative Political Theory		DSE-1A
		B) Administration and Public Policy: Concepts and Theories		
5.3	Discipline Specific Elective Course-II	From Second Discipline/Subject		DSE-2A
5.4	Generic Elective-I (Interdisciplinary) Any One	Reading Gandhi		GE-I
		From Second Discipline/Subject Based		
	SEMESTER-VI			
6.1	Skill Based-4	Ability Enhancement (Elective)	Peace and Conflict Resolution	AEEC (4)
6.2	Discipline Specific Elective Course-I Political Science	A) Democracy and Governance		DSE-1B
		B) Understanding Globalization		
6.3	Discipline Specific Elective Course-II	From Second Discipline/Subject		DSE-2B

6.4	Generic Elective -II (Interdisciplinary) Any One	Human Rights Gender and Environment		GE-II
		From Second Discipline Based		

CHOICE BASED CREDIT SYSTEM

SYLLABI AND READING LIST

B.A. POLITICAL SCIENCE

DISCIPLINE SPECIFIC CORE COURSE(4)

Paper I- Introduction to Political Theory

Course Objective: This course aims to introduce certain key aspects of conceptual analysis in political theory and the skills required to engage in debates surrounding the application of the concepts.

1. a. What is Politics?

b. What is Political Theory and what is its relevance? (11 lectures)

2. Concepts: Democracy, Liberty, Equality, Justice, Rights, Gender, Citizenship, Civil Society and State (36 lectures)

3. Debates in Political Theory:

a. Is democracy compatible with economic growth?

b. On what grounds is censorship justified and what are its limits?

c. Does protective discrimination violate principles of fairness?

d. Should the State intervene in the institution of the family? (13 lectures)

Essential Readings:

Topic 1

Bhargava, R. (2008) 'What is Political Theory', in Bhargava, R. and Acharya, A. (eds.) *Political Theory: An Introduction*. New Delhi: Pearson Longman, pp. 2-17.

Bhargava, R. (2008) 'Why Do We Need Political Theory', in Bhargava, R. and Acharya, A. (eds.) *Political Theory: An Introduction*. New Delhi: Pearson Longman, pp. 18-37.

Topic 2

Sriranjani, V. (2008) 'Liberty', in Bhargava, R. and Acharya, A. (eds.) *Political Theory: An Introduction*. New Delhi: Pearson Longman, pp. 40-57.

Acharya, A. (2008) 'Equality', in Bhargava, R. and Acharya, A. (eds.) *Political Theory: An Introduction*. New Delhi: Pearson Longman, pp. 58-73.

Menon, K. (2008) 'Justice', in Bhargava, R. and Acharya, A. (eds.) *Political Theory: An Introduction*. New Delhi: Pearson Longman, pp. 74-82.

- Talukdar, P.S. (2008) 'Rights', in Bhargava, R. and Acharya, A. (eds.) *Political Theory: An Introduction*. New Delhi: Pearson Longman, pp. 88-105.
- Srinivasan, J. (2008) 'Democracy', in Bhargava, R. and Acharya, A. (eds.) *Political Theory: An Introduction*. New Delhi: Pearson Longman, pp. 106-128.
- Roy, A. 'Citizenship', in Bhargava, R. and Acharya, A. (eds.) *Political Theory: An Introduction*. New Delhi: Pearson Longman, pp. 130-147.
- Das, S. (2008) 'State', in Bhargava, R. and Acharya, A. (eds.) *Political Theory: An Introduction*. New Delhi: Pearson Longman, pp. 170-187.
- Singh, M. (2008) 'Civil Society', in Bhargava, R. and Acharya, A. (eds.) *Political Theory: An Introduction*. New Delhi: Pearson Longman, pp. 188-205.
- Menon, N. (2008) 'Gender', in Bhargava, R. and Acharya, A. (eds.) *Political Theory: An Introduction*. New Delhi: Pearson Longman, pp. 224-235.
- Shorten, A. (2008) 'Nation and State', in McKinnon, C. (ed.) *Issues in Political Theory*, New York: Oxford University Press, pp. 33-55.
- Christiano, Thomas. (2008) 'Democracy', in McKinnon, Catriona. (ed.) *Issues in Political Theory*, New York: Oxford University Press, pp. 80-96.
- Riley, J. (2008) 'Liberty', in McKinnon, C. (ed.) *Issues in Political Theory*, New York: Oxford University Press, pp. 103-125.
- Casal, P. & William, A. (2008) 'Equality', in McKinnon, C. (ed.) *Issues in Political Theory*. New York: Oxford University Press, pp. 149- 165.
- Wolf, J. (2008) 'Social Justice', in McKinnon, C. (ed.) *Issues in Political Theory*. New York: Oxford University Press, pp. 172-193.
- Brighouse, H. (2008) 'Citizenship', in McKinnon, C. (ed.) *Issues in Political Theory*. New York: Oxford University Press, pp. 241-259.
- Chambers, C. (2008) 'Gender', in McKinnon, C. (ed.) *Issues in Political Theory*. New York: Oxford University Press, pp. 241-288.
- Swift, A. (2001) *Political Philosophy: A Beginners Guide for Students and Politicians*. Cambridge: Polity Press.

Topic 3

- Sen, A. (2003) 'Freedom Favours Development,' in Dahl, R., Shapiro, I. and Cheibub, A. J. (eds.) *The Democracy Sourcebook*. Cambridge, Massachusetts: MIT Press, pp. 444-446.

Prezowski, A., et al. (2003) 'Political Regimes and Economic Growth,' in Dahl, R., Shapiro, I. and Cheibub, A. J. (eds.) *The Democracy Sourcebook*. Cambridge, Massachusetts: MIT Press, pp. 447-454.

Sethi, A. (2008) 'Freedom of Speech and the Question of Censorship', in Bhargava, R. and Acharya, A. (eds.) *Political Theory: An Introduction*. New Delhi: Pearson Longman, pp. 308-319.

Acharya, A. (2008) 'Affirmative Action', in Bhargava, R. and Acharya, A. (eds.) *Political Theory: An Introduction*. New Delhi: Pearson Longman, pp. 298-307.

Frances E O. (1985) 'The Myth of State Intervention in the Family', *University of Michigan Journal of Law Reform*. 18 (4), pp. 835-64.

Jha, M. (2001) 'Ramabai: Gender and Caste', in Singh, M.P. and Roy, H. (eds.) *Indian Political Thought: Themes and Thinkers*, New Delhi: Pearson.

Paper-II - Indian Government and Politics

- 1) Approaches to the Study of Indian Politics and Nature of the State in India: Liberal, Marxist and Gandhian (09 lectures)**
- 2) Indian Constitution: basic features, debates on Fundamental Rights and Directive Principles (09 lectures)**
- 3) Institutional Functioning: Prime Minister, Parliament and Judiciary (09 lectures)**
- 4) Power Structure in India: Caste, class and patriarchy (07 lectures)**
- 5) Religion and Politics: debates on secularism and communalism (06 lectures)**
- 6) Parties and Party systems in India (05 lectures)**
- 7) Social Movements : Workers, Peasants, Environmental and Women's Movement (10 lectures)**
- 8) Strategies of Development in India since Independence: Planned Economy and Neo-liberalism (05 lectures)**

READING LIST

Essential Texts.

Abbas, H., Kumar, R. & Alam, M. A. (2011) *Indian Government and Politics*. New Delhi: Pearson, 2011.

Chandhoke, N. & Priyadarshi, P. (eds.) (2009) *Contemporary India: Economy, Society, Politics*. New Delhi: Pearson.

Chakravarty, B. & Pandey, K. P. (2006) *Indian Government and Politics*. New Delhi: Sage.

Chandra, B., Mukherjee, A. & Mukherjee, M. (2010) *India After Independence*. New Delhi: Penguin.

Singh, M.P. & Saxena, R. (2008) *Indian Politics: Contemporary Issues and Concerns*. New Delhi: PHI Learning.

Vanaik, A. & Bhargava, R. (eds.) (2010) *Understanding Contemporary India: Critical Perspectives*. New Delhi: Orient Blackswan.

Menon, N. and Nigam, A. (2007) *Power and Contestation: India Since 1989*. London: Zed Book.

Austin, G. (1999) *Indian Constitution: Corner Stone of a Nation*. New Delhi: Oxford University Press.

Austin, G. (2004) *Working of a Democratic Constitution of India*. New Delhi: Oxford University Press.

Jayal, N. G. & Maheta, P. B. (eds.) (2010) *Oxford Companion to Indian Politics*. New Delhi: Oxford University Press.

Paper-III- Comparative Government and Politics

- 1. The nature, scope and methods of comparative political analysis (10 lectures)**
- 2. Comparing Regimes: Authoritarian and Democratic (06 lectures)**
- 3. Classifications of political systems:**
 - a) Parliamentary and Presidential: UK and USA**
 - b) Federal and Unitary: Canada and China (15 lectures)**
- 4. Electoral Systems: First past the post, proportional representation, mixed systems (07lectures)**
- 5 Party Systems: one-party, two-party and multi-party systems (09 lectures)**
- 6 Contemporary debates on the nature of state: From state centric security to human centric security and the changing nature of nation-state in the context of globalization. (13 lectures)**

READING LIST

Essential Texts

Bara, J & Pennington, M. (eds.). (2009) *Comparative Politics*. New Delhi: Sage.

Caramani, D. (ed.). (2008) *Comparative Politics*. Oxford: Oxford University Press.

Hague, R. and Harrop, M. (2010) *Comparative Government and Politics: An Introduction*. (Eight Edition). London: Palgrave McMillan.

Ishiyama, J.T. and Breuning, M. (eds.). (2011) *21st Century Political Science: A Reference Book*. Los Angeles: Sage.

Newton, K. and Deth, Jan W. V. (2010) *Foundations of Comparative Politics: Democracies of the Modern World*. Cambridge: Cambridge University Press.

O'Neil, P. (2009) *Essentials of Comparative Politics*. (Third Edition). New York: WW. Norton & Company, Inc.

Palekar, S.A. (2009) *Comparative Government and Politics*. New Delhi: PHI Learning Pvt. Ltd.

Readings

Topic 1.

Caramani, D. (2008) 'Introduction to Comparative Politics', in Caramani, D. (ed.) *Comparative Politics*. Oxford: Oxford University Press, pp. 1-23.

Mohanty, M. (1975) 'Comparative Political Theory and Third World Sensitivity', in *Teaching Politics*. Nos. 1 & 2, pp. 22-38.

Topic: 2.

Webb, E. (2011) 'Totalitarianism and Authoritarianism', in Ishiyama, J. T. and Breuning, M. (eds.) *21st Century Political Science: A Reference Book*. Los Angeles: Sage, pp. 249-257.

Hague, R. and Harrop, M. (2004) *Comparative Government and Politics: An Introduction*. London: Palgrave MacMillan, pp. 36-50, 51-68.

Topic: 3.

Hague, R and Harrop, M. (2004) 'The Political Executive', in *Comparative Government and Politics: An Introduction*. London: Palgrave MacMillan, pp. 268-290.

Topic: 4.

Cameron, D. R. (2002) 'Canada', in Ann L. G. (ed.) *Handbook of Federal Countries*. Montreal & Kingston: McGill-Queen's University Press, pp. 105-119.

Peter, H. (2002) 'Canada: A Federal Society-Despite Its Constitution', in Rekha Saxena. (ed.) *Mapping Canadian Federalism for India*. New Delhi: Konark Publisher, Pvt., pp. 115-129.

Dhillon, Michael. (2009), 'Government and Politics', in *Contemporary China: An Introduction*. London, New York: Routledge, 2009, pp. 137-160.

Topic: 5.

Evans, Jocelyn A.J. (2009) 'Electoral Systems', in Bara, J. and Pennington, M. (eds.) *Comparative Politics*. New Delhi: Sage, pp. 93-119.

Downs, W. M. (2011) 'Electoral Systems in Comparative Perspectives', in Ishiyama, J. T. and Breuning, M. (eds.) *21st Century Political Science: A Reference Book*. Los Angeles: Sage, pp. 159- 167.

Topic: 6.

Cole, A. (2011) 'Comparative Political Parties: Systems and Organizations', in Ishiyama, J.T. and Breuning, M. (eds.) *21st Century Political Science: A Reference Book*. Los Angeles: Sage, pp. 150-158.

Caramani, D. (2008) 'Party Systems', in Caramani, D. (ed.) *Comparative Politics*. Oxford: Oxford University Press, pp. 293-317, 318-347.

Topic: 7.

Poggi, Gianfranco. (2008) 'The nation-state', in Caramani, D. (ed.) *Comparative Politics*.

Oxford: Oxford University Press pp. 85-107.

Hague, R. and Harrop, M. (2004) 'The state in a global context', in *Comparative Government and Politics: An Introduction*. London: Palgrave MacMillan, pp. 17-34.

Further Readings:

Bara, J. (2009) 'Methods for Comparative Analysis', in Bara, J. & Pennington, M. (eds.) *Comparative Politics*. New Delhi: Sage, pp. 40-65.

Blondel, J. (1996) 'Then and Now: Comparative Politics', *Political Studies*. Vol. 47, Issue 1, pp. 152-160

Chandhoke, N. (1996) 'Limits of Comparative Political Analysis', *Economic and Political Weekly*. vol. 31, No. 4, (January 27), pp. PE 2-PE8.

Mair, P. (2008) 'Democracy', in Carmani, D. (ed.) *Comparative Politics*. Oxford: Oxford University Press, pp. 108-132.

Robbins, J. W. (2011) 'Parsidentialism Verses Parliamentarism', in Ishiyama, J. T. and Marijke, B. (eds.) *21st Century Political Science: A Reference Book*. Los Angeles: Sage, pp. 177- 185.

Watts, D. (2003) *Understanding US/UK Government and Politics*. Manchester: Manchester University Press, pp. 1-25; 66-105; 106-138.

Paper-IV- Introduction to International Relations

Course Objective: This Course is designed to give students a sense of some important theoretical approaches to understand international relations; a history from 1945 onwards to the present; and an outline of the evolution of Indian foreign policy since independence and its possible future trajectory.

1. Approaches to International Relations

- (a) Classical Realism (Hans Morgenthau) and Neo-Realism (Kenneth Waltz)**
- (b) Neo-Liberalism: Complex Interdependence (Robert O. Keohane and Joseph Nye)**
- (c) Structural Approaches: World Systems Approach (Immanuel Wallerstein) and Dependency School (Andre Gunder Frank)**
- (d) Feminist Perspective (J. Ann Tickner) (27 lectures)**

2. Cold War & Post-Cold War Era

- (a) Second World War & Origins of Cold War**

- (b) Phases of Cold War:**

- First Cold War**

- Rise and Fall of Detente**

- Second Cold War**

- End of Cold War and Collapse of the Soviet Union**

- (c) Post Cold- War Era and Emerging Centers of Power (European Union, China, Russia and Japan) (20 lectures)**

3. India's Foreign Policy

- (a) Basic Determinants (Historical, Geo-Political, Economic, Domestic and Strategic)**
- (b) India's Policy of Non-alignment**
- (c) India: An Emerging Power (13 lectures)**

READING LIST

Essential Readings

William, P., Goldstein, D. M. and Shafritz, J. M. (eds.) (1999) *Classic Readings of International Relations*. Belmont: Wadsworth Publishing Co, pp. 30-58; 92-126.

Art, R. J. and Jervis, R. (eds.) (1999) *International Political Enduring: Concepts and Contemporary Issues*. 5th Edition. New York: Longman, pp. 7-14; 29-49; 119-126.

Jackson, R. and Sorenson, G. (2008) *Introduction to International Relations: Theories and Approaches*. New York: Oxford University Press, pp. 59-96.

Goldstein, J. and Pevehouse, J.C. (2009) *International Relations*. New Delhi: Pearson, pp. 81-111.

- Tickner, J. A. (2001) *Gendering World Politics: Issues and Approaches in the Post-Cold War Era*. Columbia University Press.
- Baylis, J. and Smith, S. (eds.) (2011) *The Globalization of World Politics: An Introduction to International Relations*. Fifth Edition. Oxford: Oxford University Press, pp. 90-123; 142-159; 262-277.
- Wenger, A. and Zimmermann, D. (eds.) (2003) *International Relations: From the Cold World War to the Globalized World*. London: Lynne Rienner, pp. 54-89.
- Appadorai and Rajan, M. S. (eds.) (1985) *India's Foreign Policy and Relations*. New Delhi: South Asian Publishers.
- Mewmillians, W.C. and Piotrowski, H. (2001) *The World Since 1945: A History of International Relations*. Fifth edition. London: Lynne Rienner Publishers.
- Smith, M., Little, R. and Shackleton, M. (eds.) (1981) *Perspectives on World Politics*. London: Croom Helm.
- Indian Foreign Service Institute. (1997, 1998) *India's Foreign Policy: An Agenda for the 21st Century* Vols. 1 & 2, New Delhi: Konark Publishers, pp. 3-41; 102-119.
- Ganguly, S. (ed.) (2009) *India's Foreign Policy: Retrospect and Prospect*. New Delhi: Oxford University Press.
- Vanaik, A. (1995) *India in a Changing World: Problems, Limits and Successes of Its Foreign Policy*. New Delhi: Orient Longman. pp. 19-41; 63-67; 102-114; 118-124; 132-134.
- Basu, Rumki (ed)(2012) *International Politics: Concepts theories and Issues*, New Delhi, Sage Publications India Pvt Ltd.

Ability Enhancement (Elective) Skill Based (4)

1. Legislative Support

Aim of the course: To acquaint the student broadly with the legislative process in India at various levels, introduce them to the requirements of peoples' representatives and provide elementary skills to be part of a legislative support team.

Rationale:

Peoples' representatives need support for the multiple tasks they are supposed to undertake. The need to understand complex policy issues, draft new legislation, track and analyse ongoing bills, make speeches and floor statements, write articles and press releases, attend legislative meetings, conduct meetings with various stakeholders, monitor media and public developments, manage constituent relations and handle inter-office communications. All over the world, elected representatives have an office with specialised support team to carry out these tasks.

In India this has just begun. With about 5000 MPs and MLAs, and more than 30 lakhs representatives at the Panchayati Raj level, there is a vast need that needs to be responded to. This course will equip the students with basic skills for this task and expose them to real life legislative work. It will build their skills and deepen their understanding of the political process

Course outline:

1. Powers and functions of people's representatives at different tiers of governance

Members of Parliament, State Legislative Assemblies, functionaries of rural and urban local self government from Zila Parishads/Municipal Corporation to Panchayat/Ward. ***(Weeks 1-3)***

2. Supporting the legislative process: How a Bill becomes a Law, Role of the Standing Committee in reviewing a Bill, Legislative Consultations, amendments to a Bill, the framing of Rules and Regulations. ***(Week 4)***

3. Supporting the legislative committees

Types of committees, Role of committees in reviewing government finances, policy, programmes, and legislation. **(Weeks 5-7)**

4. Reading the budget document:

Overview of Budget Process, Role of Parliament in reviewing the Union Budget, Railway Budget, Examination of Demands for Grants of Ministries, Working of Ministries. **(Weeks 8-10)**

5. Support in media monitoring and communication: Types of media and their significance for legislators. Basics of communication in print and electronic media. **(Weeks 11-12)**

Suggested Readings:

Madhavan, M.R. & N.Wahi *Financing of Election Campaigns* PRS, Centre for Policy Research, New Delh, 2008:

http://www.prsindia.org/uploads/media/conference/Campaign_finance_brief.pdf

Vanka, S. *Primer on MPLADS* Centre for Policy Research, New Delhi, 2008. can be accessed on:

<http://www.prsindia.org/parliamenttrack/primers/mplads-487/>

Kalra, H. *Public Engagement with the Legislative Process* PRS, Centre for Policy Research, New Delhi, 2011. can be accessed on:

<http://www.prsindia.org/administrator/uploads/media/Conference%202011/Public%20Engagement%20with%20the%20Legislative%20Process.pdf>

Government of India (Lok Sabha Secretariat) *Parliamentary Procedures (Abstract Series)*, 2009. Can be accessed on:

<http://164.100.47.132/LssNew/abstract/index.aspx>

Government of India, (Ministry of Parliamentary Affairs) *Legislation, Parliamentary Procedure*, 2009. Can be accessed on:

http://mpa.nic.in/Manual/Manual_English/Chapter/chapter-09.htm

Government of India, (Ministry of Parliamentary Affairs) *Subordinate Legislation, Parliamentary Procedure*, 2009. Can be accessed on:

http://mpa.nic.in/Manual/Manual_English/Chapter/chapter-11.htm

Kapur, Devesh and Pratap Banu Mehta, "The Indian Parliament as an Institution of Accountability," *Democracy, Governance and Human Rights*, Programme Paper Number 23, United Nations Research Institute for Social Development, January 2006. Can be accessed on:

[http://www.unrisd.org/UNRISD/website/document.nsf/240da49ca467a53f80256b4f005ef245/8e6fc72d6b546696c1257123002fcceb/\\$FILE/KapMeht.pdf](http://www.unrisd.org/UNRISD/website/document.nsf/240da49ca467a53f80256b4f005ef245/8e6fc72d6b546696c1257123002fcceb/$FILE/KapMeht.pdf)

Agarwal, O.P. and T.V. Somanathan, "Public Policy Making in India: Issues and Remedies," February, 2005. Can be accessed on:

<http://www.cprindia.org/admin/paper/Public Policy Making in India 1420 5 TV SOMANATHAN.pdf>.

Debroy, Bibek, "Why we need law reform," *Seminar* January 2001.

Mehta, Pratap Bhanu, "India's Unlikely Democracy: The Rise of Judicial Sovereignty," *Journal of Democracy* Vol.18, No.2, pp.70-83.

Government links:

<http://loksabha.nic.in/>; <http://rajyasabha.nic.in/>; <http://mpa.nic.in/>

Sanyal, K. *Strengthening Parliamentary Committees* PRS, Centre for Policy Research, New Delhi, 2011. can be accessed on: <http://www.prsindia.org/administrator/uploads/media/Conference%202011/Strengthening%20Parliamentary%20Committees.pdf>

Celestine, A. *How to read the Union Budget* PRS, Centre for Policy Research, New Delhi, 2011. can be accessed on: <http://www.prsindia.org/parliamenttrack/primers/how-to-read-the-union-budget-1023/>

2.Public Opinion and Survey Research

Course Objective: This course will introduce the students to the debates, principles and practices of public opinion polling in the context of democracies, with special reference to India. It will familiarise the students with how to conceptualize and measure public opinion using quantitative methods, with particular attention being paid to developing basic skills pertaining to the collection, analysis and utilisation of quantitative data.

I. Introduction to the course (6 lectures)

Definition and characteristics of public opinion, conceptions and characteristics, debates about its role in a democratic political system, uses for opinion poll

II. Measuring Public Opinion with Surveys: Representation and sampling (6 lectures)

- a. What is sampling? Why do we need to sample? Sample design.
- b. Sampling error and non-response
- c. Types of sampling: Non random sampling (quota, purposive and snowball sampling); random sampling: simple and stratified

III. Survey Research (2 lectures)

- a. Interviewing: Interview techniques pitfalls, different types of and forms of interview
- b. Questionnaire: Question wording; fairness and clarity.

IV. Quantitative Data Analysis (4 lectures)

- a. Introduction to quantitative data analysis
- b. Basic concepts: correlational research, causation and prediction, descriptive and inferential Statistics

V. Interpreting polls (6 lectures)

Prediction in polling research: possibilities and pitfalls
Politics of interpreting polling

READING LIST

I. Introduction to the course

Essential Readings:

R. Erikson and K. Tedin, (2011) *American Public Opinion*, 8th edition, New York: Pearson Longman Publishers, . pp. 40-46.

G. Gallup, (1948) *A guide to public opinion polls* Princeton, Princeton University Press, 1948. Pp. 3-13.

II. Measuring Public Opinion with Surveys: Representation and sampling

Essential Readings:

G. Kalton, (1983) *Introduction to Survey Sampling* Beverly Hills, Sage Publication.

Lokniti Team (2009) 'National Election Study 2009: A Methodological Note', *Economic and Political Weekly*, Vol. XLIV (39)

Lokniti Team, (2004) 'National Election Study 2004', *Economic and Political Weekly*, Vol. XXXIX (51).

'Asking About Numbers: Why and How', *Political Analysis* (2013), Vol. 21(1): 48-69, (first published online November 21, 2012)

III. Survey Research

Essential Readings:

H. Asher, (2001) 'Chapters 3 and 5', in *Polling and the Public: What Every Citizen Should Know*, Washington DC: Congressional Quarterly Press.

R. Erikson and K. Tedin, (2011) *American Public Opinion*, 8th edition, New York, Pearson Longman Publishers, pp. 40-46.

IV. Quantitative Data Analysis

Essential Readings:

A. Agresti and B. Finlay, (2009) *Statistical methods for the Social Sciences*, 4th edition, Upper saddle river, NJ: Pearson-Prentice Hall,

S. Kumar and P. Rai, (2013) 'Chapter 1', in *Measuring Voting Behaviour in India*, New Delhi: Sage.

V. Interpreting polls

Essential Readings:

R. Karandikar, C. Pyne and Y. Yadav, (2002) 'Predicting the 1998 Indian Parliamentary Elections', *Electoral Studies*, Vol. 21, pp.69-89.

M. McDermott and K. A. Frankovic, (2003) 'Horserace Polling and Survey Methods Effects: An Analysis of the 2000 Campaign', *Public Opinion Quarterly* 67, pp. 244-264.

Additional Readings:

K. Warren, (2001) 'Chapter 2', in *In Defense of Public Opinion Polling*, Boulder: Westview Press, pp. 45-80.

W. Cochran, (2007) 'Chapter 1', *Sampling Techniques*, John Wiley & Sons.

G. Gallup, (1948) *A Guide to Public Opinion Polls*. Princeton: Princeton University Press, pp. 14-20; 73-75.

D. Rowntree (2000) *Statistics Without Tears: an Introduction for Non Mathematicians*, Harmondsworth: Penguin.

Suggested Student Exercises:

1. Discussion of readings and Indian examples.
2. Groups of students to collect examples of and discuss various sample based studies across many fields: e.g. consumer behaviour, unemployment rates, educational standards, elections, medicinal trials etc.
3. Non-random sampling: The students have to identify one group of people or behaviour that is unique or rare and for which snowball sampling might be needed. They have to identify how they might make the initial contact with this group to start snowball rolling.
4. Give the students the electoral list of an area in Delhi (<http://ceodelhi.gov.in>). The students have to draw a random sample of n number of respondents.
5. For this activity, working with a partner will be helpful. The class should first decide on a topic of interest. Then each pair should construct a five-item self report questionnaire. Of the five items, there should be at least one nominal response, one ordinal response and one interval. After the common questionnaire is constructed putting together the questions from everyone, working in pairs, the questionnaire should be administered on 10 different individuals.
6. Give the students a questionnaire from any public opinion survey and ask them to identify the type of variables.

3. Democratic Awareness with Legal Literacy

Course Objective: The Proposed course aims to acquaint student with the structure and manner of functioning of the legal system in India.

Expected Learning Outcome: The student should be aware of the institutions that comprise the legal system - the courts, police, jails and the system of criminal justice administration. Have a brief knowledge of the Constitution and laws of India, an understanding of the formal and alternate dispute redressal (ADR) mechanisms that exist in India, public interest litigation. Have some working knowledge of how to affirm one's rights and be aware of one's duties within the legal framework; and the opportunities and challenges posed by the legal system for different sections of persons.

This course consists of 100 marks - comprising 25 marks for evaluation of the practical/ project work and a written paper of 75 marks.

Course Content:

Unit I

- Outline of the Legal system in India
- System of courts/tribunals and their jurisdiction in India - criminal and civil courts, writ jurisdiction, specialized courts such as juvenile courts, Mahila courts and tribunals.
- Role of the police and executive in criminal law administration.
- Alternate dispute mechanisms such as lok adalats, non - formal mechanisms.

Unit II

- Brief understanding of the laws applicable in India
- Constitution - fundamental rights, fundamental duties, other constitutional rights and their manner of enforcement, with emphasis on public interest litigation and the expansion of certain rights under Article 21 of the Constitution.
- Laws relating to criminal jurisdiction - provision relating to filing an FIR, arrest, bail search and seizure and some understanding of the questions of evidence and procedure in Cr. P.C. and related laws, important offences under the Indian PenalCode, offences against women, juvenile justice, prevention of atrocities on Scheduled Castes and Scheduled Tribes.
- Concepts like Burden of Proof, Presumption of Innocence, Principles of Natural Justice, Fair comment under Contempt laws.
- Personal laws in India : Pluralism and Democracy
- Laws relating to contract, property and tenancy laws.

- Laws relating to dowry, sexual harassment and violence against women
- Laws relating to consumer rights
- Laws relating to cyber crimes
- Anti-terrorist laws: implications for security and human rights
- Practical application: Visit to either a (i) court or (ii) a legal aid centre set up by the Legal Services Authority or an NGO or (iii) a Lok Adalat, and to interview a litigant or person being counselled. Preparation of a case history.

Unit III

Access to courts and enforcement of rights

- Critical Understanding of the Functioning of the Legal System
- Legal Services Authorities Act and right to legal aid, ADR systems
- **Practical application :**
What to do if you are arrested ; if you are a consumer with a grievance; if you are a victim of sexual harassment; domestic violence, child abuse, caste, ethnic and religious discrimination; filing a public interest litigation. How can you challenge administrative orders that violate rights, judicial and administrative remedies
- Using a hypothetical case of (for example) child abuse or sexual harassment or any other violation of a right, preparation of an FIR or writing a complaint addressed to the appropriate authority.

Essential Reading

Creating Legal Awareness, edited by Kamala Sankaran and Ujjwal Singh (Delhi: OUP, 2007)

Legal literacy: available amongst interdisciplinary courses on Institute of Life Long Learning (Delhi University) Virtual Learning Portal namely vle.du.ac.in

Reading list for course on Legal Literacy

- Multiple Action Research Group, *Our Laws Vols 1-10*, Delhi. Available in Hindi also.
- Indian Social Institute, New Delhi, *Legal Literacy Series Booklets*. Available in Hindi also.
- S.K. Agarwala, *Public Interest Litigation in India*, K.M. Munshi Memorial Lecture, Second Series, Indian Law Institute, Delhi, 1985.
- S.P. Sathe, *Towards Gender Justice*, Research Centre for Womens' Studies, SNDT Women's University, Bombay, 1993.
- Asha Bajpai, *Child Rights in India : Law, Policy, and Practice*, Oxford University Press, New Delhi, 2003
- Agnes, Flavia *Law and Gender Equality*, OUP, 1997.
- Sagade, Jaga, *Law of Maintenance: An Empirical Study*, ILS Law College, Pune 1996.

- B.L. Wadhera, *Public Interest Litigation - A Handbook*, Universal, Delhi, 2003.
- Nomita Aggarwal, *Women and Law in India*, New Century, Delhi, 2002.
- P.C. Rao and William Sheffiled *Alternate Dispute Resolution: What it is and How it Works*, , Universal Law Books and Publishers, Delhi, 2002
- V.N. Shukla's *Constitution of India* by Mahendra P. Singh, Eastern Book Co. 10th edition 2001.
- Parmanand Singh, '*Access to Justice and the Indian Supreme Court*', 10 & 11 Delhi Law Review 156, 1981-82.

4. Conflict and Peace Building

Course Objectives: This course is designed to help build an understanding of a variety of conflict situations among students in a way that they can relate to them through their lived experiences. It's an interdisciplinary course that draws its insights from various branches of social sciences and seeks to provide a lively learning environment for teaching and training students how to bring about political and social transformations at the local, national and international levels. The course encourages the use of new information technologies and innovative ways of understanding these issues by teaching students skills of managing and resolving conflicts and building peace through techniques such as role-play, simulations, street theatre, cinema and music on the one hand and by undertaking field visits, interacting with different segments of the civil society including those affected by conflicts as well as diplomats, journalists and experts, on the other.

Unit I. Concepts (6 Lectures)

- a. Understanding Conflict (Week 1)
- b. Conflict Management, Conflict Resolution and Conflict Transformation (Week 2)
- c. Peace Building (Week 3)

Unit II: Dimensions of Conflict (6 Lectures)

- a. Ideology (Week 4)
- b. Economic/Resource Sharing Conflicts (Week 5)
- c. Socio-Cultural Conflicts (Ethnic, Religious, Gender-based) (Week 6)

Unit III: Sites of Conflict (6 Lectures)

- a. Local (Week 7)
- b. Sub-National (Week 7)
- c. International (Week 8)

Unit IV: Conflict Responses: Skills And Techniques (6 Lectures)

- a. Negotiations: Trust Building (Week 9)
- b. Mediation: Skill Building; Active Listening (Week 10)
- c. Track I, Track II & Multi Track Diplomacy (Week 11)
- d. Gandhian Methods (Week 12)

Unit I. Concepts

a. Understanding Conflict

Essential Readings:

O. Ramsbotham, T. Woodhouse and H. Miall, (2011) 'Understanding Contemporary Conflict', in *Contemporary Conflict Resolution*, (Third Edition), Cambridge: Polity Press, pp. 94-122.
W. Zartman, (1995) 'Dynamics and Constraints In Negotiations In Internal Conflicts', in William Zartman (ed.), *Elusive Peace: Negotiating an End to Civil Wars*, Washington: The Brookings Institute, pp. 3-29.

Additional Readings:

P. Wallensteen, (2012) 'Armed Conflicts', in *Understanding Conflict Resolution*, (Third Edition), London: Sage, pp. 13-28.

b. Conflict Management, Conflict Resolution and Conflict Transformation

Essential Readings:

C. Mitchell, (2002) 'Beyond Resolution: What Does Conflict Transformation Actually Transform?', in *Peace and Conflict Studies*, 9:1, May, pp.1-23.

S. Ryan, (1990) 'Conflict Management and Conflict Resolution', in *Terrorism and Political Violence*, 2:1, pp. 54-71.

Additional Reading:

J. Lederach, (2003) *The Little Book Of a Conflict Transformation*, London: Good Books.

I. Doucet, (1996) *Thinking About Conflict*, Resource Pack For Conflict Transformation: International Alert.

c. Peace Building

Essential Readings:

M. Lund, (2001) 'A Toolbox for Responding to Conflicts and Building Peace', in L. Reychler and T. Paffenholz, eds., *Peace-Building: A Field Guide*, Boulder: Lynne Rienner, pp. 16-20.

L. Schirch, (2004) *The Little Book Of Strategic Peacebuilding*, London: Good Books.

Unit II: Dimensions of Conflict

Essential Readings:

R. Rubenstein, (2003) 'Sources', in S. Cheldelin, D. Druckman and L. Fast (eds.) *Conflict: From Analysis to Intervention*, London: Continuum, pp.55-67.

P. Le Billon, (2009) 'Economic and Resource Causes of Conflicts', in J. Bercovitch, V. Kremenyuk and I. Zartman (eds.) *The Sage Hand Book of Conflict Resolution*, London: Sage Publications, pp. 210-224.

S. Ayse Kadayifci-Orellana, (2009) 'Ethno-Religious Conflicts: Exploring the Role of Religion in Conflict Resolution', in J. Bercovitch, V. Kremenyuk and I. Zartman (eds.) *The Sage Hand Book of Conflict Resolution*, London: Sage Publications, pp. 264-284.

Unit III: Sites of Conflict

Essential Readings:

D. Barash and C. Webel, (2009) *Peace and Conflict Studies*, London: Sage Publication, pp. 91-117.

D. Sandole, (2003) 'Typology' in S. Cheldelin, D. Druckman and L. Fast (eds.) *Conflict: From Analysis to Intervention*, London: Continuum, pp.39-54.

P. Wallenstein, (2007) *Understanding Conflict Resolution* (2nd ed.), London: Sage Publications.

Unit IV: Conflict Response: Skills And Techniques Essential Readings:

H. Saunders, (1999) *A Public Peace Process: Sustained Dialogue To Transform Racial and Ethnic Conflicts*, Palgrave Macmillan: New York, pp. 1-30.

N. Behera, 'Forging New Solidarities: Non-official Dialogues', in M. Mekenkamp, P. Tongeren and H. Van De Veen (eds.), *Searching For Peace In Central And South Asia*, London: Lynne Rienner Publishers, pp. 210-236.

J Bercovitch, V. Kremenyuk, and I. Zartman (eds.), (2009) *The Sage Hand Book of Conflict Resolution*, London: Sage Publications.

M. Steger , (2001) 'Peacebuilding and Non-Violence: Gandhi's Perspective on Power', in D. Christie, R. Wagner and D. Winter, (eds.), *Peace, Conflict, and Violence: Peace Psychology for the 21st Century Englewood Cliffs*, New Jersey: Prentice-Hall.

Additional Readings:

J. Davies and E. Kaufman (eds.), (2003) *Second Track/Citizens' Diplomacy: Concepts and Techniques for Conflict Transformation*, Rowman & Littlefield: Maryland.

C. Webel and J. Galtung (eds.), (2007) *The Handbook of Peace and Conflict Studies*, London: Routledge.

Toolkits by United States Institute of Peace

S. Mason and M. Siegfried, (2010) *Debriefing Mediators To Learn Their Experiences*, Washington D.C: United States Institute Of Peace.

I. Zartman and A. De Soto, (2010) *Timing Mediation Initiatives*, Washington D.C: United States Institute Of Peace.

A. Smith and D. Smock, (2010) *Managing A Mediation Process*, Washington D.C: United States Institute Of Peace.

H. Burgess and G. Burgess, (2010) *Conducting Track II*, Washington D.C: United States Institute Of Peace.

Online Resources Conflict Resolution in Popular Art and Culture:

The International Network of Peace Museums, at www.museumsforpeace.org/, contains links to visit the websites of many of the world's peace museums.

Theatre, peace and conflict at Theatre Without Borders, www.theatrewithoutborders.com/peacebuilding

Global Peace Film Festival, www.peacefilmfest.org/

Football for Peace International, www.football4peace.eu/contact.html

Dialogue:

http://www.pgexchange.org/images/toolkits/PGX_D_Sustained%20Dialogue.pdf

Mediation:

http://www.initiativeforpeacebuilding.eu/resources/A_guide_to_Mediation_HDC.pdf

<http://www.pgexchange.org/images/toolkits/civicus%20mediation%20tool.pdf>

<http://www.beyondintractability.org/bi-essay/mediation>

Facilitation:

http://www.pgexchange.org/images/toolkits/pgx_facilitation_tool.pdf

<http://www.beyondintractability.org/bi-essay/facilitation>

Negotiation:

Roger Fisher et al, *Getting to Yes: Negotiating Agreement without Giving In*, New York: Penguin, 1991.

http://peacebuilding.caritas.org/index.php/Introduction_to_Principled_Negotiation

Reconciliation: <http://www.peacebuildinginitiative.org/index.cfm?pageId=1975>

John Paul Lederach, *The Journey Toward Reconciliation*, London: Herald Press, 1999.

Charles Lerche, "Peace Building Through Reconciliation," *International Journal of Peace Studies*, Vol. 5. No. 2, 2000. http://www.gmu.edu/programs/icar/ijps/vol5_2/lerche.htm

Crossword Puzzle:

http://www.cengage.com/cgi-wadsworth/course_products_wp.pl?fid=M20bl&product_isbn_issn=9781133602101

http://www.cengage.com/cgi-wadsworth/course_products_wp.pl?fid=M20bl&product_isbn_issn=9781111344238

Suggested Classroom Exercises/ Activities:

1) Map the ethnic composition of your classroom and examine the prevailing prejudices and stereotyping practices and their manifestations and then suggest a strategy for trust building.

2) Identify a group of immigrants/ refugees from the South Asian region (Afghans, Bangladeshis, Sri Lankans, Tibetans, Rohingya Muslims from Myanmar) and based on your interactions with them, write a report explaining their respective experiences of conflicts are amenable to what kind of solution?

3) Identify musical bands and other such endeavours in the South Asian region which have used music as a peace building measure for promoting understanding among different communities.

- 4) Sports is a means or a barrier to promoting inter community understanding. Have a debate in the class arguing for and against this proposition.
- 5) Conduct a case study of resource allocation of water and electricity by the Government of Delhi. Identify, if any, elements of institutional discrimination has taken place.
- 6) Follow a conflict from any level (local/sub-national/national) covered in the news for a month and prepare a report on its causes, the parties and the dynamics of the conflict.
- 7) Identify protests over sharing of environmental resources and study their modus operandi for seeking redressal (for example, Narmada Bachao Andolan, Protests against the Nuclear Plant in Kondakulm, Movements against POSCO and Vedanta in Orissa)
- 8) Organize a peace film festival in your college.
- 9) Follow any track-two initiative between India and any of its neighbours (for example, Neemrana Initiative, The Pakistan India Peoples forum for Peace and Democracy , RIMC Old Boys Network, Women's Initiative for Peace in South Asia, Committee for Sane Nuclear Policy, Peace Pals) and, write a report on its activities and the impact factor.

Discipline Specific Elective Course (2)

1.Themes in Comparative Political Theory

Course Objective: This course aims to familiarize students with the need to recognize how conceptual resources in political theory draw from plural traditions. By chiefly exploring the Indian and Western traditions of political theory through some select themes, the overall objective is to appreciate the value and distinctiveness of comparative political theory.

1. Distinctive features of Indian and Western political thought (08 lectures)

2. Western Thought: Thinkers and Themes

- a. Aristotle on Citizenship**
- b. Locke on Rights**
- c. Rousseau on inequality**
- d. J. S. Mill on liberty and democracy**
- e. Marx and Bakunin on State (26 lectures)**

3. Indian Thought: Thinkers and Themes

- a. Kautilya on State**
- b. Tilak and Gandhi on Swaraj**
- c. Ambedkar and Lohia on Social Justice**
- d. Nehru and Jayaprakash Narayan on Democracy**
- e. Pandita Ramabai on Patriarchy (26 lectures)**

Readings:

Topic 1.

Dallmayr, F. (2009) 'Comparative Political Theory: What is it good for?', in Shogimen, T. and Nederman, C. J. (eds.) *Western Political Thought in Dialogue with Asia*. Plymouth, United Kingdom: Lexington, pp. 13-24.

Parel, A. J. (2009) 'From Political Thought in India to Indian Political Thought', in Shogiman, T. and Nederman, C. J. (eds.) *Western Political Thought in Dialogue with Asia*. Plymouth, United Kingdom: Lexington, pp. 187-208.

Pantham, Th. (1986) 'Introduction: For the Study of Modern Indian Political Thought', in Pantham, Th. & Deutch, K. L. (eds.) *Political Thought in Modern India*. New Delhi: Sage, pp. 9-16.

Topic 2.

Burns, T. (2003) 'Aristotle', in Boucher, D and Kelly, P. (eds.) *Political Thinkers: From Socrates to the Present*. New York: Oxford University Press, pp. 73-91.

Waldron, J. (2003) 'Locke', in Boucher, D. and Kelly, P. (eds.) *Political Thinkers: From Socrates to the Present*, New York: Oxford University Press, pp. 181-197.

Boucher, D. (2003) 'Rousseau', in Boucher, D. and Kelly, P. (eds.) *Political Thinkers: From Socrates to the Present*. New York: Oxford University Press, pp. 235-252.

Kelly, P. (2003) 'J.S. Mill on Liberty', in Boucher, D. and Kelly, P. (eds.) *Political Thinkers: From Socrates to the Present*. New York: Oxford University Press, pp. 324-359.

Wilde, L. (2003) 'Early Marx', in Boucher, D. and Kelly, P. (eds.) *Political Thinkers: From Socrates to the Present*. New York: Oxford University Press, pp. 404-435.

Sparks, Ch. and Isaacs, S. (2004) *Political Theorists in Context*. London: Routledge, pp. 237-255.

Topic 3.

Mehta, V. R. (1992) *Foundations of Indian Political Thought*. New Delhi: Manohar Publishers, pp. 88-109.

Inamdar, N.R. (1986) 'The Political Ideas of Lokmanya Tilak', in Panthan, Th. & Deutsch, K. L. (eds.) *Political Thought in Modern India*. New Delhi: Sage, pp. 110-121.

Patham, Th. (1986) 'Beyond Liberal Democracy: Thinking With Democracy', in Panthan, Th. & Deutsch, K.L. (eds.) *Political Thought in Modern India*. New Delhi: Sage, pp. 325-46.

Zelliot, E. (1986). 'The Social and Political Thought of B.R. Ambedkar', in Panthan, Th. & Deutsch, K. L.(eds.) *Political Thought in Modern India*. New Delhi: Sage, pp. 161-75.

Anand Kumar, 'Understanding Lohia's Political Sociology: Intersectionality of Caste, Class, Gender and Language Issue' *Economic and Political Weekly*. Vol. XLV: 40, October 2008, pp. 64-70.

Pillai, R.C. (1986) 'The Political thought of Jawaharlal Nehru', in Panthan, T. & Deutsch, K. L. (eds.) *Political Thought in Modern India*. New Delhi: Sage pp. 260-74.

Jha, M. (2001) 'Ramabai: Gender and Caste', in Singh, M.P. and Roy, H. (eds.) *Indian Political Thought: Themes and Thinkers*, New Delhi: Pearson.

2. Administration and Public Policy: Concepts and Theories

Topics:

1. Public administration as a discipline: Meaning, scope and significance of the subject, public and private administration, brief evolution and major approaches, and comparative approaches to public administration. (16 lectures)

2. Administrative theories: the classical theory, scientific management, the human - relation theory, and rational decision-making. (16 lectures)

3. Understanding public policy: concept and theories, relevance of policy making in public administration and process of policy formulation and implementation and evaluation. (14 lectures)

4. From Development Administration to New Public Management. Elements and politics of development administration, the New Public Management paradigm – a critical perspective in the post globalized era.

Readings:

Topic 1. Public administration as a discipline

Awasthi, A. and Maheshwari, S. (2003) *Public Administration*. Agra: Laxmi Narain Agarwal, pp. 3-12.

Basu, Rumki, (2014) *Public Administration, Concepts and Theories*, Delhi Sterling Publishers

Henry, N. (2003) *Public Administration and Public Affairs*. New Delhi: Prentice Hall, pp. 1-52.

Topic 2. Administrative theories

Bhattacharya, M. and Chakrabarty, B. (2005) 'Introduction: Public Administration: Theory and Practice', in Bhattacharya, M. and Chakrabarty, B. (eds.) *Public Administration: A Reader*. Delhi: Oxford University Press, pp. 1-50.

Henry, N. (2003) *Public Administration and Public Affairs*. New Delhi: Prentice Hall, pp. 53-74.

Mouzelis, N.P. (2005) 'The Ideal Type of Bureaucracy', in Bhattacharya, M. and Chakrabarty, B. (eds.) *Public Administration: A Reader*. Delhi: Oxford University Press, pp. 88-100.

Hyderbrand, W. (1980) 'A Marxist Critique of Organization Theory', in Evan, W (ed.) *Frontiers in Organization & Management*. New York: Praeger, pp. 123-150.

Hyderbrand, W. (1977) 'Organizational Contradictions in Public Bureaucracies: Towards a Marxian Theory of Organizations', in Benson, J. K. (ed.) *Organizational Analysis: Critique and Innovation*. Beverly Hills: Sage, pp. 85-109.

Topic 3. Development administration

Bhattacharya, M. (1999) *Restructuring Public Administration: Essays in Rehabilitation*. New Delhi: Jawahar, pp. 29-70, 85-98.

Bhattacharya, M. (2001) *New Horizons in Public Administration*. New Delhi: Jawahar, pp. 248-272, 301-323.

Topic 4. Understanding public policy

Dye, T.R. (1975) *Understanding Public Policy*. New Jersey: Prentice Hall, pp. 1-38, 265-299.

Dror, Y. (1983) *Public Policy Making Reexamined*. Oxford: Transaction Publication, pp. 129-216.

Additional Readings:

Bernard, C. (1938) *The Functions of Executive*. Cambridge: Harvard University Press.

Esman, M.J. (1986) 'Politics of Development Administration', in Montgomery, J.D. and

Siffin, W. (eds.), *Approaches to Development Politics*. New York: McGraw-Hill.

Gant, G.F. (1979) *Development Administration: Concepts, Goals, Methods*. Madison: University of Wisconsin Press.

Kamenka, E. & Krygier, M. (eds.) (1979) *Bureaucracy*. London: Edward Arnold.

Lee, H.B. (ed.) (1953) *Korea: Time, Change and Administration*. Hawai'i: University of Hawai'i Press.

Leftwich, A. (1994) 'Governance, the State and the Politics of Development', *Development and Change*, 25.

March, J. and Simon, H. (1958) *Organization*. New York: Wiley.

Mooney, J. (1954) *The Principles of Organization*. New York: Harper & Row.

Simon, H. (1967) *Administrative Behavior: A Study of Decision Making Process in Administrative Organization*. New York: Macmillan.

Wiedner, E. (ed.) (1970) *Development Administration in Asia*. Durham: Duke University Press.

3. Democracy and Governance

Lectures: 60

Course Objective: This Paper tries to explain the institutional aspects of democracy and how institutions function within a constitutional framework. It further delves into how democracy as a model of governance can be complimented by institution building.

1. Structure and Process of Governance: Indian Model of Democracy, Parliament, Party Politics and Electoral behaviour, Federalism, The Supreme Court and Judicial Activism, Units of Local Governance (Grassroots Democracy)

Political Communication -Nature,Forms and Importance

Lectures 15

2. Ideas, Interests and Institutions in Public Policy:

a. Contextual Orientation of Policy Design

b. Institutions of Policy Making

Lectures 15

a. Regulatory Institutions – SEBI, TRAI, Competition Commission Of India,

Lectures 05

b. Lobbying Institutions: Chambers of Commerce and Industries, Trade Unions, Farmers Associations, etc.

Lectures 05

3. Contemporary Political Economy of Development in India: Policy Debates over Models of Development in India, Recent trends of Liberalisation of Indian Economy in different sectors, E-governance.

Lectures 10

4. Dynamics of Civil Society: New Social Movements and Various interests, Role of NGO's, Understanding the political significance of Media and Popular Culture.

Lectures 10

Essential Readings:

Agarwal B, Environmental Management, Equity and Ecofeminism: Debating India's Experience, Journal of Pesant Studies, Vol. 25, No. 4, pp. 55-95.

Atul Kohli (ed.), The Success of India's Democracy, Cambridge University Press, 2001.

Corbridge, Stuart and John Harris, *Reinventing India: Liberalisation, Hindu Nationalism and Popular Democracy* OUP, 2000.

J.Dreze and A.Sen, *India: Economic Development and Social Opportunity*, Clarendon, 1995

Saima Saeed, *Screening the Public Sphere: Media and Democracy in India*, 2013

Nick Stevenson, *Understanding Media Cultures*, 2002

Fuller, C.J. (ed.) *Caste Today*, Oxford University Press, 1997

Himat Singh, *Green Revolution Reconsidered: The Rural World of Punjab*, OUP, 2001.

Jagdish Bhagwati, *India in Transition: Freeing The Economy*, 1993.

Joseph E. Stiglitz, *Globalisation and its Discontents*, WW Norton, 2003.

Patel, I.G., *Glimpses of Indian Economic Policy: An Insider View*, OUP, 2002.

Rajni Kothari and Clude Alvares, (eds.) *Another Revolution Fails: an investigation of how and why India's Operation Flood Project Touted as the World's Largest Dairy*

Development Program Funded by the EEC went off the Rails, Ajanta, New Delhi, 1985.

Smitu Kothari, *Social Movements and the Redefinition of Democracy*, Boulder, Westview, 1993.

Qah, John S.T., *Curbing Corruption in Asia: A Comparative Study of Six Countries*, Eastern University Press, 2003.

Vasu Deva, *E-Governance In India : A Reality*, Commonwealth Publishers, 2005

M.J.Moon, *The Evolution of Electronic Government Among Municipalities: Rheoteric or Reality*, American Society For Public Administration, *Public Administration Review*, Vol 62, Issue 4, July –August 2002

Pankaj Sharma, *E-Governance: The New Age Governance*, APH Publishers, 2004

Pippa Norris, *Digital Divide: Civic Engagement, Information Poverty and the Internet in Democratic Societies*, Cambridge: Cambridge University Press, 2001.

Ghanshyam Shah [ed.], *Social Movements and The State*, Sage Publication, 2002

Su H. Lee, *Debating New Social Movements: Culture, Identity, and Social Fragmentation*, Rawat Publishers, 2010

S. Laurel Weldon, *When Protest Makes Policy : How Social Movements Represent Disadvantaged Groups*, Michigan Publishers, 2011

Richard Cox, Production, Power and World Order, New York, Columbia University Press, 1987

Additional Readings

Baxi, Upendra and Bhikhu Parekh, (ed.) Crisis and Change in Contemporary India, New Delhi, Sage, 1994.

Bidyut Chakrabarty, Public Administration: A Reader, Delhi Oxford University Press, 2003.

Elaine Kamarck, Government Innovation Around the World: Occasional Paper Series, John F Kennedy School of Government, 2003

Kothari, Rajini, Politics in India, Delhi, Orient Longman, 1970.

Mackie, Gerry, Democracy Defended, New York, Cambridge University Press, 2003.

Mahajan, Gurpreet (ed.), Democracy, Difference and Social Justice, New Delhi, Oxford University Press, 2000.

Menon, Nivedita, (ed.), Gender and Politics in India, New Delhi, Oxford University Press, 2001.

Mohanty, Manoranjan, Peoples Rights: Social Movements and the State in the Third World, Sage, New Delhi, 1998.

Paul Brass, Politics in India Since Independence, Hyderabad, Orient Longman, 1990.

Rob Jenkins – Regional Reflections: Comparative Politics Across India's States, New Delhi, OUP, 2004.

Sury, M.M, India : A Decade of Economic Reforms : 1991 –2001, New Delhi, New Century Publication, 2003.

Thomas R. Dye., Understating Public Policy, Prentice Hall NJ, 1984.

Y. Dror, Public Policy Making Reexamined, Leonard Hill Books, Bedfordshire, 1974.

Basu Rumki et, al(ed) Democracy and good governance: Reinventing the Public service Delivery System in India, New Delhi, Bloomsbury India, 2015

4. Understanding Globalization

Course Objective: The Purpose of this course is to give students a basic understanding of what is meant by the phenomenon of globalization, its sources and forms. In addition, students will obtain a familiarity with both key global actors and certain urgent problems that require solutions at global level.

1. Globalization

a) What is it?

b) Economic, Political, Technological and Cultural Dimensions (09 Lectures)

2. Contemporary World Actors

a) United Nations

b) World Trade Organisation (WTO)

c) Group of 77 Countries (G-77) (25 Lectures)

3. Contemporary World Issues

a) Global Environmental Issues (Global Warming, Bio-diversity, Resource Scarcities)

b) Poverty and Inequality

c) International Terrorism (26 Lectures)

Reading List

Essential Readings

Lechner, F. J. and Boli, J. (eds.) (2004) *The Globalization Reader*. 2nd Edition. Oxford: Blackwell.

Held, D., Mc Grew, A. et al. (eds.) (1999) *Global Transformations Reader. Politics, Economics and Culture*, Stanford: Stanford University Press, pp. 1-50.

Viotti, P. R. and Kauppi, M. V. (2007) *International Relations and World Politics-Security, Economy, Identity*. Third Edition. Delhi: Pearson Education, pp. 430-450.

Baylis, J. and Smith, S. (eds.) (2011) *The Globalization of World Politics: An Introduction to International Relations*. Fourth Edition. Oxford: Oxford University Press, pp. 312-329;50-385; 468-489.

Tickner, J.A. (2008) 'Gender in World Politics', in Baylis, J. and Smith, S. (eds.) *The Globalization of World Politics: An Introduction to International Relation*. 4th Edition. Oxford: Oxford University Press.

Taylor, P. and Grom, A.J.R. (eds.) (2000) *The United Nations at the Millennium*. London: Continuum. pp. 1-20.

- Ravenhill, J. (2008) 'The Study of Global Political Economy', in Ravenhill, John (ed.) *Global Political Economy*. Second Edition. New York: Oxford University Press, pp. 18-24.
- Sauvant, K. (1981) *Group of 77: Evolution, Structure and Organisation*, New York: Oceana Publications.
- Chasek, P. S., Downie, D. L. and Brown, J. W. (eds.) *Global Environmental Politics*. Fourth Edition. Boulder: Colorado: Westview Press.
- Roberts, J.M. (1999) *The Penguin History of the 20th Century*. London: Penguin.
- Smith, M., Little, R. and Shackleton, M. (eds.) (1981) *Perspectives on World Politics*. London: Croom Helm.
- White, B. et al. (eds.) (2005) *Issues in World Politics*. Third Edition, New York: Macmillan, pp. 74-92; 191-211.
- Halliday, F. (2004) 'Terrorism in Historical Perspective', *Open Democracy*. 22 April, available at:
http://www.opendemocracy.net/conflict/article_1865.jsp
- Thomas, C. (2005) 'Poverty, Development, and Hunger', in Baylis, J. and Smith, S. (eds.) *The Globalization of World Politics*. Third Edition. New Delhi: Oxford University Press, pp. 645-668.
- Vanaik, A. (2007) 'Political Terrorism and the US Imperial Project', in *Masks of Empire*. New Delhi: Tulika Books, pp. 103-128.
- Art, R.J. and Jervis, R. (eds.) (1999) *International Politics: Enduring Concepts and Contemporary Issues*. 5th Edition. New York: Longman, pp. 495-500; pp.508-516.

Generic Elective -2 (Interdisciplinary): (2)

1) Reading Gandhi

Course Objective: The course seeks to meet two essential objectives: one, to acquaint the students with the art of reading texts, to enable them to grasp its conceptual and argumentative structure and to help them acquire the skills to locate the texts in a broader intellectual and socio-historical context. Second, it aims to acquaint the students with the social and political thought of Gandhi. The themes in Gandhian thought that are chosen for a close reading are particularly relevant to our times.

A). Ways to read a text:

a. textual

b. contextual

- Terence Ball, *Reappraising Political Theory*, Ch. 1, OUP, 1995
- “Meaning and Interpretation in the History of Ideas” in *Visions of Politics*, Quentin Skinner (ed.), Vol. 1, CUP, Cambridge, 2002.

B) Hind Swaraj:

1. **Gandhi in his own words: A close reading of Hind Swaraj.**

2. **Commentaries on Hind Swaraj and Gandhian thought:**

- “Introduction”, M.K.Gandhi, Hind Swaraj and other writings ed. A.J.Parel (1997).
- B.Parekh, Gandhi (1997), chs. 4 (“Satyagraha”) and 5 (“The critique of modernity”).
- D.Hardiman, Gandhi in his time and ours (2003), ch.4 (“An alternative modernity”)

C) Gandhi and modern India.

- a. Nationalism.
- b. Communal unity
- c. Women’s Question
- d. Untouchability.

This component will contain the following selections from Gandhi’s India of my Dreams (compiled R.K.Prabhu): “The meaning of Swaraj” (no.2); “In defence of Nationalism” (no.3); “India’s cultural heritage” (no.45); “Regeneration of Indian women” (no.54); “Women’s education” (no.55); “Communal unity” (no.59); “The curse of untouchability” (no.61); “Religious tolerance in India” (no.62); “The problem of minorities” (no.66)

2) Human Rights Gender and Environment

Course Objective: This course aims at enabling the students to understand the issues concerning the rights of citizens in general and the marginalized groups in particular, and assess the institutional and policy measures which have been taken in response to the demands of various movements. Conceptual dimensions, international trends and the Indian experience form the contents of the course.

Expected Learning Outcome: The study of the course will equip the students with theoretical and conceptual understanding of socio – economic and political problems of marginalized groups in society such as women, dalits, minorities and adivasis and repercussions of contemporary developments on globalization on them.

I Understanding Social Inequality

- Caste, Gender, Ethnicity and Class as distinct categories and their interconnection.
- Globalisation and its impact on workers, peasants, dalits, adivasis and women.

II Human Rights

- Human Rights: Various Meanings
- UN Declarations and Covenants
- Human Rights and Citizenship Rights
- Human Rights and the Indian Constitution
- Human Rights, Laws and Institutions in India; the role of the National Human Rights Commission.
- Human Rights of Marginalized Groups: Dalits, Adivasis, Women, Minorities and Unorganized Workers.
- Consumer Rights: The Consumer Protection Act and grievance redressal mechanisms.
- Human Rights Movement in India.

III Gender

- Analysing Structures of Patriarchy
- Gender, Culture and History
- Economic Development and Women
- The issue of Women's Political Participation and Representation in India
- Laws, Institutions and Women's Rights in India
- Women's Movements in India

IV Environment

- Environmental and Sustainable Development

- UN Environment Programme: Rio, Johannesburg and after.
- Issues of Industrial Pollution, Global Warming and threats to Bio – diversity
- Environment Policy in India
- Environmental Movement in India

Essential Readings

Agarwal, Anil and Sunita Narain (1991), *Global Warming and Unequal World: A Case of Environmental Colonialism*, Centre for Science and Environment, Delhi.

Baxi, Upendra (2002), *The Future of Human Rights*, Oxford University Press, Delhi.

Beteille, Andre (2003), *Antinomies of Society: Essays on Ideology and Institutions*, Oxford University Press, Delhi.

Geetha, V. (2002) *Gender*, Stree Publications, Kolkata.

Ghanshyam Shah, (1991) *Social Movements in India*, Sage Publications, Delhi.

Guha, Ramachandra and Madhav Gadgil, (1993) *Environmental History of India*, University of California Press, Berkeley.

Haragopal, G. (1997) *The Political Economy of Human Rights*, Himachal Publishing House, Mumbai.

Menon, Nivedita (ed) (2000) *Gender and Politics in India*, Oxford University Press, Delhi.

Patel, Sujata et al (eds) (2003) *Gender and Caste: Issues in Contemporary Indian Feminism*, Kali for Women, Delhi.

Shah, Nandita and Nandita Gandhi (1992) *Issues at Stake: Theory and Practice in the Contemporary Women's Movement in India*, Kali for Women, Delhi.

Gonsalves, Colin (2011) *Kaliyug: The decline of human rights law in the period of globalization* Human Rights Law Network, New Delhi.

Sen, Amartya, *Development as Freedom* (1999) New Delhi, OUP.

HEMVATI NANDAN BAHUGUNA GARHWAL UNIVERSITY

(A CENTRAL UNIVERSITY)

SRINAGAR (GARHWAL), UTTARAKHAND



SCHOOL OF ARTS, COMMUNICATION AND LANGUAGES

SANSKRIT

SYLLABUS

UNDERGRADUATE COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)

BA- I SEMESTER — BA- VI SEMESTER

W.E.F SESSION 2018-19



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)

CONTENTS			
BA-I SEMESTER			
SEMESTER	PAPER/ COURSE	PAPER CODE	PAGE
BA- I Semester	DSC- 1 Sanskrit Poetry	S0A/SAN/UG/ DSC-1	5-6
BA/ BCom I/ II Semester	MIL (Sanskrit)-1A Sanskrit Literature (For XII with Sanskrit)	S0A/SAN/UG/ MIL-1A	7-8
	or	or	
	MIL (Sanskrit)-1B Upaniṣad and Gītā (For X with Sanskrit)	S0A/SAN/UG/ MIL-1B	9-10
	or	or	
	MIL (Sanskrit) -1C Nīti Literature (For VIII with Sanskrit)	S0A/SAN/UG/ MIL-1C	11-12
BA/BCom/BSc. - I/II Semester	MIL (Sanskrit) Communication* Ability Enhancement Compulsory Course (AECC)	S0A/SAN/UG/MIL COM.	13-14

BA-II SEMESTER			
BA- II Semester	DSC- 2 Sanskrit Prose	S0A/SAN/UG/ DSC-2	15-16
BA/ BCom- II/ I Semester	MIL (Sanskrit) -1A Sanskrit Literature (For XII with Sanskrit)	S0A/SAN/UG/ MIL-1A	17-18
	or	or	
	MIL (Sanskrit) -1B Upaniad and Gītā (For X with Sanskrit)	S0A/SAN/UG/ MIL-1B	19-20
	or	or	
	MIL (Sanskrit) -1C Nīti Literature (For VIII with Sanskrit)	S0A/SAN/UG/ MIL-1C	21-22
BA/BCom/ BSc-II/ISemester	MIL (Sanskrit) Communication* Ability Enhancement Compulsory Course (AECC)	S0A/SAN/UG/MIL COM.	23-24

BA-III SEMESTER			
BA- III Semester	DSC-3 Sanskrit Drama	S0A/SAN/UG/ DSC-3	25-26
BA- III/ IV Semester	AEEC-1 Basic Elements of Jyotisa	S0A/SAN/UG/ AEEC-1	27
	or	or	
	AEEC- 2 Indian Architecture System	S0A/SAN/UG/ AEEC-2	28-29
	or	or	
	AEEC- 3 Basic Element of Āyurveda	S0A/SAN/UG/ AEEC-3	30
BA/BCom- III/ IVSemester	MIL (Sanskrit) -2A Grammar and Translation (For XII with Sanskrit)	S0A/SAN/UG/ MIL-2A	31-32
	or	or	



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)

	MIL (Sanskrit) -2B Grammar and Composition (For X with Sanskrit)	S0A/SAN/UG/ MIL-2B	33-34
	or	or	
	MIL (Sanskrit) -2C Sanskrit Grammar (For VIII with Sanskrit)	S0A/SAN/UG/ MIL-2C	35-36

BA- IV SEMESTER

BA- IV Semester	DSC-4 Sanskrit Grammar	S0A/SAN/UG/ DSC-4	37
BA- IV/ III Semester	AEEC-1 Basic Elements of Jyotisa	S0A/SAN/UG/ AEEC-1	38
	or	or	
	AEEC- 2 Indian Architecture System	S0A/SAN/UG/ AEEC-2	39-40
	or	or	
BA/BCom-IV/III Semester	AEEC- 3 Basic Element of Āyurveda	S0A/SAN/UG/ AEEC-3	41
	MIL (Sanskrit) -2A Grammar and Translation (For XII with Sanskrit)	S0A/SAN/UG/ MIL-2A	42-43
	or	or	
	MIL (Sanskrit) -2B Grammar and Composition (For X with Sanskrit)	S0A/SAN/UG/ MIL-2B	44-45
	or	or	
	MIL (Sanskrit) -2C Sanskrit Grammar (For VIII with Sanskrit)	S0A/SAN/UG/ MIL-2C	46-47

BA- V SEMESTER

BA- V/VI Semester	AEEC- 4 Computer Awareness for Sanskrit	S0A/SAN/UG/ AEEC- 4	48-49
	or	or	
	AEEC- 5 E- Learning Tools and Techniques for Sanskrit	S0A/SAN/UG/ AEEC- 5	50-51
	or	or	
	AEEC- 6 Yogasūtra of Patañjali	S0A/SAN/UG/ AEEC- 6	52
	or	or	
BA- V Semester	AEEC- 7 Indian Theatre	S0A/SAN/UG/AEEC- 7	53-54
	DSE- 1 Philosophy, Religion and Culture in Sanskrit Tradition	S0A/SAN/UG/ DSE-1	55
	or	or	
	DSE- 2 Indian Perspectives in Personality Development	S0A/SAN/UG/ DSE-2	56
BA- V Semester	GE- 2 Sanskrit Media	S0A/SAN/UG/ GE-2	57
	or	or	



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)

	GE- 3 Sanskrit Meter and Music	S0A/SAN/UG/ GE-3	58
	or	or	
	GE- 4 Nationalistic Thought in Sanskrit Literature	S0A/SAN/UG/ GE-4	59-61

BA- VI SEMESTER			
BA- VI/V Semester	AEEC- 4 Computer Awareness for Sanskrit	S0A/SAN/UG/ AEEC-4	62-63
	or	or	
	AEEC- 5 E- Learning Tools and Techniques for Sanskrit	S0A/SAN/UG/ AEEC-5	64-65
	or	or	
	AEEC- 6 Yogasūtra of Patañjali	S0A/SAN/UG/ AEEC-6	66
	or	or	
BA- VI Semester	AEEC- 7 Indian Theatre	S0A/SAN/UG/ AEEC-7	67-68
	DSE- 3 Literary Criticism	S0A/SAN/UG/ DSE- 3	69
	or	or	
	DSE- 4 Nationalism in Sanskrit Literature	S0A/SAN/UG/ DSE- 4	70-71
or	or		
BA- VI Semester	DSE- 5 Mathematical Tradition in Sanskrit	S0A/SAN/UG/ DSE- 5	72-73
	GE- 1 Political Thought in Sanskrit	S0A/SAN/UG/ GE-1	74-76
	or	or	
	GE- 5 Ethical and Moral Issues in Sanskrit Literature	S0A/SAN/UG/ GE-5	77-78
	or	or	
	GE- 6 Basics of Sanskrit Linguistics	S0A/SAN/UG/ GE-6	79-80

*NB

- (1) The University Grants Commission (UGC), New Delhi has not uploaded the National Syllabus for MIL (Sanskrit) Communication for Undergraduate Courses on its website. HNB Garhwal University has framed its own syllabus for MIL (Sanskrit) Communication to start with. University may modify it if UGC uploads the National Syllabus for MIL (Sanskrit) Communication.

विश्वविद्यालय अनुदान आयोगेन (यूजीसी) देहलीस्थेन स्ववेबसाईटे एम आई एल संस्कृत कम्प्यूनिकेशनस्य पाठ्यक्रमः न आरोहितः। हेमवती नन्दन बहुगुणा गढ़वाल विश्वविद्यायेन एम आई एल संस्कृत कम्प्यूनिकेशनस्य पाठ्यक्रमः स्वयं निर्मितः। विश्वविद्यालय अनुदान आयोगः (यूजीसी) एम आई एल संस्कृत कम्प्यूनिकेशनस्य पाठ्यक्रमं स्ववेबसाईटे चेदारोहपयेत तर्हि एतस्मिन् पाठ्यक्रमे परिवर्तनं सम्भवेत्।

- (2) DISTRIBUTION OF MARKS FOR EVERY COURSE/ PAPER

End Semester Examination = 70 Maximum Marks
Internal Assessment/ Sessional Test = 30 Maximum Marks
Total = 100 Maximum Marks

Syllabus for Internal Assessment/ Sessional Test is same as for End Semester Examination.



HEMVATI NANDAN BAHUGUNA GARHWAL UNIVERSITY, SRINAGAR GARHWAL
(A CENTRAL UNIVERSITY)



BA (UNDER GRADUATE COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER I

		BA SEMESTER- I		
		SANSKRIT		
		PAPER CODE—S0A/SAN/UG/DSC-1		
		DSC-1 SANSKRIT POETRY		M. Marks: 70
[A]		Prescribed Course:		
	Section 'A'	<i>Raghuvamsham</i>		15
	Section 'B'	<i>Shisupalavadham</i>		15
	Section 'C'	<i>Nitishatakam</i>		25
	Section 'D'	History of Sanskrit Poetry		15
[B]	Course Objectives:			
	This course aims to get the students acquainted with the Classical Sanskrit Poetry. It also intends to give an understanding of literature, through which students will be able to understand the basics of Sanskrit.			
[C]	Unit-wise Division:			
	Section 'A'			
	<i>Raghuvamsham</i>			
	Unit I	Introduction (Author and Text) Canto- I (Verses 1-10) Meaning/Translation, Explanation, Story, Characteristics of Raghu Clan, Characteristics of Dilipa.		
	Unit II	Canto-I (Verses: 11-25) Meaning/ Translation, Explanation, Role of Dilipa for the welfare of the subjects. Appropriateness of title, Background of given contents.		
	Section 'B'			
	<i>Shisupalavadham</i>			
	Unit I	Introduction (Author and Text), Appropriateness of title, Background of given contents. Canto II, Verses 26-37, Grammar, Translation, Explanation, Poetic excellence, Thematic analysis.		
	Unit II	Verses: 42-56, Grammar, Translation, Explanation, Poetic excellence, Thematic analysis.		
	Section 'C'			
	<i>Nitishatakam</i>			
	Unit I	Verses: 1-20, Translation and Explanation. (Social Experience of Bhartrihari, Types of Fool)		
	Unit II	Verses: 21-50, Translation and Explanation.		
	Section 'D'			
	History of Sanskrit Poetry			
	Unit I	Origin and development of different types of Mahakavya and Gitikavya with special reference to the following poets and their works: Poets: Ashvaghosha, Kalidasa, Bharavi, Magha, Sriharsha, Jayadeva, Bhartrihari and their works.		



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER I

D	Suggested Books/Readings
1.	कालिदास रघुवंश -----
2.	Kālidāsa. <i>Raghuvanśam</i> Eng.Trans. & Ed. M.R. kale. Delhi: Motilal Banarasidass.
3.	Kālidāsa. <i>Raghuvanśam</i> Eng.Trans. & Ed. Gopal Raghunath Nandergikar. Delhi: Motilal Banarasidass.
4.	Kālidāsa. <i>Raghuvanśam</i> Eng.Trans. & Ed. C.D. Devadhar. Delhi: Motilal Banarasidass.
5.	Kieth, AB. <i>History of Sanskrit Literature</i> . Hindi Trans. <i>Samskrit Sahitya Kā Itihāsa</i> . Translator Maṅgal Deva Śāstrī. Delhi: Motilal Banarasi Dass,-----
6.	Kriṣṇamācārya, M. <i>History of Classical Sanskrit Literature</i> . Delhi: Motilal Banarasi Dass,-----
7.	Śāstrī, Gaurinātha. <i>A Concise History of Sanskrit Literature</i> . Delhi: Motilal Banarasi Dass,-----
8.	Macdonnel, A. <i>A History of Sanskrit Literature</i> . New York: D. Appleton and Company, 1900.
9.	Weber, A. <i>The History of Indian Literature</i> . Tran. John Mann and Theodor Zachariaes. London: Kegan Paul. Trench. Trubner & Com. Ltd, 1914.
10.	Winternitz, M. <i>Geschichte der Indischen Litteratur</i> . Eng. Tran. <i>A History of Indian Literature</i> . Hindi Trans. <i>Bhāratīya Sāhitya Kā Itihāsa</i> . Delhi: Moti Lal Banarasidass. 2010. Vol. I-II
11.	माघ, शिशुपालवध, मल्लिनाथसूरिकृतसर्वङ्कशा टीका सहित, मुंबई खेमराज श्रीकृष्णदास वेंकटेश्वर स्टीम मुद्रणालय
12.	माघ, शिशुपालवध, मल्लिनाथसूरिकृतसर्वङ्कशा टीका सहित, व्याख्याकार और सम्पादक
13.	भृत्हरि, नीतिशतक, व्याख्याकार और सम्पादक डॉ. बाबूराम त्रिपाठी, आगरा-2 महालक्ष्मी प्रकाशन, संवत्सर.....
14.	भृत्हरि, नीतिशतक, अनुवादक और संस्कर्ता जनार्दन” शास्त्री पाण्डेय, दिल्ली मोतीलाल बनारसीदास.
15.	द्विवेदी, कपिलदेव, संस्कृत साहित्य का समीक्षात्मक इतिहास, सागर विश्वविद्यालय प्रकाशन, 2004
16.	त्रिपाठी राधाबल्लभ, संस्कृत साहित्य का अभिनव इतिहास, सागर विश्वविद्यालय प्रकाशन, 2004
17.	पाण्डेय अमरनाथ, संस्कृतकविसमीक्षा, वाराणसी चौखम्बा ओरिएण्टला, 1977
18.	Keith, AB. <i>The Sanskrit Drama</i> , London: Oxford University Press Ely House, 1974



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER I

BA/ BCom SEMESTER- II/I		
SANSKRIT		
PAPER CODE— S0A/SAN/UG/MIL-1A		
CORE MIL-1A		M. Marks 70
SANSKRIT LITERATURE		
[A]	Prescribed Course:	
	Section 'A' Hitopadeśa	30
	Section 'B' Cāṇakyanīti	25
	Section 'C' History of Sanskrit Prose and Nītikāvaya	15
[B]	Course Objectives:	
	This course aims to get the students acquainted with the outline of Sanskrit literature.	
[C]	Unit-Wise Division:	
	Section 'A'	
	Hitopadeśa: First Two Stories from Mitralābha	
Unit I	(i) Mitralābha— Foreword (प्रस्तावन)— श्लोकाः गद्यसंहिता 1- 47. (Translation, Explanation and Grammar).	
Unit II	(i) Mitralābha— First Story— श्लोकाः गद्यसंहिता 1-55. (Translation, Explanation and Grammar). (ii) Mitralābha— Second Story— from beginning up to “ ' श्लोकः गद्यसंहितः 56. (Translation, Explanation and Grammar).	
	Section 'B'	
	Cāṇakyanīti	
Unit I	First Chapter (Verses: 1-16) (Translation, Explanation and Grammar)	
Unit II	Second Chapter (Verses: 3-20) (Translation, Explanation and Grammar)	
	Section 'C'	
	History of Sanskrit Prose and Nītikāvaya	
Unit I	Origin and development of Prose and Nītikāvaya.	
Unit II	Short notes on Subandhu, Bāna, Dandin, Ambikādatta Vyāsa, Kathāsaritsāgara, Pañcatantra, Hitopadeśa and Cāṇakyanīti.	
D	Suggested Books/Readings	
	<ol style="list-style-type: none"> 1. नारायणपण्डित, हितोपदेश, सम्पादक जीवानन्द विद्यासागर कालिकाता..... 2. चाणक्य, चाणक्यनीतिदर्पण, व्याख्याकार श्रीलाल उपाध्याय, वाराणसी, वैजनाथ प्रसाद बुकसेलर..... 3. द्विवेदी कपिलदेव, संस्कृत साहित्य का समीक्षात्मक इतिहास, इलाहाबाद संस्कृत साहित्य संस्थान..... 4. 'शर्मा, उमाशंकर, ऋषि संस्कृत साहित्य का इतिहास, वाराणसी चौखम्बा सुरभारती प्रकाशनम्..... 5. उपाध्याय बलदेव, संस्कृत साहित्य का इतिहास, वाराणसी 'शारदा निकेतन..... 6. गोयल, प्रीतिप्रभा, संस्कृत साहित्य का इतिहास, जोधपुर राजस्थानी, ग्रन्थालय..... 7. Kieth, AB. <i>History of Sanskrit Literature</i>. Hindi Trans. <i>Sanskrit Sahitya Kā Itihāsa</i>. Translator 	



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER I

	<p>Śāstrī, Mangal Deva. Delhi: Motilal Banarasi Dass,-----</p> <p>8. Krisnamācārya, M. <i>History of Classical Sanskrit Literature</i>. Delhi: Motilal Banarasi Dass,-----</p> <p>9. Śāstrī, Gaurinātha. <i>A Concise History of Sanskrit Literature</i>. Delhi: Motilal Banarasi Dass,-----</p> <p>10. त्रिपाठी, राधाबल्लभ, संस्कृत साहित्य का अभिनव इतिहास, सागर विश्वविद्यालय प्रकाशन, 2004</p> <p>11. Macdonnel, A. <i>A History of Sanskrit Literature</i>. New York: D. Appleton and Company, 1900.</p> <p>12. Weber, A. <i>The History of Indian Literature</i>. Tran. John Mann and Theodor Zachariaes. London: Kegan Paul. Trench. Trubner & Com. Ltd, 1914.</p> <p>13. Winternitz, M. <i>Geschichte der Indischen Litteratur</i>. Eng. Tran. <i>A History of Indian Literature</i>. Hindi Trans. <i>Bhāratīya Sāhitya Kā Itihāsa</i>. Delhi: Moti Lal Banarasidass. 2010.</p>
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BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER I

<p>9. Kieth, AB. <i>History of Sanskrit Literature</i>. Hindi Trans. <i>Sanskrit Sahitya Kā Itihāsa</i>. Translator Maṅgal Deva Śāstrī. Delhi: Motilal Banarasi Dass,-----</p> <p>10. Krisṇamācārya, M. <i>History of Classical Sanskrit Literature</i>. Delhi: Motilal Banarasi Dass,-----</p> <p>11. Śāstrī, Gaurinātha. <i>A Concise History of Sanskrit Literature</i>. Delhi: Motilal Banarasi Dass,-----</p> <p>12. त्रिपाठी, राधाबल्लभ संस्कृत साहित्य का अग्निव इतिहास, सागर विश्वविद्यालय प्रकाशन-2004...</p> <p>13. Macdonnel, A. <i>A History of Sanskrit Literature</i>. New York: D. Appleton and Company, 1900.</p> <p>14. Weber, A. <i>The History of Indian Literature</i>. Tran. John Mann and Theodor Zachariaes. London: Kegan Paul. Trench. Trubner & Com. Ltd, 1914.</p> <p>15. Winternitz, M. <i>Geschichte der Indischen Litteratur</i>. Eng. Tran. <i>A History of Indian Literature</i>. Hindi Trans. <i>Bhāratīya Sāhitya Kā Itihāsa</i>. Delhi: Moti Lal Banarasidass. 2010.</p>



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
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SEMESTER I

or		
BA/ BCom SEMESTER- I/II		
SANSKRIT		
PAPER CODE— S0A/SAN/UG/MIL-1C		
CORE MIL-1C (Sanskrit)		
NĪTI LITERATURE		
M. Marks 70		
[A]	Prescribed Course:	
	Section 'A'	Pañcatantram
	Section 'B'	Nītiśatakam
	Section 'C'	General Introduction to Sanskrit Nīti Literature
[B]	Course Objectives:	
	This course aims are to get the students acquainted with the outline of Sanskrit Nīti literature through texts Pañcatantram and Nītiśatakam with the General Introduction to Sanskrit Literature.	
[C]	Unit-Wise Division:	
	Section 'A'	
	Pañcatantram	
	(A study of the text is expected for answering critical questions, translations and explanations)	
	Unit I	Text Introduction of the following: <i>ksapadakakathā, simhakāraka-murkhabrāhmanakathā</i> (क्षपणककथा, सिंहकारकमुखर्ब्राह्मणकथा)
	Unit II	Text Introduction of the following: <i>murkhapanditakathā, vānara-makara-macchakathā</i> and <i>gangadattamandūkakathā</i> (मुखर्पण्डितकथा, वानर-मकरमच्छकथा तथा गङ्गदत्तमण्डूककथा)
	Section 'B'	
	(A study of the text is expected for answering critical questions, translations and explanations)	
	Nītiśatakam	
	Unit I	Introduction to Nītiśatakam Text reading of Nītiśatakam from verses: 01-10.
	Unit II	Text reading of Nītiśatakam from verses: 11-30
	Section 'C'	
	General Introduction to Sanskrit Nīti Literature	
	Unit I	General Introduction to Sanskrit Nīti Literature
	Unit II	Short notes on Bhartrhari, Visnuśarmā, Nārāyana Pandit, Nītiśataka, Pañcatantra and Hitopadeśa.
D	Suggested Books/Readings	
	<ol style="list-style-type: none"> 1. विष्णुशर्मा, पञ्चतन्त्रम्, व्याख्याकार श्यामाचरण पाण्डेय, दिल्ली मोतीलाल बनारसीदास, 1975 2. <i>A Collection of Ancient Hindu Tales</i>. Ed. Franklin Edgerton, Johannes Hertel, 1908. 3. Visnuśarmā. <i>Pañcatantram</i>. Trans. and Ed. M.R. Kale. Delhi: Motilal Banarasidass, 1999. 4. Visnuśarmā. <i>Pañcatantram</i>. Trans. Chandra Rajan. Penguin Classics, Penguin Books. 	



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER I

5. भर्तृहरि नीतिशतक, संस्कृत हिन्दी व्याख्याकार विष्णुदत्त ”
‘ शर्मा, मेरठ ज्ञानप्रकाशन.....
6. भर्तृहरि नीतिशतक, व्याख्याकार और सम्पादक डॉ० बाबूराम त्रिपाठी, आगरा 2 महालक्ष्मी प्रकाशन, संवत्सर 2027, 1986.
7. भर्तृहरि नीतिशतक, अनुवादक और संस्कृतकर्ता, जनार्दन” शास्त्री पाण्डेय दिल्लो,
मोतीलाल बनारसी दास, 2014
8. भर्तृहरि नीतिशतक, संस्कृत हिन्दी अंग्रेजी व्याख्यासहित..
9. भर्तृहरि नीतिशतक, संस्कृतहिन्दीव्याख्याकार, सम्पादक तरणीश झा, इलाहाबाद रामनारायण वेनीमाधव, 1976
10. भर्तृहरि नीतिशतक, मनोरमा हिन्दीव्याख्याकार, ओमप्रकाश पाण्डेय, वाराणसी चौखम्बा अमर भारती प्रकाशन, 1982
11. ‘ शर्मा, उमाशंकर ऋषि, संस्कृत साहित्य का इतिहास, वाराणसी चौखम्बा सुरभारती.....
12. द्विवेदी, कपिलदेव, संस्कृत संस्कृत साहित्य का समीक्षात्मक इतिहास, इलाहाबाद संस्कृत साहित्य संस्थान
13. पाण्डेय, अमरनाथ, संस्कृतकविसमीक्षा, वाराणसी, चौखम्बा ओरिएन्टला, 1977
14. Keith, AB. *The Sanskrit Drama*. London: Oxford University Press. Ely House, 1974.
15. त्रिपाठी, रमाशंकर, संस्कृत साहित्य का प्रामाणिक इतिहास, वाराणसी कृष्णदास अकादमी.....
16. भोलाशंकर, संस्कृत कविदर्शन, वाराणसी चौखम्बा विद्याभवन.....
17. Dasgupta, S.N. *A History of Sanskrit Literature*. (Classical Period). Calcutta: University of Calcutta, 1977.
18. Keith, Arthur Berriedale. *A History of Sanskrit Literature*. Delhi: Motilal Banarasidass, ----
19. Krishnamacharya, M. *Classical Sanskrit Literature*. Delhi: Motilal Banarasidass, -----
20. Macdonnel, A. *A History of Sanskrit Literature*. New York: D. Appleton and Company, 1900.
21. Weber, A. *The History of Indian Literature*. Tran. John Mann and Theodor Zachariaes. London: Kegan Paul. Trench. Trubner & Com. Ltd, 1914.
22. Winternitz, M. *Geschichte der Indischen Litteratur*. Eng.Tran. *A History of Indian Literature*. Delhi: Moti Lal Banarasidass. 2010.



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
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SEMESTER I

BA/ BCom/ BSc- I/II SEMESTER			
SANSKRIT			
PAPER CODE— S0A/SAN/UG/MIL COM.			
MIL (SANSKRIT) COMMUNICATION* (AECC)			M. Marks 70
[A]	Prescribed Course:		
	Section 'A'	Introduction to Communication	10
	Section 'B'	Verbal (Spoken) Communication in Sanskrit	15
	Section 'C'	Written Communication in Sanskrit	15
	Section 'D'	Rudiments of Sanskrit Grammar	30
[B]	Course Objectives:		
	This course aims to get the students acquainted with Sanskrit communication.		
[C]	Unit-Wise Division:		
	Section 'A'		
	Introduction to Communication		
	Unit I	Theory of Communication, Types and Modes of Communication.	
	Section 'B'		
	Verbal (Spoken) Communication in Sanskrit		
	Unit I	<i>Sanbhāsana</i> in Sanskrit: Meaning of <i>Sanbhāsana</i> , Types of <i>Sanbhāsana svagata-kathanam, parasparakathanam, Sāmūhikacarcā, Sāksātkāre Sanskrte Praśnottaram, Sanskrte udghosaṇā.</i>	
	Section 'C'		
	Written Communication in Sanskrit		
	Unit I	Letter Writing in Sanskrit: <i>Pārivārika-patra-lekhanam (letter to father), vyāvasāyika-patra-lekhanam (letter to bookseller), Āmantraṇapatra-lekhanam.</i>	
	Section 'D'		
	Rudiments of Sanskrit Grammar		
	Unit I	(1) Declensions of following nominal stems: <i>Rām, Hari, guru, pitr, ramā, nadī, mātr, phal, tat, asmad, yusmad.</i> (2) Conjugations of following verbal stems: <i>As, bhū, Gam, Path, drś.</i> (3) Cardinal Numbers up to twenty. (4) Ordinal Numbers up to twentieth.	
	Unit II	Laghusiddhāntakaumudī: <i>Māheśvarsūtrāṇi, Sañjāprakaraṇam, Vibhaktyarthaprakaranam.</i>	
	Unit III	<i>Suffixes:</i> (1) <i>Kṛtpratyayah: kta, ktavatu, śatr, śānac, ktvā (lyap), tumun, tavya, tavyat, Anīyar.</i> (2) <i>Taddhitapratyayah: tarap, tamap, tasil</i>	



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
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SEMESTER I

	Unit IV	<i>Vyāvahārika śabdāḥ in Sanskrit: Vastunāmāni, Sambandhināmāni, Aṅganāmāni, paśupakṣināmāni.</i>	
	Unit V	Translation in Sanskrit	
[D]	Suggested Books/Readings		
	1. द्विवेदी, कपिलदेव, प्रौढरचनानुवादकौमुदी, वाराणसी भैरवनाथ विश्वविद्यालय प्रकाशन, 2011		
	2. द्विवेदी, कपिलदेव, प्रौढरचनानुवादकौमुदी, वाराणसी भैरवनाथ विश्वविद्यालय प्रकाशन, 2013		
	3. नौटियाल, चक्रधर हंस, वृहदनुवादचन्द्रिका, दिल्ली मोतीलाल बनारसीदास, बंगलो मार्ग, जवाहरनगर, 2013		
	4. पत्राचार द्वारा संस्कृतम् (प्रवेशः) हरिद्वार संस्कृतभारती रामलीलाभवन, कोतवाली के पास, 2014		
	5. संस्कृत-व्यवहार-साहस्री, नई दिल्ली संस्कृतभारती माता मन्दिर गली झण्डेवाला, 1998		
	6. वरदराज, लघुसिद्धान्तकौमुदी, प्राज्ञतोशिणी व्याख्याकार और सम्पादक श्रीधरानन्द 'शास्त्री' शिल्डियाल, दिल्ली मोतीलाल बनारसी दास, 1977		
	7. वरदराज, लघुसिद्धान्तकौमुदी भाग-1, व्याख्याकार भीमसेन 'शास्त्री', दिल्ली, भौमी प्रकाशन		
	8. डॉ० नरेन्द्र, संस्कृतस्य व्यावहारिकस्वरूपम् Trans. Functional Sanskrit: Its Communicative Aspects. Pondicherry: Sri Aurovindo Ashram.		

*NB

The University Grants Commission (UGC), New Delhi has not uploaded the National Syllabus for MIL (Sanskrit) Communication for Undergraduate Courses on its website. HNB Garhwal University has framed its own syllabus for MIL (Sanskrit) Communication to start with. It may be modified if UGC uploads the National Syllabus for MIL (Sanskrit) Communication.

विश्वविद्यालय अनुदान आयोगेन (यूजीसी) देहलीस्थेन स्व वेबसाईटे एम आई एल संस्कृत कम्प्यूनिकेशनस्य पाठ्यक्रमः न आरोहितः। हेमवती नन्दन बहुगुणा गढ़वाल विश्वविद्यालयेन एम आई एल संस्कृत कम्प्यूनिकेशनस्य स्व पाठ्यक्रमः निर्मितः। विश्वविद्यालय अनुदान आयोगेन (यूजीसी) एम आई एल संस्कृत कम्प्यूनिकेशनस्य पाठ्यक्रमः स्व वेबसाईटे चेदारोहयत् तर्हि एतस्मिन् पाठ्यक्रमे परिवर्तनं सम्भवेत्।



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SEMESTER II

BA SEMESTER II

SANSKRIT

PAPER CODE— S0A/SAN/UG/DSC-2

DSC-2

SANSKRIT PROSE

M. Marks 70

[A]	Prescribed Course:		
	Section 'A'	Sukanāsopadeśa	30
	Section 'B'	Sivarājaviṅjaya: Niḥśwāsa-I	25
	Section 'C'	Survey of Sanskrit Literature- Prose	15
[B]	Course Objectives:		
	This course aims to acquaint the students with the Classical Sanskrit Prose literature. One of the most famous prose texts of modern era, namely Sivarājaviṅjaya is also included here for the students to get acquainted with the beginnings of modern Sanskrit literature. The course also seeks to help students negotiate the text independently with the help of Proficiency of Sanskrit.		
[C]	Unit-Wise Division:		
	Section 'A'		
	Sukanāsopadeśa		
	Unit I	General introduction to Śukanāsopadeśa and its author Bānabhaṭṭ. Translation and explanation of passages/sūktīs of Śukanāsopadeśa.	
	Unit II	Critical questions on Sukanāsopadeśa.	
	Section 'B'		
	Sivarājaviṅjaya: Niḥśwāsa-I		
	Unit I	General introduction to Sivarājaviṅjaya and its author Ambikādattavyāsa, and critical questions. Translation and explanation of passages/ sūktīs of “विष्णोर्माया भगवती यया सम्मोहितगत्”. up to..... “स्वकीया विजयध्वजिनीं गजिनीं नाम राजधानी प्राविशत्”	
	Unit II	Translation and explanation of passages/ sūktīs of “अथ कालक्रमेण सप्ताशीत्युत्तरसहस्रतमे” (1087)... up to... “पत्रमेकमादाय सगणः स्वकुटीरं प्रविवेश”.	
	Section 'C'		
	Survey of Sanskrit Literature: Prose		
	Unit I	Origin and development of prose and important prose romances.	
	Unit II	Short notes on Subandhu, Bāna, Dandin, Ambikādatta Vyāsa, Pañcatantra, Hitopadeśa, Vetālapañcaviśatikā, Sinhāsanadvātriṅśikā and Puruṣaparīkṣā,	
D	Suggested Boos/Readings		
	<ol style="list-style-type: none"> 1. वाणभट्ट, कादम्बरी चन्द्रकला टीकासहित, टीकाकार आचार्य 'शेषराज' शर्मा, रेग्मी चाराणसी, चौखम्बा सुरभारती प्रकाशन, 1997 2. वाणभट्ट, कादम्बरी, 'शुकनासोपदेश, संस्कृत टीकाकार, हिन्दीव्याख्याकार और अनुवादक भानुचन्द्रसिंह 3. वाणभट्ट, कादम्बरी, शुकनासोपदेश, व्याख्याकार प्रह्लादकुमार, दिल्ली, मेहरचन्द लक्ष्मणदास, 1974 4. वाणभट्ट, कादम्बरी, 'शुकनासोपदेश, व्याख्याकार रामनाथशर्मा सुमन, मेरठ साहित्य भण्डार, 1968 5. अम्बिकादत्तव्यास, शिवराजविजय, व्याख्याकार और सम्पादक डॉ० कृष्णकुमार, कानपुर साहित्य निकेतन, 1981 82 		



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<ol style="list-style-type: none">6. अम्बिकादत्तव्यास, शिवराजविजय, व्याख्याकार और सम्पादक डॉ० देवनारायण मिश्र, मेरठ साहित्य भण्डार, सुभाष बाजार, 20057. द्विवेदी, कपिल, संस्कृत साहित्य का समीक्षात्मक इतिहास, इलाहाबाद संस्कृत साहित्य संस्थान8. ' शर्मा, उमाशंकर ऋषि, संस्कृत साहित्य का इतिहास, वाराणसी चौखम्बा सुरभारती प्रकाशन9. उपाध्याय, बलदेव, संस्कृत साहित्य का इतिहास, वाराणसी ' शारदा निकेतन10. गोयल, प्रीतिप्रभा, संस्कृत साहित्य का इतिहास, जोधपुर, राजस्थानी ग्रन्थागार11. Kieth, AB. <i>History of Sanskrit Literature</i>. Hindi Trans. <i>Sanskrit Sahitya Kā Itihāsa</i>. Translator Mangal Deva Śāstrī. Delhi: Motilal Banarasi Dass,-----12. Krisnamācārya, M. <i>History of Classical Sanskrit Literature</i>. Delhi: Motilal Banarasi Dass,-----13. Śāstrī, Gaurinātha. <i>A Concise History of Sanskrit Literature</i>. Delhi: Motilal Banarasi Dass,-----14. Macdonnel, A. <i>A History of Sanskrit Literature</i>. New York: D. Appleton and Company, 1900.15. Weber, A. <i>The History of Indian Literature</i>. Tran. John Mann and Theodor Zachariaes. London: Kegan Paul. Trench. Trubner & Com. Ltd, 1914.16. Winternitz, M. <i>Geschichte der Indischen Litteratur</i>. Eng. Tran. <i>A History of Indian Literature</i>. Hindi Trans. <i>Bhāratīya Sāhitya Kā Itihāsa</i>. Delhi: Moti Lal Banarasidass. 2010.



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SEMESTER II

BA/ BCom SEMESTER- II/I			
SANSKRIT			
PAPER CODE— S0A/SAN/UG/MIL-1A			
CORE MIL-1A			M. Marks 70
SANSKRIT LITERATURE			
[A]	Prescribed Course:		
	Section 'A'	Hitopadeśa	30
	Section 'B'	Cānakyānīti	25
	Section 'C'	History of Sanskrit Prose and Nītikāvaya	15
[B]	Course Objectives:		
	This course aims to get the students acquainted with the outline of Sanskrit literature.		
[C]	Unit-Wise Division:		
	Section 'A'		
	Hitopadeśa: First Two Stories from Mitralābha		
Unit I	(ii) Mitralābha— Foreword (प्रस्तावन)— श्लोकाः गद्यसंहिता: 1- 47. (Translation, Explanation and Grammar).		
Unit II	(iii) Mitralābha— First Story— श्लोकाः गद्यसंहिता: 1-55. (Translation, Explanation and Grammar). (iv) Mitralābha— Second Story— from beginning up to श्लोकाः गद्यसंहिता: 56. (Translation, Explanation and Grammar).		
	Section 'B'		
	Cānakyānīti		
Unit I	First Chapter (Verses: 1-16) (Translation, Explanation and Grammar)		
Unit II	Second Chapter (Verses: 3-20) (Translation, Explanation and Grammar)		
Unit III	Third Chapter (Verses: 1-16) (Translation, Explanation and Grammar)		
	Section 'C'		
	History of Sanskrit Prose and Nītikāvaya		
Unit I	Origin and development of Prose and Nītikāvya.		
Unit II	Short notes on Subandhu, Bāna, Dandin, Ambikādatta Vyāsa, Kathāsaritsāgara, Pañcatantra, Hitopadeśa and Cānakyānīti.		
D	Suggested Books/Readings		
	<ol style="list-style-type: none"> 1. नारायणजीडित, हितोपदेश, रम्य दक्ष जोयानन्द विद्यासागर, कलिकाता 2. चाणक्य, चाणक्यनीतिदर्शन, व्याख्याकार श्रीलाल उपाध्याय, वाराणसी, वैजन्थप्रसाद बुकसेलर 3. द्विवेदी, कपिलदेव, संस्कृत साहित्य का सनीधात्मक इतिहास, इलाहबाद संस्कृत साहित्य संस्थान 4. ' शर्मा, उमाशंकर ऋषि, संस्कृत साहित्य का इतिहास, वाराणसी चौखम्बा सूरभारती प्रकाशनम् 5. उपाध्याय, बलदेव, संस्कृत साहित्य का इतिहास, वाराणसी शारदा निकेतन 6. गोयल, प्रीतिप्रभ, संस्कृत साहित्य का इतिहास, जोधपुर, राजस्थानी ग्रन्थागार 7. Kieth, AB. <i>History of Sanskrit Literature</i>. Hindi Trans. <i>Saṁskṛit Sahitya Kā Itihāsa</i>. Translator 		



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	<p>Śāstrī, Mangal Deva. Delhi: Motilal Banarasi Dass,-----</p> <p>8. Kriṣṇamācārya, M. <i>History of Classical Sanskrit Literature</i>. Delhi: Motilal Banarasi Dass,-----</p> <p>9. Śāstrī, Gaurinātha. <i>A Concise History of Sanskrit Literature</i>. Delhi: Motilal Banarasi Dass,-----</p> <p>10. त्रिपाठी, राधावल्लभ, संस्कृत साहित्य का अभिनव इतिहास, सागर विश्वविद्यालय प्रकाशन, 2004</p> <p>11. Macdonnel, A. <i>A History of Sanskrit Literature</i>. New York: D. Appleton and Company, 1900.</p> <p>12. Weber, A. <i>The History of Indian Literature</i>. Tran. John Mann and Theodor Zachariaes. London: Kegan Paul. Trench. Trubner & Com. Ltd, 1914.</p> <p>13. Winternitz, M. <i>Geschichte der Indischen Litteratur</i>. Eng. Tran. <i>A History of Indian Literature</i>. Hindi Trans. <i>Bhāratīya Sāhitya Kā Itihāsa</i>. Delhi: Moti Lal Banarasisdass. 2010.</p>
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SEMESTER II

or			
BA/BCom SEMESTER- II/I			
SANSKRIT			
PAPER CODE— S0A/SAN/UG/MIL-1B			
CORE MIL-1B UPANISAD AND GĪTĀ			M. Marks 70
[A]	Prescribed Course:		
	Section 'A'	Upanisad: Īśāvāsyopanisad	20
	Section 'B'	Gītā	40
	Section 'C'	General Introduction to Upanisadic Philosophy	10
[B]	Course Objectives:		
	Objective of this course is to get students to know about the principle thesis of the Upaniad and the Gītā.		
[C]	Unit-Wise Division:		
	Section 'A'		
	Upanisad: Īśāvāsyopanisad		
	Unit I	Text Introduction to Īśāvāsyopanisad	
	Unit II	Text Reading of Īśāvāsyopanisad	
	Section 'B'		
	Gītā: Second Chapter		
	Unit I	Text Introduction and Text Reading: Second Chapter, Verse: 01-25.	
	Unit II	Text Reading: Chapter Two, Verse: 26-72.	
	Section 'C'		
	General Introduction to Upanisadic Philosophy		
	Unit I	General Introduction to Upanisadic Philosophy: <i>ātman, brahman, īśvara, karma, sr̥ṣṭi</i> .	
D	Suggested Books/Readings		
	<ol style="list-style-type: none"> 1 श्रीवेदव्यास, श्रीमद्भगवद्गीता, सम्पादक हनुमान प्रसाद पोद्दार, गोस्वपुर गीतप्रेस 2 श्रीमद्भगवद्गीता, 'शाङ्करभाष्य के हिन्दीभाषानुवाद सहित, गोरखपुर, गीतप्रेस, संवत्सर 2069 3 <i>The Bhagavadgītā</i> with the commentary of Śrīśankarācārya. Tran. Allādi Mahādeva Śāstrī. Madras: Samata Books, 1981. 4 <i>Śrī Īśāvāsyopanisad</i>. Trans.and Ed. A.C. Bhaktivedānta Swamī Prabhupād. Bombay: The Bhaktivedanta Book Trust, 1974. California: 37 Watsaka Avenue Los Angeles- 90034, 1974. 5 द्विवेदी, कपिलदेव, संस्कृत साहित्य का सनीधारमक इतिहास, इलाहबाद संस्कृत साहित्य संस्थान 6 ' शर्मा, उमाशंकर ऋषि, संस्कृत साहित्य का इतिहास, वाराणसी चौरुन्वा सुरभारती प्रकाशनम् 7 उपाध्याय, बलदेव, संस्कृत साहित्य का इतिहास, वाराणसी ' शारदा निबन्धन 8 गोयल, प्रीतिप्रभा, संस्कृत साहित्य का इतिहास, जोधपुर, राजस्थानी ग्रन्थगार 		



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SEMESTER II

9	Kieth, AB. <i>History of Sanskrit Literature</i> . Hindi Trans. <i>Sanskrit Sahitya Kā Itihāsa</i> . Translator Mangal Deva Śāstrī. Delhi: Motilal Banarasi Dass,-----
10	Kriṣṇamācārya, M. <i>History of Classical Sanskrit Literature</i> . Delhi: Motilal Banarasi Dass,-----
11	Śāstrī, Gaurinātha. <i>A Concise History of Sanskrit Literature</i> . Delhi: Motilal Banarasi Dass,-----
12	त्रिपाठी, राधावल्लभ, संस्कृत साहित्य का अभिनव इतिहास, सागर विश्वविद्यालय प्रकाशन, 2004
13	Macdonnel, A. <i>A History of Sanskrit Literature</i> . New York: D. Appleton and Company, 1900.
14	Weber, A. <i>The History of Indian Literature</i> . Tran. John Mann and Theodor Zachariaes. London: Kegan Paul. Trench. Trubner & Com. Ltd, 1914.
15	Winternitz, M. <i>Geschichte der Indischen Litteratur</i> . Eng. Tran. <i>A History of Indian Literature</i> . Hindi Trans. <i>Bhāratīya Sāhitya Kā Itihāsa</i> . Delhi: Moti Lal Banarasisidass. 2010.



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SEMESTER II

or			
BA/BCom SEMESTER- II/I			
SANSKRIT			
PAPER CODE— S0A/SAN/UG/MIL-1C			
CORE MIL-1C NĪTILITERATURE			M. Marks 70
[A]	Prescribed Course:		
	Section 'A'	Pañcatantram	30
	Section 'B'	Nītiśatakam	25
	Section 'C'	General Introduction to Sanskrit Nīti Literature	15
[B]	Course Objectives:		
	This course aims to get the students acquainted with the outline of Sanskrit Nīti literature through texts Pañcatantram and Nītiśatakam with the General Introduction to Sanskrit Literature.		
[C]	Unit-Wise Division:		
	Section 'A'		
	Pañcatantram		
	(A study of the text is expected for answering critical questions, translations and explanations)		
	Unit I	Text Introduction of the following: <i>ksapanakakathā, sinha-kāraka-murkh-abrāhmanakathā</i> (क्षपणककथा, सिंहकारकमूर्खब्राह्मणकथा)	
	Unit II	Text Introduction of the following: murkhapanditakathā, vānara-makara-macchakathā and gangadattamandūkakathā (मूर्खपण्डितकथा, वानरमकरमच्छकथा तथा गङ्गदत्तमण्डूककथा)	
	Section 'B'		
	Nītiśatakam		
	(A study of the text is expected for answering critical questions, translations and explanations)		
	Unit I	Introduction to Nītiśatakam Text reading of Nītiśatakam from verses: 01-10.	
	Unit II	Text reading of Nītiśatakam from verses: 11-30	
	Section 'C'		
	General Introduction to Sanskrit Nīti Literature		
	Unit I	General Introduction to Sanskrit Nīti Literature	
	Unit II	Short notes on Bhartrhari, Viśnuśarmā, Nārāyana Pandit, Nītiśataka, Pañcatantra and Hitopadeśa.	
D	Suggested Books/Readings		
	1 विष्णुशर्मा, पञ्चतन्त्रम्, व्याख्याकार श्यामाचरण पाण्डेय, दिल्ली मोतीलाल बनारसीदास, 1975.		
	2 A Collection of Ancient Hindu Tales. Ed. Franklin Edgerton, Johannes Hertel, 1908.		



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SEMESTER II

- 3 Visnuśarmā. *Pañcatantram*. Trans. and Ed. M.R. Kale. Delhi: Motilal Banarasidass, 1999.
- 4 Visnuśarmā. *Pañcatantram*. Trans. Chandra Rajan. Penguin Classics, Penguin Books.
- 5 भर्तृहरि, नीतिशतक, संस्कृत हिन्दी व्याख्यकार विष्णुदत्त शर्मा, मेरठ ज्ञानप्रकाशन
- 6 भर्तृहरि, नीतिशतक, व्याख्याकार और सम्पादक, डॉ० बाबूरान त्रिपाठी, आगरा-2, महालक्ष्मी प्रकाशन, संवत्सर 2027, 1986
- 7 भर्तृहरि, नीतिशतक, अनुवादक और संस्कर्ता, जनार्दनशास्त्री पाण्डेय, दिल्ली नोतीलाल बनारसी दस, 2014
- 8 भर्तृहरि, नीतिशतक, संस्कृत-हिन्दी-अंग्रेजी व्याख्य सहित
- 9 भर्तृहरि, नीतिशतक, संस्कृत हिन्दी व्याख्याकार सम्पादक तरणीश झा, इलाहाबाद रामनारयण बेनीमधव, 1976
- 10 भर्तृहरि, नीतिशतक, ननोरमा हिन्दीव्याख्याकार ओनमल्लश पाण्डेय, वाराणसी चौखम्बा उमर भारती, प्रकाशन 1982
- 11 ' शर्मा, उमाशंकर ऋषि, संस्कृत साहित्य का इतिहास, वाराणसी चौखम्बा सुरभारती प्रकाशनम्
- 12 द्विवेदी, कपिलदेव, संस्कृत साहित्य का समीक्षात्मक इतिहास, इलाहाबाद संस्कृत साहित्य संस्थान
- 13 पाण्डेय, अमरनाथ, संस्कृतकविस्नीधा, वाराणसी चौखम्बा, अंग्रेजोंका, 1977
- 14 Keith, AB. *The Sanskrit Drama*. London: Oxford University Press. Ely House, 1974.
- 15 त्रिपाठी, रनाशंकर, संस्कृत साहित्य का प्रामाणिक इतिहास, वाराणसी कृष्णदास अकादमी
- 16 भोलारकर, संस्कृत ललितदर्शन, वाराणसी चौखम्बा विद्याभवन
- 17 Dasgupta, S.N. *A History of Sanskrit Literature*. (Classical Period). Calcutta: University of Calcutta, 1977.
- 18 Keith, Arthur Berriedale. *A History of Sanskrit Literature*. Delhi: Motilal Banarasidass, ----
- 19 Krishnamacharya, M. *Classical Sanskrit Literature*. Delhi: Motilal Banarasidass, -----
- 20 Macdonnel, A. *A History of Sanskrit Literature*. New York: D. Appleton and Company, 1900.
- 21 Weber, A. *The History of Indian Literature*. Tran. John Mann and Theodor Zachariaes. London: Kegan Paul. Trench. Trubner & Com. Ltd, 1914.
- 22 Winternitz, M. *Geschichte der Indischen Litteratur*. Eng. Tran. *A History of Indian Literature*. Delhi: Moti Lal Banarasidass. 2010.



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER II

BA/ BCom/ BSc-II/I SEMESTER			
SANSKRIT			
PAPER CODE— S0A/SAN/UG/MIL COM.			
MIL (SANSKRIT) COMMUNICATION* (AECC)			M. Marks 70
[A]	Prescribed Course:		
	Section 'A'	Introduction to Communication	10
	Section 'B'	Verbal (Spoken) Communication in Sanskrit	15
	Section 'C'	Written Communication in Sanskrit	15
	Section 'D'	Rudiments of Sanskrit Grammar	30
[B]	Course Objectives:		
	This course aims to get the students acquainted with Sanskrit communication.		
[C]	Unit-Wise Division:		
	Section 'A'		
	Introduction to Communication		
	Unit I	Theory of Communication, Types and Modes of Communication.	
	Section 'B'		
	Verbal (Spoken) Communication in Sanskrit		
	Unit I	<i>Sambhāsana</i> in Sanskrit: Meaning of <i>Sambhāsana</i> , Types of <i>Sambhāsana</i> : <i>svagata-kathanam</i> , <i>parasparakathanam</i> , <i>Sāmūhikacarcā</i> , <i>Sāksātkāre Sanskrte Praśnottaram</i> , <i>Sanskrte udghosaṇā</i> .	
	Section 'C'		
	Written Communication in Sanskrit		
	Unit I	Letter Writing in Sanskrit: <i>Pārivārika-patra-lekhanam</i> (letter to father), <i>vyāvasāyika-patra-lekhanam</i> (letter to bookseller), <i>Āmantranapatra-lekhanam</i> .	
	Section 'D'		
	Rudiments of Sanskrit Grammar		
	Unit I	(1) Declensions of following nominal stems: <i>Rām</i> , <i>Hari</i> , <i>guru</i> , <i>pitr</i> , <i>ramā</i> , <i>nadī</i> , <i>mātr</i> , <i>phal</i> , <i>tat</i> , <i>asmad</i> , <i>yusmad</i> . (2) Conjugations of following verbal stems: <i>As</i> , <i>bhū</i> , <i>Gam</i> , <i>Path</i> , <i>drś</i> . (3) Cardinal Numbers up to twenty. (4) Ordinal Numbers up to twentieth.	
	Unit II	Laghusiddhāntakaumudī: <i>Māheśvarsūtrāni</i> , <i>Sañjāprakaraṇam</i> , <i>Vibhaktyarthaprakaraṇam</i> .	
	Unit III	<i>Suffixes</i> : (1) <i>Krtpratyayah</i> : <i>kta</i> , <i>ktavatu</i> , <i>śatr</i> , <i>śānac</i> , <i>ktivā</i> (<i>lyap</i>), <i>tumun</i> , <i>tavya</i> , <i>tavyat</i> , <i>Anīyar</i> . (2) <i>Taddhitapratyayah</i> : <i>tarap</i> , <i>tamap</i> , <i>tasil</i>	



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER II

	Unit IV	<i>Vyāvahārika śabdāh in Sanskrit :</i> <i>Vastunāmāni, Sambandhināmāni, Anganāmāni, paśupakṣināmāni.</i>	
	Unit V	Translation in Sanskrit	
[D]	<p>Suggested Books/Readings</p> <ol style="list-style-type: none"> 1. द्विन्द्वे, कविलिखे, प्रसङ्गानुवचकमुनिः, वरपरसी मन्वनाथ, विश्वविद्यालय प्रकाशन, 2011 2. द्विन्द्वे, कविलिखे, प्रसङ्गानुवचकमुनिः, वरपरसी मन्वनाथ, विश्वविद्यालय प्रकाशन, 2013 3. नटिवल, यमशर हंस, सूदक्षनुवाचकदेव, दिल्ली मन्तीलाल बनस्रीदत्त, अलं नार्, लवाहारा, 2013 4. पत्राचार ज्ञान संस्कृतम्, (प्रवेश), हरिद्वार संस्कृतमार्गदर्शक मन्तीलाल मन्व कविलिखे के पास, 2014 5. संस्कृत-व्यकरण-नाहरी, नई दिल्ली संस्कृतमार्गदर्शक मन्तीलाल मन्व कविलिखे के पास, 1985 6. वरदशर, लघुसंस्कृतकवली, प्रदत्तपेठो, आश्रयकार अंश समुदाय श्रीधरनन्द 'शास्त्री विश्वविद्यालय, दिल्ली मन्तीलाल बनस्रीदत्त, 1977 7. वरदशर, लघुसंस्कृतकवली-भाग-1, आश्रयकार मन्तीलाल मन्व कविलिखे के पास, दिल्ली मन्तीलाल बनस्रीदत्त 8. डॉ० नरेश, संस्कृतस्य वाक्यात्मिकवचनम्, Trans. Functional Sanskrit: Its Communicative Aspects. Pondicherry: Sri Aurovindo Ashram. 		

*NB

The University Grants Commission (UGC), New Delhi has not uploaded the National Syllabus for MIL (Sanskrit) Communication for Undergraduate Courses on its website. HNB Garhwal University has framed its own syllabus for MIL (Sanskrit) Communication to start with. It may be modified if UGC uploads the National Syllabus for MIL (Sanskrit) Communication.

विश्वविद्यालय अनुदान आयोगेन (यूजीसी) देहलीस्थेन स्व वेबसाईटे एम आई एल संस्कृत कम्प्यूनिकेशनस्य पाठ्यक्रमः न आरोहितः। हेमवती नन्दन बहुगुणा गढ़वाल विश्वविद्यालयेन एम आई एल संस्कृत कम्प्यूनिकेशनस्य स्व पाठ्यक्रमः निर्मितः। विश्वविद्यालय अनुदान आयोगेन (यूजीसी) एम आई एल संस्कृत कम्प्यूनिकेशनस्य पाठ्यक्रमः स्व वेबसाईटे चेदाराहयत् तर्हि एतस्मिन् पाठ्यक्रमे परिवर्तनं सम्भवेत्।



HEMVATI NANDAN BAHUGUNA GARHWAL UNIVERSITY, SRINAGAR GARHWAL
(A CENTRAL UNIVERSITY)



BA (UNDER GRADUATE COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER III

		BA SEMESTER- III	
		PAPER CODE—S0A/SAN/UG/DSC-3	
		DSC-3	M. Marks: 70
		SANSKRIT DRAMA	
[A]	Prescribed Course:		
	Section 'A'	<i>Pratimanatakam</i> - Bhasa ; Act I & III	15
	Section 'B'	<i>Abhijnanashakuntalam</i> – Kalidasa: ACT I - IV	30
	Section 'C'	Technical Terms from Sanskrit Dramaturgy	10
	Section 'D'	History of Sanskrit Drama and an Introduction to Principles of Sanskrit Drama	15
[B]	Course Objectives: This course aims to acquaint the students with two most famous dramas of Sanskrit literature, which not only reflect poetic excellence but also depict contemporary society and highlight human values.		
[C]	Unit-wise Division:		
		Section 'A'	
		<i>Pratimanatakam</i> - Bhasa; Act I & III	
	Unit I	First Act Introduction, Text Reading (Grammar, Translation and Explanation), Poetic excellence, Plot.	
	Unit II	Third Act Introduction, Text Reading (Grammar, Translation and Explanation), Poetic excellence, Plot.	
		Section 'B'	
		<i>Abhijnanshakuntalam</i> - Kalidasa: Act I- IV	
	Unit I	Act I-IV (a) Introduction, Explanation of terms like <i>nandi</i> , <i>prastavana</i> , <i>sutradhara</i> , <i>nati</i> , <i>vishkambhaka</i> , <i>vidushaka</i> and <i>kanchuki</i> , (b) Text Reading (Grammar, Translation and Explanation), Poetic excellence, Plot, Timing of action, Personification of nature.	
	Unit II	Kavyesu natakam ramyam, upama, Language of Kalidasa, dhvani in Kalidasa, Purpose and design behind <i>Abhijnanshakuntalam</i> and other problems related to the text.	
		Section 'C'	
		Technical Terms from Sanskrit Dramaturgy	
	Unit I	<i>Natak</i> , <i>Nayak</i> , <i>Nayika</i> , <i>Purvaranga</i> , <i>Nandi</i> , <i>Sutradhara</i> , <i>Nepathya</i> , <i>Prastavana</i> , <i>Kanchuki</i> and <i>Vidushaka</i>	
	Unit II	<i>Anka</i> , <i>Swagat</i> , <i>Prakash</i> , <i>Apvarit</i> , <i>Janantik</i> , <i>Akashbhashit</i> , <i>Vishkambhaka</i> , <i>Praveshaka</i> and <i>Bharatvakya</i>	
		Section 'D'	
		History of Sanskrit Drama and an Introduction to Principles of Sanskrit Drama	
		Origin and Development of Sanskrit Drama	
	Unit II	Some Important dramatists and dramas: Bhasa, Kalidasa, Sudraka, Vishakhadatta, Harsha, Bhavabhuti, and their works.	



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
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SEMESTER III

[D]	Suggested Books/Readings:
	1. भासकृतम् प्रतिमानाटकम्-----
	2. -----
	3. कालिदस, अभिज्ञानशाकुन्तलम्, व्याख्याकार और सम्पादक डॉ० लपिलदेव द्विवेदी इलाहबाद, स हिन्द संस्थान 37 कचेहरी मार्ग , 1974
	4. कालिदस, अभिज्ञानशाकुन्तलम्, सम्पादक. नारायणान आचार्य, नुम्बई, निर्णयसागर प्रेस, 1983
	5. उपाध्याय, भगवतशरण, कालिदास की लालित्य योजना, दिल्ली राजकमल प्रकाशन
	6. द्विवेदी, हजारीप्रसाद, कालिदास की लालित्य योजना, दिल्ली राजकमल प्रकाशन -----
	7. निश्र, गंजकनार, कालिदास की रम्यत्व को अवधारणा, दिल्ली गरिमल पब्लिकेशनम्----
	8. कालिदस, अभिज्ञानशाकुन्तलम्, व्याख्याकार और सम्पादक सुबोधचन्द्र वन्त, दिल्ली मोतीलाल बनरसी दास--.
	9. Kālidāsa. <i>The Abhijñānaśākuntalam</i> . Tran. & Ed. M.R. Kāle. Delhi: Motilāl Banārasīdāss, 1977.
	10. Kālidāsa. <i>The Abhijñānaśākuntalam</i> . Tran. & Ed. C.D. Devdhar. Delhi: Motilāl Banārasīdāss, ----
	11. Kālidāsa. <i>The Abhijñānaśākuntalam</i> . Tran. & Ed. Gajendra Gadakar. Delhi: Motilāl Banārasīdāss, --
	12. Kālidāsa. <i>The Abhijñānaśākuntalam</i> . Tran. & Ed. Ramendramohan Bosa. Kolakātā: Modern Book Agency, -----
	13. Dalal, Minaksi. <i>Conflict in Sanskrit Drama</i> .----- Somaiya Pulication Pvt. Ltd-----
	14. Dixit, Ratnamayi. <i>Women in Sanskrit Dramas</i> . Delhi: Meharchand Laksmandas.-----
	15. Keith, AB. <i>The Sanskrit Drama</i> . London: Oxford University Press. Ely House, 1974.
	16. Bhatt, GK. <i>Sanskrit Drama</i> . Dharwar: University Press,-----



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER III

BA SEMESTER- III/IV		
SANSKRIT		
PAPER CODE--S0A/SAN/UG/AEEC-1		
AEEC-1 Basic Elements of Jyotisa		M. Marks 70
[A]	Prescribed Course:	
	Section 'A'	Origin, Development and Branches of Jyotisa
	Section 'B'	Jyotisaṅḍrikāsaṁjñāprakaraṇam
	Section 'C'	Jyotisaṅḍrikāsaṁjñāprakaraṇam
[B]	Course Objectives:	
	The objective of this course to introduce basic elements of the Jyotisa to the students. The course covers Origin, Development and Branches of Jyotiṣa and reading of the Jyotisaṅḍrikā.	
[C]	Unit-Wise Division:	
	Section 'A'	
	Origin, Development and Branches of Jyotisa	
	Unit I	Origin and Development of Jyotisa
	Unit II	General introduction to following branches of Astrology: Siddhānta, Saṁhitā, Horā, Tājika, Praśna, Vāstuśāstra and Muhūrtaśāstra.
	Section 'B'	
	Jyotisaṅḍrikāsaṁjñāprakaraṇam	
	Unit I	Jyotisaṅḍrikāsaṁjñāprakaraṇam, Verses: 1- 29)
	Unit II	Jyotisaṅḍrikāsaṁjñāprakaraṇam, Verses: 30- 65)
	Section 'C'	
	Jyotisaṅḍrikāsaṁjñāprakaraṇam	
	Unit I	Jyotisaṅḍrikāsaṁjñāprakaraṇam, Verses: 66- 90)
	Unit II	Jyotisaṅḍrikāsaṁjñāprakaraṇam, Verses: 91- 115)
D	Suggested Books/Readings	
	<ol style="list-style-type: none"> 1. ' शर्मा, रेवतीरनण, ज्योतिषचन्द्रिका.----- 2. वराहमिहिर, बृहत्संहिता, हिन्दीभाषानुवादक, आहूतानन्द झा, वाराणसी चौखन्वा विद्याभवन ----- 3. वराहमिहिर, बृहत्संहिता, हिन्दीभाषानुवादक, एम एमकृष्ण दिल्ली नोतीलाल बनारसी दास,----- 4. दीक्षित, ' शंकरबालकृष्ण, भारतीय ज्योतिष, हिन्दीभाषा अनुवादक शिवनाथ झाखण्डी, लखनऊ, हिन्दी समिति उत्तरप्रदेश— 5. ' शाल्त्री, नेनीचन्द्र, भारतीय ज्योतिष, वाराणसी भारतीय ज्ञानपीठ----- 6. त्रिपाठी, देवीप्रसाद, ब्रह्माण्ड और सौरपरिवार, दिल्ली----- 7. त्रिपाठी, देवीप्रसाद, भुवनल्लेष, दिल्ली----- 	



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SEMESTER III

or		
BA SEMESTER- III/IV		
SANSKRIT		
PAPER CODE— S0A/SAN/UG/AEEC-2		
AEEC-2		
Indian Architecture System		
M. Marks 70		
[A]	Prescribed Course:	
	Section 'A'	Vāstusaukhyam of Todaramala
	Section 'B'	Vāstusaukhyam of Todaramala
	Section 'C'	Vāstusaukhyam of Todaramala
	Section 'D'	Vāstusaukhyam of Todaramala
[B]	Course Objectives:	
	Vāstu śāstra is an ancient science of architecture and construction. The aims of Vāstuvidyā course to get the students to know about the principals of design, layout, measurement, ground preparation and space arrangement etc.	
[C]	Unit-Wise Division:	
	Section 'A'	
	Vāstusaukhyam of Todaramala	
	Unit I	Vāstusaukhyam of Todaramala- Chapter– 1 vastuprayojana, vastusvarūpa. (verses- 4- 13).
	Unit II	Vāstusaukhyam of Todaramala- Chapter– 2 Bhūmiparīkṣnam, dīkṣādhanam, nivāsahetu sthananirvācanam. (verses- 14- 22).
	Section 'B'	
	Vāstusaukhyam of Todaramala	
	Unit I	Vāstusaukhyam of Todaramala- Chapter– 3 <i>Grhapyāvaranam: Tree plantation, śalyaśodhanam. (Verses 31-49, 74-82).</i>
	Unit II	Vāstusaukhyam of Todaramala– Chapter- 4 sadvargaparīśodhanam, vāstucakram, grhavāstu, śilānyāsam. (verses 83-102,107-112).
	Section 'C'	
	Vāstusaukhyam of Todaramala	
	Unit I	Vāstusaukhyam- Chapter– 6 Pañcavidhāni Ghāni (five types of house), śālālipramānam (verses-171-194), Vīthikāpramāṇam (195-196).
	Unit II	Vāstusaukhyam- Chapter– 7 Dvārajñānam, Stambhapramānam, Pañca Chatusśālāni Gṛhāṇi-Sarvatobhadram, Nandyāvartam, Vardhamānam, Svastikam, Rūcakam (verses 203-217)
	Section 'D'	
	Vāstusaukhyam of Todaramala	
	Unit I	Vāstusaukhyam- Chapter- 8 Ekāsīti-pada vāstucakram (287-302), Marmasthānāni (305-307).
	Unit II	Vāstusaukhyam- Chapter -9 Vāsadisā-nirūpanam, Dvārafalam, Dvārvedhafalam (322-335, 359-369).
D	Suggested Books/Readings	
	1. चतुर्वेदी, वासुदेव, भारतीय वास्तु रत्न, नई दिल्ली, श्री लाल बहादुर रत्नी राष्ट्रीय संस्कृत विद्यापीठ ----	



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
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SEMESTER III

	<ol style="list-style-type: none">2. ' शास्त्री, विनोद और शर्मा सीताराम, वास्तुशिरोमणि, दिल्ली, मेतीलाल बनारसीदास,-----3. द्विवेदी, राममनोहर और त्रिपाठी, ब्रह्मानन्द बृहद्वास्तुमीमांसा, वाराणसी, चौखम्बा सरमार्ती प्रकशन, 20124. त्रिपाठी, देवीप्रसाद, वास्तुशास्त्र, दिल्ली ईस्टर्न बुक लिंकर्स, 20155. जीवानन्द, वास्तुशास्त्रावली
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BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER III

or			
BA SEMESTER- III/IV			
SANSKRIT			
PAPER CODE— S0A/SAN/UG/AEEC-3			
AEEC-3			M. Marks 70
Basic Elements of Āyurveda			
[A]	Prescribed Course:		
	Section 'A'	Introduction to Āyurveda	20
	Section 'B'	Carakasānhitā – (Sūtrasthānam)	25
	Section 'C'	Taittirīyopanisad	25
[B]	Course Objectives:		
	<p>Āyurveda is a traditional Indian system of healthcare that has been traced back as early as 5,000 BCE. Through the classroom lectures and discussions, this course will introduce students to the theory of Āyurveda. The theory modules sessions that make up this course offer an introduction to Āyurveda that is well rounded, comprehensive and useful for students in their own day-to-day living. The major objective is to understand the basic principles and concepts of preventative medicine and health maintenance, diet and nutrition, usage of commonly used spices and herbs and outline of Āyurvedic therapeutic procedures in Āyurveda.</p>		
[C]	Unit-Wise Division:		
	Section 'A'		
	Introduction to Āyurveda		
	Unit I	Introduction to Āyurveda, History of Indian Medicine in the pre-Caraka period, The two schools of Āyurveda: Dhanvantari and Punarvasu.	
	Unit II	Main Ācāryas of Āyurveda – Caraka, Suśruta, Vāgbhatta, Mādhava, Sāraṅghara and Bhāvamiśra.	
	Section 'B'		
	Carakasānhitā – (Sūtrasthānam)		
	Unit I	Carakasānhitā – (Sūtrasthānam): Division of Time and condition of nature and body in six seasons. Regimen of Fall Winter (Hemanta), Winter (Śīśira) & Spring (Vasanta) seasons. Regimen of Summer (Grīśma), Rainy (Varṣā) and Autumn (Śarada) seasons.	
	Section 'C'		
	Taittirīyopanisad		
	Unit I	Taittirīyopanisad—Bhrguvallī, anuvāka 1- 5	
	Unit II	Taittirīyopanisad—Bhrguvallī, anuvāka 6- 10	
D	Suggested Books/Readings		
	<ol style="list-style-type: none"> 1. चरकसंहिता सम्पादक ब्रह्म नन्द त्रिपाठी, वाराणसी चौखम्बा सुरभारती प्रेस शन, 2005. 2. तैत्तिरीयोपनिषद् भगुवल्ली, गोरखपुर गीताप्रेस संवत् 2059 3. दिद्यालंकर, अत्रिदेव, आयुर्वेद का बृहद् इतिहास----- 4. ' शर्मा, त्रियदत्त, चरक चिन्तन. ----- 5. Narayanaswami, V. <i>Origin and Development of Āyurveda</i> Vol. 1, No. 1, July 1981, pages 1-7..... 		



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
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SEMESTER III

BA/BCom SEMESTER- III/IV			
SANSKRIT			
PAPER CODE- S0A/SAN/UG/MIL-2A			
CORE MIL-2A GRAMMAR AND TRANSLATION			M. Marks 70
[A]	Prescribed Course:		
	Section 'A'	Samjñā and Sandhi	25
	Section 'B'	Samāsa	15
	Section 'C'	Vibhaktyarthaprakarana	15
	Section 'D'	Translation	15
[B]	Course Objectives:		
	This course aims to get the students to know the basics of Sanskrit Grammar, including rules of Samjñā, Sandhi, Samāsa and Vibhaktyarthaprakarana based on Laghusiddhāntakaumudī, a primer of Pāinian grammar. Besides, the students will be able to translate sentences in Sanskrit.		
[C]	Unit-Wise Division:		
	Section 'A'		
	Samjñā and Sandhi		
	Unit I	Laghusiddhāntakaumudī: Samjñāprakaraṇa. <i>Acsandhi— yaṅa, guṅa, dīrgha, ayādi, vṛddhi, pūrvarūpa.</i>	
	Unit II	Laghusiddhāntakaumudī: <i>Hal and Visarga Sandhis— ścutva, utva, anunāsikatva, chhatva, jaśtva, satva, utva, lopa, rutva.</i>	
	Section 'B'		
	Samāsa		
	Unit I	Basic concepts of Samāsa and types.	
	Section 'C'		
	Vibhaktyarthaprakarana		
	Unit I	Laghusiddhāntakaumudī: Vibhaktyarthaprakarana.	
	Section 'D'		
	Translation		
	Unit I	Translation in Sanskrit.	
D	Suggested Books/Readings		
	<ol style="list-style-type: none"> 1. वरदराज, लघुसिद्धान्तकौमुदी, प्राज्ञतोषिणी व्याख्याकार और सम्पादक श्रीधरानन्द ' शास्त्री दिल्ली, दिव्यो मोतीलाल बनारसी दास, 1977 2. वरदराज, लघुसिद्धान्तकौमुदीभाग-1, व्याख्याकार भीमसेन" शास्त्री, दिल्ली, भौमीप्रकाशन 3. ' शास्त्री, चारुदेव, व्याकरणचन्द्रोदय (भाग-1, 2, 3) दिल्ली मोतीलाल बनारसीदास, 1977 4. वरदराज, लघुसिद्धान्तकौमुदी-1, व्याख्याकार काशीराम, दिल्ली, मोतीलाल बनारसीदास, 2009 5. Apte, V.S. <i>The Students' Guide to Sanskrit Composition</i>. Varanasi: Chowkhamba Sanskrit Series, ----- 		



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER III

6.	Kale, M.R. <i>Higher Sanskrit Grammar</i> . Delhi: Motilal Banarasi Dass, -----
7.	<i>Online Tools for Sanskrit Grammar</i> . Computational Linguistics Group. Delhi: Department of Sanskrit. University of Delhi: http://sanskrit.du.ac.in ,-----



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER III

or			
BA/ BCom SEMESTER- III/IV			
SANSKRIT			
PAPER CODE— S0A/SAN/UG/MIL-2B			
CORE MIL-2B GRAMMAR AND COMPOSITION			M. Marks 70
[A]	Prescribed Course:		
	Section 'A'	Sandhi	25
	Section 'B'	Samāsa	15
	Section 'C'	Krtpratyaya	15
	Section 'D'	Composition	15
[B]	Course Objectives:		
	This course aims to get the students to know the basics of Sanskrit Grammar, including rules of Sandhi, Samāsa and Kt pratyaya based on Laghusiddhāntakaumudī, a primer of Pāninian grammar. Besides, the students will also learn the techniques of writing of paragraph and composition in Sanskrit.		
[C]	Unit-Wise Division:		
	Section 'A'		
	Sandhi		
	Unit I	Acsandhi (6): <i>yan, guṇa, dīrgha, ayādi, vṛddhi and pūrvarūpa.</i>	
	Unit II	Halsandhi (5): <i>ścutva, utva, anunāsikatva, chhatva and jaśtva</i>	
	Unit III	Visargasandhi (4): <i>utva, lopa, satva, rutva.</i>	
	Section 'B'		
	Samāsa		
	Unit I	Samāsa (4): <i>avyayībhāva, tatpuruṣa, bahuvrīhi and dvandva</i>	
	Section 'C'		
	Krtpratyaya		
	Unit I	Krtpratyaya (15): <i>tavyat, tavya, anīyar, yat, ṛyat, ṛvul, tṛc, aṇ, kṛta, ktavatu, śatri, śānac, tumun, ktvā (lyap) and lyuṭ.</i>	
	Section 'D'		
	Composition		
	Writing of paragraph and composition in Sanskrit.		
D	Suggested Books/Readings		
	<ol style="list-style-type: none"> 1. वरदराज, लघुसिद्धान्तकौमुदी, प्राज्ञतोषिणी व्याख्याकार और सम्पादक श्रीधरानन्दशास्त्री छिन्डियाल, दिह्लो मोतीलाल बनारसी दास, 1977 2. वरदराज, लघुसिद्धान्तकौमुदीभाग-1, व्याख्याकार भीमसेन" शास्त्री, दिल्ली, भैमीप्रकाशन 3. ' शास्त्री, चारुदेव, व्याकरणचन्द्रोदय (भाग-1, 2, 3) दिल्ली मोतीलाल बनारसीदास, 1977 4. वरदराज, लघुसिद्धान्तकौमुदो-1, व्याख्याकार काशीराम, दिल्ली, मोतीलाल बनारसीदास, 2009 5. Apte, V.S. <i>The Students' Guide to Sanskrit Composition</i>. Varanasi: Chowkhamba Sanskrit Series, ----- 		



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER III

6	Kale, M.R. <i>Higher Sanskrit Grammar</i> . Delhi: Motilal Banarasi Dass, -----
7	<i>Online Tools for Sanskrit Grammar</i> . Computational Linguistics Group. Delhi: Department of Sanskrit. University of Delhi: http://sanskrit.du.ac.in ,-----



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
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SEMESTER III

or			
BA/BCom SEMESTER- III/IV			
SANSKRIT			
PAPER CODE— S0A/SAN/UG/MIL-2C			
CORE MIL-2C SANSKRIT GRAMMAR			M. Marks 70
[A]	Prescribed Course:		
	Section 'A'	Declensions and Conjugations	20
	Section 'B'	Sandhis, Compounds, Kāraka and Vibhakti Rules	20
	Section 'C'	Krt Suffixes	15
	Section 'D'	Composition	15
[B]	Course Objectives:		
	To introduce basic Sanskrit to students who have not studied Sanskrit at all or have studied it only up to class VIII or less and wish to revive their knowledge of the language. This will also enable them to compose short sentences and paragraphs on the basis of their knowledge of grammar.		
[C]	Unit-Wise Division:		
	Section 'A'		
	Declensions and Conjugations		
	Unit I	Masculine Words. Stems endings in vowels (4) : Noun Ending 'a', 'i', 'u', and 'r' only, <i>rāma, muni, guru, pitṛ</i> Stems ending in consonants: <i>ātman, daṇḍin, candramas</i>	
	Unit II	Feminine Words. Stems endings in vowels (4): Noun Ending 'ā', 'ī', 'ī', and 'r' only, <i>ramā, mati, kumārī, and mātr</i> Stems ending in consonants: <i>vāc and sarit.</i>	
	Unit III	Neuter Words. Stem ending in vowels (4): Noun Ending 'a', 'i', and 'u' only, <i>Phala, vāri and madhu</i> Stem ending in consonants: <i>payas, jagat.</i> Pronouns <i>asmad, yusmad, tad, yad, idam, etad, kim</i> (in all three genders) Numerals Declension of numeral words from <i>eka</i> to <i>daśan</i> (In all three genders)	
	Unit IV	Conjugations : <i>path, pac, bhū, kr, as, nrt., śru, jñā, (in lat, lrt, lan, lot and vidhilin)</i>	
	Section 'B'		
	Sandhis, Compounds, Kāraka and Vibhakti Rules		
	Unit I	Rules of Sandhi: <i>Acsandhi (6): yana, guna, dīrgha, ayādi, vrddhi and pūrvarūpa</i> <i>Halsandhi (5): ścutva, utva, anuṅāsikatva, chhatva and jāstva</i> <i>Visargasandhi (4): utva, lopa, satva, rutva.</i>	
	Unit II	Compounds: The concept of Compound and its types	
	Unit III	<i>Kāraka and Vibhakti Rules. Concept of kāraka and vibhakti, Types of kāraka, kārakavibhakti and upapadavibhakti</i>	
	Section 'C'		
	Krt suffixes		
	Unit I	<i>Krt Suffixes : tavyat, anīyar, yat, ṅyat, , kta, ktavatu, śatṛ, śānac, tumun, ktvā and lyap</i>	



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER IV

BA SEMESTER- IV			
SANSKRIT			
PAPER CODE— S0A/SAN/UG/DSC-4			
DSC- 4			M. Marks 70
SANSKRIT GRAMMAR			
[A]	Prescribed Course:		
	Section 'A'	Laghusiddhāntakaumudī : Samjñāprakaraṇa	10
	Section 'B'	Laghusiddhāntakaumudī : Sandhiprakarana	30
	Section 'C'	Laghusiddhāntakaumudī : Vibhaktyarthprakarana	30
[B]	Course Objectives:		
	This course aims to get students to learn the Samjñā, Sandhi and Vibhaktyartha Prakaranas of Sanskrit grammar through Laghusiddhāntakaumudī. Students will be able to learn the application of Pānini's sūtras.		
[C]	Unit-Wise Division:		
	Section 'A'		
	Laghusiddhantakaumudi: SamjñāPrakaraṇa		
	Unit I	Samjñāprakarana	
	Section 'B'		
	Laghusiddhantakaumudi: Sandhiprakarana		
	Unit I	Acsandhi: yana, guṇa, dīrgha, ayādi, vṛddhi and pūrvarūpa.	
	Unit II	Halsandhi: ścutva, utva, anuṅśikātvā, chhatva and jaśtvā	
	Unit III	Visargasandhi: utva, lopa, satva and rutva	
	Section 'C'		
	Laghusiddhāntakaumudī: Vibhaktyarthprakarana		
	Unit I	Vibhaktyarthprakarana	
D	Suggested Books/Readings		
	1	वरदराज, लघुसिद्धान्तकौमुदी, प्राज्ञतोषिणी व्याख्याकार और सम्पादक श्रीधरानन्दशास्त्री धिखिडियाल, दिल्ली, मोतीलाल बनारसी दास, 1977	
	2	वरदराज, लघुसिद्धान्तकौमुदी, भाग:- 1, व्याख्याकार भीमसेनशास्त्री, दिल्ली भैमीप्रकाशन,-----	
	3	' शास्त्री, चारुदेव, व्याकरण चन्द्रोदय (भाग-1, 2, 3), दिल्ली मोतीलाल बनारसीदास, 1977.	
	4	वरदराज, लघुसिद्धान्तकौमुदी, प्रकाशिका व्याख्याकार सत्यपालसिंह, दिल्ली शिवालिक पब्लिकेशन, 2014.	
	5	Apte, V.S. <i>The Students' Guide to Sanskrit Composition</i> . Varanasi: Chowkhamba Sanskrit Series, -	
	6	Kale, M.R. <i>Higher Sanskrit Grammar</i> . Delhi: Motilal Banarasi Dass, -----	
	7	वरदराज, लघुसिद्धान्तकौमुदी-1, व्याख्याकार काशीराम दिल्ली, मोतीलाल बनारसोदास, 2009.	
	8	<i>Online Tools for Sanskrit Grammar</i> . Computational Linguistics Group. Delhi: Department of Sanskrit. University of Delhi: http://sanskrit.du.ac.in. ,-----	



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER IV

BA SEMESTER- IV/III		
SANSKRIT		
PAPER CODE--S0A/SAN/UG/AEEC-1		
AEEC-1		
Basic Elements of Jyotisa		
M. Marks 70		
[A]	Prescribed Course:	
	Section 'A'	Origin, Development and Branches of Jyotisa
	Section 'B'	Jyotiscandrikāsaṃjñāprakaraṇam
	Section 'C'	Jyotiscandrikāsaṃjñāprakaraṇam
[B]	Course Objectives:	
	The objective of this course to introduce basic elements of the Jyotisa to the students. The course covers Origin, Development and Branches of Jyotisa and reading of the Jyotischandrikā.	
[C]	Unit-Wise Division:	
	Section 'A'	
	Origin, Development and Branches of Jyotisa	
	Unit I	Origin and Development of Jyotisa
	Unit II	General introduction to following branches of Astrology: Siddhānta, Samhitā, Horā, Tājika, Praśna, Vāstuśāstra and Muhūrtaśāstra.
	Section 'B'	
	Jyotiscandrikāsaṃjñāprakaraṇam	
	Unit I	Jyotiscandrikāsaṃjñāprakaraṇam, Verses: 1- 29)
	Unit II	Jyotiscandrikāsaṃjñāprakaraṇam, Verses: 30- 65)
	Section 'C'	
	Jyotiscandrikāsaṃjñāprakaraṇam	
	Unit I	Jyotiscandrikāsaṃjñāprakaraṇam, Verses: 66- 90)
	Unit II	Jyotiscandrikāsaṃjñāprakaraṇam, Verses: 91- 115)
D	Suggested Books/Readings	
	<ol style="list-style-type: none"> 1 शर्मा, रेवतीरक्षण, ज्योतिषचन्द्रिका:----- 2 वराहमिहिर, बृहत्संहिता, हिन्दीभाषानुवादक, आह्वानन्द झा वाराणसी चौखम्बा विद्याभवन ----- 3 वराहमिहिर, बृहत्संहिता, हिन्दीभाषानुवादक, एम० कृष्ण दिल्ली, मोतीलाल बनारसीदास,----- 4 दीक्षित, शंकरबालकृष्ण, भारतीय ज्योतिष हिन्दीभाषा अनुवादक शिवनाथ झारखण्डी, लखनऊ हिन्दी समिति उत्तरप्रदेश, 5 शास्त्री, नेमिचन्द्र, भारतीय ज्योतिष, वाराणसी भारतीय ज्ञानपीठ,----- 6 त्रिपाठी, देवीप्रसाद, ब्रह्माण्ड एवं सौरपरिवार, दिल्ली-----, -- 7 त्रिपाठी, देवीप्रसाद नुवनकोष, दिल्ली,-----, --- 	



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER IV

or		
BA SEMESTER- IV/III		
SANSKRIT		
PAPER CODE— S0A/SAN/UG/AEEC-2		
AEEC-2		
Indian Architecture System		
M. Marks 70		
[A]	Prescribed Course:	
	Section 'A'	Vāstusaukhyam of Todaramala
	Section 'B'	Vāstusaukhyam of Todaramala
	Section 'C'	Vāstusaukhyam of Todaramala
	Section 'D'	Vāstusaukhyam of Todaramala
[B]	Course Objectives:	
	Vāstu śāstra is an ancient science of architecture and construction. The aims of Vāstuvīdyā course to get the students to know about the principals of design, layout, measurement, ground preparation and space arrangement etc.	
[C]	Unit-Wise Division:	
	Section 'A'	
	Vāstusaukhyam of Todaramala	
	Unit I	Vāstusaukhyam of Todaramala- Chapter– 1 vastuprayojana, vastusvarūpa. (verses-4-13).
	Unit II	Vāstusaukhyam of Todaramala- Chapter– 2 Bhūmiparikṣṇam, dikṣādhanam, nivāsahetu sthananirvācanam. (varses-14- 22).
	Section 'B'	
	Vāstusaukhyam of Todaramala	
	Unit I	Vāstusaukhyam of Todaramala - Chapter – 3 <i>Grhaparyāvaranam: Tree plantation, śalyaśodhanam. (Verses31-49, 74-82).</i>
	Unit II	Vāstusaukhyam of Todaramala – Chapter- 4 sadvargapariśodhanam, vāstucakram, grhavāstu, śilānyāsam. (verses 83-102,107-112).
	Section 'C'	
	Vāstusaukhyam of Todaramala	
	Unit I	Vāstusaukhyam- Chapter– 6 Pañcavidhāni Ghāni (five types of house), śālāindapramānam (verses-171-194), Vīthikāpramāṇam (195-196).
	Unit II	Vāstusaukhyam- Chapter– 7 Dvārajñānam, Stambhapramāṇam, Pañca Chatuḥśālāni Gṛhāṇi-Sarvatobhadram, Nandyāvartam, Vardhamānam, Svastikam, Rūcakam (verses 203-217) ḍ
	Section 'D'	
	Vāstusaukhyam of Todaramala	
	Unit I	Vāstusaukhyam- Chapter- 8 Ekāsīti-padavāstucakram (287-302), Marmasthānāni (305-307).
	Unit II	Vāstusaukhyam- Chapter -9 Vāsadisā-nirūpanam, Dvārafalam, Dvārvedhafalam (322-335, 359-369).
D	Suggested Books/Readings	



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER IV

<ol style="list-style-type: none">1. चतुर्वेदी, वासुदेवी, भारतीय वास्तुशास्त्र, नई दिल्ली, श्री लाल बहादुरशास्त्री राष्ट्रीय संस्कृत विद्यापीठ ----2. ' शास्त्री, विनोद शर्मा, सीताराम, वास्तुशिरोमणि, दिल्ली मोतीलाल बनारसीदास,-----3. द्विवेदी, राममनोहर और त्रिपाठी, ब्रह्मानन्द, वृहद्वास्तुमीमांसा, वाराणसी चौखम्बा सुरभारती प्रकाशन, 2012.4. त्रिपाठी, देवीप्रसाद, वास्तुसार, दिल्ली, ईस्टर्न बुक लिंकर्स, 2015.5. जीवानन्द, वास्तुरत्नावली



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER IV

or			
BA SEMESTER- IV/III			
SANSKRIT			
PAPER CODE— S0A/SAN/UG/AEEC -3			
AEEC-3 Basic Elements of Āyurveda			M. Marks 70
[A]	Prescribed Course:		
	Section 'A'	Introduction to Āyurveda	20
	Section 'B'	Carakasamhitā – (Sūtrasthānam)	25
	Section 'C'	Taittirīyopanisad	25
[B]	Course Objectives:		
	<p>Āyurveda is a traditional Indian system of healthcare that has been traced back as early as 5,000 BCE. Through the classroom lectures and discussions, this course will introduce students to the theory of Āyurveda. The theory modules sessions that make up this course offer an introduction to Āyurveda that is well rounded, comprehensive and useful for students in their own day-to-day living. The major objective is to understand the basic principles and concepts of preventative medicine and health maintenance, diet and nutrition, usage of commonly used spices and herbs and outline of Āyurvedic therapeutic procedures in Āyurveda.</p>		
[C]	Unit-Wise Division:		
	Section 'A'		
	Introduction to Āyurveda		
	Unit I	Introduction to Āyurveda, History of Indian Medicine in the pre-Caraka period, The two schools of Āyurveda: Dhanvantari and Punarvasu.	
	Unit II	Main Ācāryas of Āyurveda – Caraka, Suśruta, Vāgbhatta, Mādhava, Sāraṅgadhara and Bhāvamiśra.	
	Section 'B'		
	Carakasamhitā – (Sūtrasthānam)		
	Unit I	Carakasamhitā – (Sūtrasthānam): Division of Time and condition of nature and body in six seasons. Regimen of Fall Winter (Hemanta), Winter (Śisīra) & Spring (Vasanta) seasons. Regimen of Summer (Grīma), Rainy (Varṣā) and Autumn (Śarada) seasons.	
	Section 'C'		
	Taittirīyopanisad		
	Unit I	Taittirīyopanisad—Bhrguvallī, anuvāka 1- 5	
	Unit II	Taittirīyopanisad—Bhrguvallī, anuvāka 6-10	
D	Suggested Books/Readings		
	<ol style="list-style-type: none"> 1. चरकसंहिता, सम्पादक ब्रह्मानन्द त्रिपाठी, वाराणसी चौखम्भा सुरभारती प्रकाशन, 2005. 2. तैत्तिरीयोपनिषद्भृगुवल्लो, गोरखपुर, गीताप्रेस संवत् 2059 3. विद्यालंकार, अत्रिदेव, आयुर्वेद का वृहद् इतिहास. ----- 4. ' शर्मा, प्रियव्रत, चरक चिन्तन. ----- 5. Narayanaswami, V. <i>Origin and Development of Āyurveda</i> Vol. 1, No. 1, July 1981, pages 1-7..... 		



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER IV

BA/BCom SEMESTER- III/IV			
SANSKRIT			
PAPER CODE- S0A/SAN/UG/MIL-2A			
CORE MIL-2A GRAMMAR AND TRANSLATION			M. Marks 70
[A]	Prescribed Course:		
	Section 'A'	Samjñā and Sandhi	25
	Section 'B'	Samāsa	15
	Section 'C'	Vibhaktyarthaprakarana	15
	Section 'D'	Translation	15
[B]	Course Objectives:		
	This course aims to get the students to know the basics of Sanskrit Grammar, including rules of Samjñā, Sandhi, Samāsa and Vibhaktyarthaprakaraṇa based on Laghusiddhāntakaumudī, a primer of Pāṇinian grammar. Besides, the students will be able to translate sentences in Sanskrit.		
[C]	Unit-Wise Division:		
	Section 'A'		
	Samjñā and Sandhi		
	Unit I	Laghusiddhāntakaumudī: Samjñāprakarana. <i>Acsandhi— yana, guna, dīrgha, ayādi, vṛddhi, pūrvarūpa.</i>	
	Unit II	Laghusiddhāntakaumudī: <i>Hal and Visarga Sandhis— ścutva, utva, anunāsikatva, chhatva, jaśtva, satva, utva, lopa, rutva.</i>	
	Section 'B'		
	Samāsa		
	Unit I	Basic concepts of Samāsa and types.	
	Section 'C'		
	Vibhaktyarthaprakarana		
	Unit I	Laghusiddhāntakaumudī: Vibhaktyarthaprakarana.	
	Section 'D'		
	Translation		
	Unit I	Translation in Sanskrit.	
D	Suggested Books/Readings		
	<ol style="list-style-type: none"> 1. वरदराज, लघुसिद्धान्तकौमुदी, प्राज्ञतोषिणी व्याख्याकार और सम्पादक श्रीधरानन्दशास्त्री धिल्लियाल, दिल्ली, मोतीलाल बनारसी दास, 1977 2. वरदराज, लघुसिद्धान्तकौमुदी, भा: 1, व्याख्याकार भीमसेनशास्त्री, दिल्ली भैमीप्रकाशन 3' शास्त्री, चारुदेव, व्याकरण चन्द्रोदय (भाग-1, 2, 3), दिल्ली मोतीलाल बनारसीदास, 1977 4 वरदराज लघुसिद्धान्तकौमुदी-1, व्याख्याकार काशीराम दिल्ली, मोतीलाल बनारसीदास, 2009. 3. Apte, V.S. <i>The Students' Guide to Sanskrit Composition</i>. Varanasi: Chowkhamba Sanskrit Series, ----- 		



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
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SEMESTER IV

6.	Kale, M.R. <i>Higher Sanskrit Grammar</i> . Delhi: Motilal Banarasi Dass, -----
7.	<i>Online Tools for Sanskrit Grammar</i> . Computational Linguistics Group. Delhi: Department of Sanskrit. University of Delhi: http://sanskrit.du.ac.in ,-----



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SEMESTER IV

or			
BA/ BCom SEMESTER- III/IV			
SANSKRIT			
PAPER CODE— S0A/SAN/UG/MIL-2B			
CORE MIL-2B			M. Marks 70
GRAMMAR AND COMPOSITION			
[A]	Prescribed Course:		
	Section 'A'	Sandhi	25
	Section 'B'	Samāsa	15
	Section 'C'	Kṛtpratyaya	15
	Section 'D'	Composition	15
[B]	Course Objectives:		
	This course aims to get the students to know the basics of Sanskrit Grammar, including rules of Sandhi, Samāsa and Kṛt pratyaya based on Laghusiddhāntakaumudī, a primer of Pāṇinian grammar. Besides, the students will also learn the techniques of writing of paragraph and composition in Sanskrit.		
[C]	Unit-Wise Division:		
	Section 'A'		
	Sandhi		
	Unit I	Acsandhi (6): <i>yan, guṇa, dīrgha, ayādi, vṛddhi and pūrvarūpa.</i>	
	Unit II	Halsandhi (5): <i>ścutva, utva, anunāsikatva, chhatva and jaśtva</i>	
	Unit III	Visargasandhi (4): <i>utva, lopa, satva, rutva.</i>	
	Section 'B'		
	Samāsa		
	Unit I	Samāsa (4): <i>avyayībhāva, tatpuruṣa, bahuvrīhi and dvandva</i>	
	Section 'C'		
	Kṛtpratyaya		
	Unit I	Kṛtpratyaya (15): <i>tavyat, tavya, anīyar, yat, ṛyat, ṛvul, ṛc, aṇ, kṛta, ktavatu, śatri, śānac, tumun, ktvā (lyap) and lyuṭ.</i>	
	Section 'D'		
	Composition		
	Writing of paragraph and composition in Sanskrit.		
D	Suggested Books/Readings		
	<ol style="list-style-type: none"> 1. वरदराज, लघुसिद्धान्तकौमुदी, प्राज्ञतोषिणी व्याख्याकार और सम्पादक श्रीधरानन्दशास्त्री घिल्डियाल, दिल्ली, मोतीलाल बनारसी दास, 1977 2. वरदराज, लघुसिद्धान्तकौमुदी, भाग:- 1, व्याख्याकार भीमसेनशास्त्री, दिल्ली भैमीप्रकाशन 3. ' शास्त्री, चारुदेव, व्याकरण चन्द्रोदय (भाग-1, 2, 3), दिल्ली मोतीलाल बनारसीदास, 1977 4. वरदराज, लघुसिद्धान्तकौमुदी-1, व्याख्याकार काशीराम दिल्ली, मोतीलाल बनारसीदास, 2009 5. Apte, V.S. <i>The Students' Guide to Sanskrit Composition.</i> Varanasi: Chowkhamba Sanskrit Series, ----- 		



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UNDER CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER IV

	<p>6 Kale, M.R. <i>Higher Sanskrit Grammar</i>. Delhi: Motilal Banarasi Dass, -----</p> <p>7 <i>Online Tools for Sanskrit Grammar</i>. Computational Linguistics Group. Delhi: Department of Sanskrit. University of Delhi: http://sanskrit.du.ac.in,-----</p>
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BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
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SEMESTER IV

or			
BA/Bom SEMESTER- IV/III			
SANSKRIT			
PAPER CODE— S0A/SAN/UG/MIL-2C			
CORE MIL-2C			M. Marks 70
SANSKRIT GRAMMAR			
[A]	Prescribed Course:		
	Section 'A'	Declensions and Conjugations	20
	Section 'B'	Sandhis, Compounds, Kāraka and Vibhakti Rules	20
	Section 'C'	Kṛt Suffixes	15
	Section 'D'	Composition	15
[B]	Course Objectives:		
	To introduce basic Sanskrit to students who have not studied Sanskrit at all or have studied it only up to class VIII or less and wish to revive their knowledge of the language. This will also enable them to compose short sentences and paragraphs on the basis of their knowledge of grammar.		
[C]	Unit-Wise Division:		
	Section 'A'		
	Declensions and Conjugations		
	Unit I	Masculine Words. Stems endings in vowels (4) : Noun Ending 'a', 'i', 'u', and 'r' only, <i>rāma, muni, guru, pitr</i> Stems ending in consonants: <i>ātman, dandin, candramas</i>	
	Unit II	Feminine Words. Stems endings in vowels (4): Noun Ending 'ā', 'ī', 'ī', and 'r' only, <i>ramā, mati, kumārī, and mātr</i> Stems ending in consonants: <i>vāc and sarit.</i>	
	Unit III	Neuter Words. Stem ending in vowels (4): Noun Ending 'a', 'i', and 'u' only, <i>Phala, vāri and madhu</i> Stem ending in consonants: <i>payas, jagat.</i> Pronouns <i>asmad, yusmad, tad, yad, idam, etad, kim</i> (in all three genders) Numerals Declension of numeral words from <i>eka</i> to <i>daśan</i> (In all three genders)	
	Unit IV	Conjugations : <i>path, pac, bhū, kr, as, nrt., śru, jñā, (in lat, lrt,lan, lot and vidhilin)</i>	
	Section 'B'		
	Sandhis, Compounds, Kāraka and Vibhakti Rules		
	Unit I	Rules of Sandhi: <i>Acsandhi (6): yana, guna, dīrgha, ayādi, vrddhi and pūrvarūpa.</i> <i>Halsandhi (5): ścutva, utva, anunāsikatva, chhatva and jaśtva.</i> <i>Visarga sandhi (4): utva, lopa, satva, rutva.</i>	
	Unit II	Compounds: The concept of Compound and its types	
	Unit III	Kāraka and Vibhakti Rules: Concept of <i>kāraka and vibhakti</i> , Types of <i>kāraka, kārakavibhakti and upapadavibhakti</i>	
	Section 'C'		
	Kṛt Suffixes		
	Unit I	Kṛt suffixes : <i>tavyat, anīyar, yat, nyat, kta, ktavatu, śatr, śānac, tumun, ktvā and lyap</i>	



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER IV

		Section 'D'	
		Composition	
		Short sentences, paragraph writing	
D	Suggested Books/Readings		
	<ol style="list-style-type: none">1. द्विवेदी, कपिलदेव, प्रौढरचनानुवादकौमुदी, भैरवनाथ विश्वविद्यालय प्रकाशन, 2011.2. नौटियाल, चक्रधर हंस, वृहदअनुवादचिन्द्रिका, दिल्ली मोतीलाल बनारसीदास, बंगलो मार्ग, जवाहरनगर 2013.3. Apte, V.S. <i>The Students' Guide to Sanskrit Composition</i>. (Hindi Translation also available) Varanasi: Chowkhamba Sanskrit Series,4. Kale, M.R. <i>Higher Sanskrit Grammar</i>. (Hindi Translation also available) Delhi: Motilal Banarasidass,--5. संभाषणसंदेशः, बंगलूरु, संस्कृतभारती, Sambhashana sandesha, Sanskrit Bharati, Bangalore.6. <i>Online Tools for Sanskrit Grammar</i>. Computational Linguistics Group. Delhi: Department of Sanskrit University of Delhi: http://sanskrit.du.ac.in.		



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER V

BA SEMESTER- V/VI		
SANSKRIT		
PAPER CODE— S0A/SAN/UG/AEEC-4		
AEEC-4 Computer Awareness for Sanskrit		M. Marks 70
[A]	Prescribed Course:	
	Section 'A'	Basic Computer Awareness
	Section 'B'	Typing in Unicode for Preservation and Digitalization of Sanskrit Text
	Section 'C'	Web Publishing
[B]	Course Objectives:	
	This course has been designed for those students who need to have some basic grounding in computer applications. The course will begin with introducing computer fundamentals and then will go on to provide a hands-on experience of popular software applications and tools to students.	
[C]	Unit-Wise Division:	
	Section 'A'	
	Basic Computer Awareness	
	Unit I	Design, Architecture: Operating System
	Unit II	MS Office Tools (Word, Power points, Excel etc.)
	Unit III	Using Internet, Web Search (Searching E-text/ e-book for Sanskrit in Roman and Devanagari Scripts), Email etc.
	Section 'B'	
	Typing in Unicode for Preservation and Digitalization of Sanskrit Text	
	Unit I	Character encoding, Unicode, ASCII, UTF-8, U
	Unit II	Typing in Unicode through various Softwares
	Unit III	Sanskrit Text Digitalization/ Preservation/ Storage
	Section 'C'	
	Web Publishing	
	Unit I	Basics HTML, Java Scripts and CSS
	Unit II	Basics of Databases
D	Suggested Books/Readings	
	<ol style="list-style-type: none"> 1. Tom Henderson (April 17, 2014). "<i>Ancient Computer Character Code Tables – and Why They're Still Relevant</i>". Smart bear. Retrieved 29 April 2014. 2. <i>Unicode Technical Report #17: Unicode Character Encoding Model</i>". 2008-11-11. Retrieved 2009-08-08. At: http://www.unicode.org/reports/tr17/ 3. Constable, Peter (2001-06-13). "<i>Character set encoding basics</i>". <i>Implementing Writing Systems: An introduction</i>. SIL International. Retrieved 2010-03-19. 	



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER V

4. <i>Devanāgarī Unicode Chart</i> . http://unicode.org/charts/PDF/U0900.pdf
5. <i>The Unicode Consortium</i> . http://unicode.org/
6. <i>W3Schools Online Web Tutorials</i> . http://www.w3schools.com/
7. <i>Microsoft Office 2013 Online Tutorials</i> . https://www.microsoft.com/enable/training/office2013/



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
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SEMESTER V

or		
BA SEMESTER- V/VI		
SANSKRIT		
PAPER CODE— S0A/SAN/UG/AEEC-5		
AEEC-5		
E-learning Tools and Techniques for Sanskrit		
M. Marks 70		
[A]	Prescribed Course:	
	Section 'A'	Interactive Sanskrit Teaching Learning Tools.
	Section 'B'	Standard for Indian Languages (Unicode)
	Section 'C'	E-Content Creation for Sanskrit Text.
[B]	Course Objectives:	
	This course has been designed for those students who need to have some basic grounding in e-learning/online learning. The course will begin with introducing basics of online learning and then will go on to provide a hands-on experience of popular software applications and tools to students.	
[C]	Unit-Wise Division:	
	Section 'A'	
	Interactive Sanskrit Teaching Learning Tools	
	Unit I	E-learning, E-learning a brief introduction, Is e-learning better, Pitfall of e-learning, E-learning Architecture, Learning in E-learning.
	Unit II	Brief Introduction of Interactive Tools for Sanskrit, Basics of Multimedia, Web based tools development, HTML, Web page etc., Tools and Techniques.
	Unit III	Survey of E-learning tools and Techniques.
	Section 'B'	
	Standard for Indian Languages (Unicode) and E-learning tools	
	Unit I	Unicode Typing in Devanagari Scripts, Typing Tools and Software.
	Unit II	Introduction of Various Available E-learning Tools.
	Section 'C'	
	E-Content Creation for Sanskrit Text	
	Unit I	Digitalization of Contents, Text Processing Preservation, Techniques.
	Unit II	Introduction to database, Create, Select, Insert, Delete, Update, Handling Unicode data.
D	Suggested Books/Readings	
	<ol style="list-style-type: none"> 1. Linguistics Group. <i>Computational Tools</i>. Department of Sanskrit. University of Delhi. Delhi: http://sanskrit.du.ac.in 2. <i>Basic concept and issues of multimedia</i>. http://www.newagepublishers.com/samplechapter/001697.pdf 3. <i>Content creation and E-learning in Indian languages: a model</i>: http://eprints.rclis.org/7189/1/ 	



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SEMESTER V

<p>vijayakumarjk_01.pdf</p> <ol style="list-style-type: none">4. <i>HTML Tutorial - W3Schools</i>. www.w3schools.com/html5. <i>The Unicode Consortium</i>. http://unicode.org/6. Gupta, S. B. & Mittal, A. <i>Introduction to Database Management System</i>. Laxmi Publications, 2010.7. <i>Database Tutorial</i>. W3Schools: www.w3schools.com/sql8. Lai, Kwok-Wing. <i>E-Learning</i>. Otago: Teaching and Professional Development with the Internet, Otago University Press, 2001.9. Albert, Traver. <i>E-Learning: Methods, Modules and Infrastructure</i>. Clanrye International, 2015.10. Singh, P. P. & Sharma, Sandhir. <i>E-Learning: New Trends and Innovations</i>.----- Deep & Deep Publications Pvt. Ltd, 2005.11. Steinmetz, <i>Multimedia Fundamentals. Volume 1: Media Coding and Content Processing</i>. Pearson Education, 2004.
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SEMESTER V

or		
BA SEMESTER- V/VI		
SANSKRIT		
PAPER CODE— S0A/SAN/UG/AEEC- 6		
AEEC-6		
Yogasūtra of Patañjali		
M. Marks 70		
[A]	Prescribed Course:	
	Section 'A'	Yogasūtra of Patañjali: Samādhipāda
	Section 'B'	Yogasūtra of Patañjali: Sādhanapāda
	Section 'C'	Yogasūtra of Patañjali: Vibhūtipāda
[B]	Course Objectives:	
	This Yoga Darśana course aims to get the students to know about the world's most important texts and the vision of our ancient Yoga's tradition. For this, selected Sutras of Patañjali's Yogasūtra has been prescribed.	
[C]	Unit-Wise Division:	
	Section 'A'	
	Yogasūtra of Patañjali: Samādhipāda	
	Unit I	Yogasūtra of Patañjali: Samādhipāda (Sutras: 1-15)
	Unit II	Yogasūtra of Patañjali: Samādhipāda (Sutra: 16-29)
	Section 'B'	
	Yogasūtra of Patañjali: Sādhanapāda	
	I	Yogasūtra of Patañjali: Sādhanapāda (Sutra: 29-45)
	II	Yogasūtra of Patañjali: Sādhanapāda (Sutras: 46-55)
	Section 'C'	
	Yogasūtra of Patañjali: Vibhūtipāda	
	I	Yogasūtra of Patañjali: Vibhūtipāda Sutras: 1-3)
D	Suggested Books/Readings	
	<ol style="list-style-type: none"> 1. पातञ्जल योगदर्शन, गोरखपुर, गीताप्रेस,----- 2. योगप्रदीप, गोरखपुर, गीताप्रेस,-----' 3. पातञ्जलयोगदर्शनम्, व्याख्याकार श्रीमत् स्वामी हरिहरानन्द आरण्य, सम्पादक डॉ० रामशंकर भट्टाचार्य, दिल्ली मोतीलाल बनारसीदास, 2003. 	



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SEMESTER V

or			
BA SEMESTER- V/VI			
SANSKRIT			
PAPER CODE— S0A/SAN/UG/AEEC-7			
AEEC-7			
Indian Theatre			
			M. Marks 70
[A]	Prescribed Course:		
	Section 'A'	Tradition and History of Indian Theatre	15
	Section 'B'	Theatre: Types and Constructions	15
	Section 'C'	Acting: <i>Āngika, Vācika, Āhārya and Sāttvika</i>	15
	Section 'D'	Drama: Subject-Plot (<i>vastu</i>), Hero (<i>netā</i>) and Sentiment (<i>rasa</i>)	25
[B]	Course Objectives:		
	Objective of this course is to introduce Principles and practices of Indian Theatre to students.		
[C]	Unit-Wise Division:		
	Section 'A'		
	Tradition and History of Indian Theatre		
	Unit I	Origin and development of stage in different ages: pre-historic, Vedic age.	
	Unit II	Epic-purānic age, court theatre, temple theatre, open theatre, modern theatre, folk theatre, commercial theatre, national and state level theatre.	
	Section 'B'		
	Theatre: Types and Constructions		
	Unit I	Theatre: Types and Constructions	
	Section 'C'		
	<i>Acting: Āngika, Vācika, Āhārya and Sāttvika</i>		
	Unit I	<i>Acting: Āngika, Vācika</i>	
	Unit II	<i>Āhārya and Sāttvika</i>	
	Section 'D'		
	Drama: Subject-Plot (<i>vastu</i>), Hero (<i>netā</i>) and Sentiment (<i>rasa</i>)		
	Unit I	<i>Vastu</i> (Subject-Matter)	
	Unit II	<i>Netā</i> (Hero)	
	Unit II	<i>Rasa</i> (Sentiment)	
D	Suggested Books/Readings		
	<ol style="list-style-type: none"> 1. त्रिपाठी राधाबल्लभ, संक्षिप्त नाटयशास्त्र हिन्दी भाषानुवाद सहित, दिल्ली, वाणी प्रकाशन 2008. 2. त्रिपाठी राधाबल्लभ, भारतीय नाटयः स्वरूप एवं परम्परा, सागर मध्यप्रदेश संस्कृत परिषद्, 1988. 3. द्विवेदी, हजारीप्रसाद, नाटयशास्त्र की भारतीय परम्परा एवं दशरूपक, दिल्ली, राजकमल प्रकाशन, 1963 4. झा, सीताराम, नाटक और रंगमंच, पटना बिहार राष्ट्रभाषा परिषद् 1982. 		



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER V

5. भरतमुनि नाटयशास्त्रम् (1-4 भाग), सम्पादक बाबूराम शुक्ल शास्त्री, वाराणसी चौखम्बा संस्कृत संस्थान, 1984.
6. त्रिपाठी, राधाबल्लभ, नाटयशास्त्र विश्वकोश (1-4 भाग) दिल्ली प्रतिभा प्रकाशन, 1999.
7. त्रिपाठी, राधाबल्लभ, भारतीय नाटयशास्त्र की परम्परा और विश्व रंगमंच दिल्ली, प्रतिभा प्रकाशन --.
8. भरतमुनि नाटयशास्त्रम्, सम्पादक ब्रजमोहन चतुर्वेदी दिल्ली विद्यानिधि प्रकाशन, 2003.
9. मुसलगांवकर, केशवराज, संस्कृत नाटयमीमांसा, दिल्ली परिमल प्रकाशन,-----
10. शर्मा, शिवशरण, आचार्य भरत भोपाल, मध्यप्रदेश हिन्दी अकादमी,-----
11. शुक्ल, रामलखन, संस्कृत नाटयकला दिल्ली, मोतीलाल बनारसीदास, 1970.
12. राय, गोविन्दचन्द्र, नाटयशास्त्र में रंग" शालाओं के रूप, काशी, 1958.
13. मेहता, भानुशंकर, भरत-नाटयशास्त्र तथा आधुनिक प्रासंगिकता, वाराणसी-----
14. गौरोला, वाचस्पति, भारतीय नाटय परम्परा एवं अभिनवदर्पण, इलाहाबाद.. 1967.
15. लाल, लक्ष्मीनारायण, रंगमंच और नाटक की भूमिका, दिल्ली -, 1965.
16. गर्ग, लक्ष्मीनारायण, भारत के लोकनाटय, हाथरस संगीत कार्यालय, 1961.
17. चतुर्वेदी, सीताराम, भारतीय एवं पाश्चात्य रंगमंच, लखनऊ हिन्दी समिति, 1964.
18. माथुर, जगदीशचन्द्र, परम्पराशील नाटय पटना बिहार राष्ट्रभाषा परिषद् 1961.
19. Gupta, C B. *Indian Theatre*. Vārānasi: 1954.
20. Yājñānik, R K. *Indian Theatre*. London: 1933.
21. Mehta, Tarala. *Sanskrit Play Production in Ancient India*. Delhi: Motilal Banarasi Dass, 1999.
22. Nicoll, Allardyce. *The Theatre and Dramatic Theory*. London: ----- 1962.



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SEMESTER V

BA SEMESTER- V			
SANSKRIT			
PAPER CODE— S0A/SAN/UG/DSE-1			
DSE-1			M. Marks 70
Philosophy, Religion and Culture in Sanskrit Tradition			
[A]	Prescribed Course:		
	Section 'A'	Dharma	30
	Section 'B'	Sanskāra and Puruṣārtha	20
	Section 'C'	Svadharmā	20
[B]	Course Objectives:		
	Objective of this course to introduce Philosophy, Religion and Culture in Sanskrit Tradition to the students.		
[C]	Unit-Wise Division:		
	Section 'A'		
	Dharma		
	Unit I	Form of God, Mode of worship, Bhakta as a morally evolved person- Gita Chapter XII	
	Unit II	<i>Dharma</i> – tenfold dharma and its versions, definitions of satya, ahimsā, asteya, aparigraha, pañcamahāyājñā; theory of three debts.	
	Unit III	Man's initiative and God's design; God's līlā and Kṛpā, Daiva versus puruṣakāra, adṛṣṭa, three types of karma– sañcita, kriyamāṇa and prārabdha, karma.	
	Section 'B'		
	Sanskāra and Puruṣārtha		
	Unit I	Process of acculturation – importance of Sanskāra.	
	Unit II	Aim of human life – theory of Puruṣārtha.	
	Section 'C'		
	Svadharmā		
	Unit I	An 'amoral' person – svadharmā and karmayoga, sthitaprajñā in the Gita (Chapter II).	
	Unit II	Prakṛti – three guṇas and their impact on personality.	
D	Suggested Books/Readings		
	<ol style="list-style-type: none"> 1. श्रीवेदव्यास, श्रीमद्भगवद्गोता सम्पादक हनुमान प्रसाद पोदार गोरखपुर गीताप्रेस,----- 2. Vedavyāsa. <i>Śrimadbhagavadgītā</i>. Comentator Radhakrishnan.----- 3. पाण्डेय, राजबली, हिन्दू संस्कार.----- 4. ज्ञानी, शिवदत्त, भारतीय संस्कृति----- 5. गोयल, डॉ० प्रीतिप्रभा, भारतीय संस्कृति, जोधपुर, राजस्थानी ग्रन्थागार सोजती गेट, 2004. 6. शास्त्री, डॉ० नरेन्द्रदेव, भारतीय संस्कृति का इतिहास, मेरठ साहित्य भण्डार, सुभाष बाजार, 1969. 7. काणे, पाण्डुरङ्गवामन, हिस्ट्री ऑफ धर्म" शास्त्र हिन्दीअनुवाद-धर्मशास्त्र का इतिहास, हिन्दीभाषानुवादक अर्जुन चौबे प्रतापगढ़ 		



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UNDER CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER V

or		
BA SEMESTER- V		
SANSKRIT		
PAPER CODE— S0A/SAN/UG/DSE-2		
DSE–2		
Indian Perspectives in Personality Development		
M. Marks 70		
[A]	Prescribed Course:	
	Section 'A'	Historical Perspective
	Section 'B'	Concept of a person
	Section 'C'	Personality Types
	Section 'D'	Measures for behavioral Improvement
[B]	Course Objectives:	
	Indian philosophical tradition advocates an integrated approach to human personality where material and psychological growth complement each other. This course seeks to introduce some theoretical concepts and practical techniques for development of the human person.	
[C]	Unit-Wise Division:	
	Section 'A'	
	Historical Perspective	
	Unit I	Historical Perspective: Rgveda, 1.164.37; Chāndogyopanisad, VI. 2.3, VI.8.6, VIII.1.4 Brhadāraṇyakopaniṣad, II.5.18-19
	Section 'B'	
	Concept of a person	
	Unit I	Concept of a person, Gītā, Chapter: 1, Verses:1-30 Jīva as Core and Eight-fold Nature as Cover Ksetrajña as Core and Ksetra as Cover Chapter-13, Verses-1-2, Chapter-13, Verses: 5-6, Chapter-13, Vrses-19-23. Aksara as Core and Kṣara as Cover, Chapter-15, Verses: 7-11 and 6-19).
	Section 'C'	
	Personality Types	
	Unit I	Personality Types Gītā, Chapter-14, Verses:5-14, Chapter-17, Verses: 2-6, Chapter-17, Verses:11.21
	Section 'D'	
	Measures for behavioral Improvement	
	Unit I	Measures for behavioral Improvement Control of Senses and Mind (Gītā: Chapter-2, Verses: 59-60, 64 and 68, Chapter:3, Verses:41-43, Chapter: 6, Verses:19-23. Right Faith (Gītā, Chapter: 9, Verses:3, 22, 23-28, 30-34) Recognition of Svadharma - Inner Urge; (Gītā, Chapter: 2, Verses:31,41-44, Chapter:3, Verses:4, 5, 8, 9, 27-30, 33-34, Chapter:4, Verses:18-22, Chapter:5, Verses:11-12, Chapter:7, Verses:15, 18, 20- 23, 27-29) Channelizing Innate Urges on Social Lines: (Gītā, Chapter:18, Verses:41-62)
D	Suggested Books/Readings	
	1. Radhakrishana. <i>The Bhagvadgītā</i> . ---- 2. <i>Gītā</i> with Hindi Translation. Gorakhpur: Gita Press, - -	



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UNDER CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER V

BA SEMESTER- V			
SANSKRIT			
PAPER CODE— S0A/SAN/UG/GE-2			
GE-2 Sanskrit Media			M. Marks 70
[A]	Prescribed Course:		
	Section 'A'	Television and Radio	
	Section 'B'	Magazines and Newspapers	
	Section 'C'	Internet, Social Networks, Blogs, Important sites, Sanskrit Wikipedia general awareness only)	
[B]	Course Objectives:		
	This course aims to familiarize the students with the journey of Sanskrit literature in the modern Information Technology world. Students will get the brief information regarding Sanskrit Media.		
[C]	Unit-Wise Division:		
	Section 'A'		
	Television and Radio		
	Unit I	News Translation, Editing, Anchoring.	
	Unit II	Graphics, Voice-over, Para Dubbing, Band, Packaging.	
	Section 'B'		
	Magazines and Newspapers		
	Unit I	Journey of Sanskrit Magazines, Various Sanskrit Magazines, Types of Sanskrit Magazines.	
	Unit II	Article Collection, Editing, Reporting, Packaging	
	Section 'C'		
	Internet, Social Networks, Blogs, Important sites, Sanskrit Wikipedia general awareness only)		
	Unit I	Internet, blogs, important sites, Sanskrit Wikipedia (general awareness only).	
D	Suggested Books/Readings		
	XXXXXXXXXXXXX-----		
	XXXXXXXXXXXXX-----		



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SEMESTER V

or		BA SEMESTER- V	
		SANSKRIT	
		PAPER CODE— S0A/SAN/UG/GE-3	
		GE-3	
		Sanskrit Meter and Music	
		M. Marks 70	
[A]	Prescribed Course:		
	Section 'A'	Brief Introduction to Chandaśāstra	
	Section 'B'	Classification and Elements of Sanskrit Meter	
	Section 'C'	Analysis of Selected Vedic Meter and their Musical Rendering (गान-पद्धति)	
	Section 'D'	Analysis of Selected Classical Meter and their Musical Rendering (गान पद्धति)	
[B]	Course Objectives:		
	The objectives of this course to learn Sanskrit meter for analysis and lyrical techniques. Students will get the complete information regarding selected Vedic and Classical meters with lyrical techniques.		
[C]	Unit-Wise Division:		
	Section 'A'		
	Brief Introduction to Chandaśāstra		
	Unit I	Brief Introduction to Chandaśāstra.	
	Section 'B'		
	Classification and Elements of Sanskrit Meter		
	Unit I	Syllabic verse (aksaravṛtta): Syllabo-quantitative verse (varṇavṛtta) Quantitative verse (mātrāvṛtta).	
	Unit II	Syllables: laghu and guru, Gana, Feet.	
	Section 'C'		
	Analysis of Selected Vedic Meter and their Musical Rendering (YTN-PS ^V)		
	Unit I	Definition, Example, Analysis and Lyrical Methods of following Meters: <i>gāyatrī</i> , <i>uṣṇik</i> , <i>anuṣṭup</i> , <i>bṛhatī</i> , <i>pañkti</i> , <i>triṣṭup</i> and <i>jagatī</i> .	
	Section 'D'		
	Analysis of Selected Classical Meter and their Musical Rendering (YTN-PS ^V)		
	Unit I	Definition, Example, Analysis and Lyrical Methods of following Meters: <i>bhujangaprayāta</i> , <i>sragviṇī</i> , <i>toṭaka</i> , <i>hariṅtikā</i> , <i>vidyunmālā</i> , <i>anuṣṭup</i> , <i>āryā</i> , <i>mālinī</i> , <i>śikhariṇī</i> , <i>vasantatilakā</i> , <i>mandākrāntā</i> , <i>sragdharā</i> and <i>sārdūlvikrīḍita</i>	
D	Suggested Books/Readings		
	<ol style="list-style-type: none"> 1. Brown, Charles Philip (1869). <i>Sanskrit Prosody and Numerical Symbols Explained</i>. London: Trübner & Co. 2. Deo, Ashwini. <i>The Metrical Organization of Classical Sanskrit Verse</i>. (PDF). Journal of Linguistics 43 (01): 63–114. doi: 10.1017/s0022226706004452, 2007. 3. Nagaraja Rao, H. V. (ORI, Mysore). Ashwinideo, Sharma, Ram Karan. Kolhatkar, Arvind. <i>Recordings of recitation</i>.-----: ----,--- 4. Computational Linguistics Group. <i>Online Tools for Sanskrit Meter</i>. Delhi: Department of Sanskrit, University of http://sanskrit.du.ac.in 5. केदारभट्ट, वृत्तरत्नाकरः सम्पादक धरानन्दशास्त्री, दिल्ली, मोतीलाल बनारसीदास, 2004. 		



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UNDER CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER V

or			
BA SEMESTER- V			
SANSKRIT			
PAPER CODE— S0A/SAN/UG/GE-4			
GE-4			M. Marks 70
Nationalistic Thought in Sanskrit Literature			
[A]	Prescribed Course:		
	Section 'A'	Definitions, Concepts of Nation and Indian Nationalism	20
	Section 'B'	Nationalistic Thought in Vedic and Classical Literature	25
	Section 'C'	Nationalistic Thought in Modern Sanskrit Poetry	25
[B]	Course Objectives:		
	Basic Fundamental concepts of Indian Nationalism have been developed and highlighted under the Sanskrit term 'Rāṣṭra' in Ancient times. The aim of this course is to make the students acquainted with the concepts and historical development of Indian Nationalism with special reference to Sanskrit literature of past and present. The course also focuses the nationalistic thought of modern Sanskrit poetry with special reference to Mahatma Gandhi on the basis of modern Sanskrit works.		
[C]	Unit-Wise Division:		
	Section 'A'		
		Definitions, Concepts of Nation and Indian Nationalism	
	Unit I	Definitions of Nation 'Rāṣṭra' in Indian Perspective Meaning and Definitions of Nation and Nationality in Modern Context, Etymology and Meaning of 'Rāṣṭra' according to Sanskrit lexicographers, Concept of Nation with special reference to term 'Rāṣṭra' in Sanskrit Literature, Political Concept of 'Rāṣṭra' and 'Saptāṅga' Theory of State: Kautilya's Arthaśāstra 6.1, Mahābhārata, Śāntiparva 56.5, Śukranīti 1.61-62	
	Unit II	Factors of Nationalism, Country Name and National Symbols: Essential Factors of Nationality: National Integration, Patriotism, Freedom, Religious Tolerance, National Pride, National Consciousness, Citizenship. Characteristics of Indian Nationalism: Social Harmony, Equality of the Religions, International Brotherhood, Unity in Diversity, and Cultural Consciousness; Different Views Regarding Name of the Country 'Bhāratavarsa' in Purāṇa; National Symbols of India: National Anthem-'Jana Gana Mana', National Song 'Vande Mātaram' National Flag of India, National Emblem 'Ashok Chakra'.	
	Section 'B'		
	Nationalistic Thought in Vedic and Classical Literature		
	Unit I	Origin and Development of 'Rāṣṭra' in Vedic Literature: Nationalistic Identity of the Vedic People with 'Bharatas' and 'Bharatajana' in Rgveda (3.53.123; 3.53.24; 7.33.6); Concept of 'Rāṣṭra' in 'Bhūmīśūkta' Atharvaveda (12.1,1-12; Elements of 'Rāṣṭra' in Śuklayajurveda (22.22); Nationalistic Significance of 'Rāṣṭrabrdhoma' (Coronation Ceremony) in Śatapathabrāhmana (9.4.1.1-5)	
	Unit II	Nationalistic Identity of 'Rāṣṭra' in Classical Literature: Geographical and Sociological Identity of 'Bhāratavara' in Vi upuana (2.3), Geographical Unity of 'Rāṣṭra' in Vālmiki Rāmāyana (Kiskindhākāṇḍa, chapters- 46, 47, 48); Cultural Unity in Kālidasa's	



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SEMESTER V

		Raghuvamśa (fourth canto), Demographical Unification of 'Rāstra' in Mahābhārata (Śāntiparva, 65.13-22).	
		Section 'C'	
		Nationalistic Thought in Modern Sanskrit Poetry	
	Unit I	Nationalistic Trends of Modern Sanskrit Poetry before Independence: Survey of nationalistic trends in modern Sanskrit poetry before Independence with special reference to 'Bhāratavijayanātakam' of Mathura Prasad Dikshita, 'Satyāgrahagītā' of Pandita Ksamārāva, 'Gāndhīcaritam' of Charudeva Shastri, and 'Śivarājavijayh' of Ambikādatta Vyāsa.	
	Unit II	Nationalistic Trends of Modern Sanskrit Poetry After Independence: Survey of nationalistic trends in modern Sanskrit poetry after independence with special reference to Dr.Satyavrat Shstri, Dr Harinarayan Dikshit, Dr. Radha Vallabh Tripathi, Dr. Abhiraja Rajendra Mishra and Dr. Hari Datt Sharma.	
D	Suggested Books/Readings		
	<ol style="list-style-type: none"> 1. Kautilya. <i>Arthashastra of Kautilya</i>. Ed. R.P Kangale. Delhi: Motilal Banarasidas, 1965. 2. <i>Atharvaveda Samhita</i>. Trans. R.T.H. Griffith. 1896-97, rept. (2 Vols) 1968. 3. <i>Mahabharata (7 Vols)</i>. H.P. Shastri, London, 1952-59. 4. <i>Ramayana of Valmiki (3 Vols)</i>. Trans. H.P. Shastri. Ramayana of Valmiki (3 Vols), London, 1952-59. 5. <i>Śatapatha Brahmana (3 Vols)</i>. Ed. Jeet Ram Bhatt. Delhi: EBL, 2009. 6. <i>R gveda samhita (6 Vols)</i>. Trans. H.H. Wilson. Bangalore. Bangalore Printing & Publishing Co., 1946. 7. Chakrabarty, B. and Pandey, R. <i>Modern Indian Political Thought</i>. New Delhi: Sage Publications, 2010. 8. Chatterjee, P. <i>The Nation and its Fragments: Colonial and Postcolonial Histories</i>. Oxford University Press, New Delhi, 1993. 9. <i>The Collected Works of Mahatma Gandhi</i>, Ahmedabad: Navajivan, 1958. 10. Jha, M.N. <i>Modern Indian Political Thought</i>. Meerut: Meenakshi Parkashan, 11. Pradhan, R. <i>Raj to Swaraj</i>. New Delhi: Macmillan, 2008. 12. Shukla, Hiralal. <i>Modern Sanskrit Literature</i>. Delhi, 2002. 13. कौटिलीय अर्थशास्त्रम्, हिन्दी अनुवादक उदयवीर शास्त्री, दिल्ली मेहरचन्द लक्ष्मनदास, 1968. 14. महाभारत (1-6 भाग), हिन्दी अनुवादक रामनारायण दत्त शास्त्री पाण्डेय, गोरखपुर, गीताप्रेस 15. शतपथब्राह्मण (1-5) माध्यन्दिन शास्त्रीय भाष्यकार सायण और हरिस्वामी, दिल्ली 16. "श्रीमद्वाल्मीकियरामायणम् (1-2) हिन्दी अनुवाद सहित, सम्पादक जानकीनाथ भार्मा, गोरखपुर ---- 17 शुक्नीति हिन्दी अनुवादक और सम्पादक ब्रह्मशंकर मिश्र.वाराणसी, चौखम्बा संस्कृत सीरीज 1968. 		



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SEMESTER V

17. कपूर, अनूपचन्द्र, राजनीतिविज्ञान के सिद्धान्त, दिल्ली प्रीमियर पब्लिशिंग हाउस, 1967
18. पण्डिता क्षमराव सत्याग्रहगीता पेरिस, 1932
19. यजुर्वेद: हिन्दी अनुवाद सहित, अनुवादक सातवलेकर श्रीपाद दामोदर. पारडी
20. विष्णुपुराणम् हिन्दी अनुवाद सहित अनुवाद मुनिलाल गुप्त गोरखपुर गीताप्रेस
21. टण्डन, किरण, महात्मा गाँधी परक संस्कृत काव्य, दिल्ली, ईस्टर्न बुक लिंकर्स, 1991
22. तिवारी, शशि, संस्कृत साहित्य में राष्ट्रीयता एवं भारतीय साहित्य, दिल्ली, विद्यानिधि प्रकाशन, 2007
23. तिवारी, शशि, संस्कृत साहित्य में राष्ट्रवाद एवं भारतीय राजशास्त्र, दिल्ली, विद्यानिधि प्रकाशन, 2013
24. राष्ट्रीय एकता और भारतीय साहित्य, योगेन्द्र स्वामी काशो अधिवेशन स्मृतिग्रन्थ, 2001
25. दीक्षित, हरिनारायण, संस्कृत साहित्य में राष्ट्रीय भावना, दिल्ली ईस्टर्न बुक लिंकर्स, 2006
26. इकबाल नारायण, आधुनिक राजनीतिक विचारधाराएं, जयपुर ग्रन्थ विकास, 2001
27. पुष्पेन्द्र, कुमार, पुराणों में राष्ट्रीय एकता, दिल्ली नाग पब्लिशर्स
28. मिश्र, अजय कुमार, मथुराप्रसाद दीक्षित के नाटक, दिल्ली, प्रकाशन विभाग दिल्ली विश्वविद्यालय, 2002
29. राय, बाबू गुलाब, राष्ट्रीयता दिल्ली किताब घर, 1996
30. राय, सत्या एम, भारत में उपनिवेशवाद और राष्ट्रवाद दिल्ली, 1953



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SEMESTER VI

BA SEMESTER- VI/V		
SANSKRIT		
PAPER CODE— S0A/SAN/UG/AEEC-4		
AEEC-4		
Computer Awareness for Sanskrit		
M. Marks 70		
[A]	Prescribed Course:	
	Section 'A'	Basic Computer Awareness
	Section 'B'	Typing in Unicode for Preservation and Digitalization of Sanskrit Text
	Section 'C'	Web Publishing
[B]	Course Objectives:	
	This course has been designed for those students who need to have some basic grounding in computer applications. The course will begin with introducing computer fundamentals and then will go on to provide a hands-on experience of popular software applications and tools to students.	
[C]	Unit-Wise Division:	
	Section 'A'	
	Basic Computer Awareness	
	Unit I	Design, Architecture: Operating System
	Unit II	MS Office Tools (Word, Power points, Excel etc.)
	Unit III	Using Internet, Web Search (Searching E-text/ e-book for Sanskrit in Roman and Devanagari Scripts), Email etc.
	Section 'B'	
	Typing in Unicode for Preservation and Digitalization of Sanskrit Text	
	Unit I	Character encoding, Unicode, ASCII, UTF-8, U
	Unit II	Typing in Unicode through various Softwares
	Unit III	Sanskrit Text Digitalization/ Preservation/ Storage
	Section 'C'	
	Web Publishing	
	Unit I	Basics HTML, Java Scripts and CSS
	Unit II	Basics of Databases
D	Suggested Books/Readings	
	<ol style="list-style-type: none"> 1. Tom Henderson (April 17, 2014). "Ancient Computer Character Code Tables – and Why They're Still Relevant". Smart bear. Retrieved 29 April 2014. 2. Unicode Technical Report #17: Unicode Character Encoding Model". 2008-11-11. Retrieved 2009-08-08. At: http://www.unicode.org/reports/tr17/ 3. Constable, Peter (2001-06-13). "Character set encoding basics". Implementing Writing Systems: An introduction. SIL International. Retrieved 2010-03-19. 	



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	<ol style="list-style-type: none">4. <i>Devanāgarī Unicode Chart</i>. http://unicode.org/charts/PDF/U0900.pdf5. <i>The Unicode Consortium</i>. http://unicode.org/6. <i>W3Schools Online Web Tutorials</i>. http://www.w3schools.com/7. <i>Microsoft Office 2013 Online Tutorials</i>. https://www.microsoft.com/enable/training/office2013/
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SEMESTER VI

or		
BA SEMESTER- VI/V		
SANSKRIT		
PAPER CODE— S0A/SAN/UG/AEEC-5		
AEEC-5		
E-learning Tools and Techniques for Sanskrit		
M. Marks 70		
[A]	Prescribed Course:	
	Section 'A'	Interactive Sanskrit Teaching Learning Tools.
	Section 'B'	Standard for Indian Languages (Unicode)
	Section 'C'	E-Content Creation for Sanskrit Text.
[B]	Course Objectives:	
	This course has been designed for those students who need to have some basic grounding in e-learning/online learning. The course will begin with introducing basics of online learning and then will go on to provide a hands-on experience of popular software applications and tools to students.	
[C]	Unit-Wise Division:	
	Section 'A'	
	Interactive Sanskrit Teaching Learning Tools	
	Unit I	E-learning, E-learning a brief introduction, Is e-learning better, Pitfall of e-learning, E-learning Architecture, Learning in E-learning.
	Unit II	Brief Introduction of Interactive Tools for Sanskrit, Basics of Multimedia, Web based tools development, HTML, Web page etc., Tools and Techniques.
	Unit III	Survey of E-learning tools and Techniques.
	Section 'B'	
	Standard for Indian Languages (Unicode) and E-learning tools	
	Unit I	Unicode Typing in Devanagari Scripts, Typing Tools and Software.
	Unit II	Introduction of Various Available E-learning Tools.
	Section 'C'	
	E-Content Creation for Sanskrit Text	
	Unit I	Digitalization of Contents, Text Processing Preservation, Techniques.
	Unit II	Introduction to database, Create, Select, Insert, Delete, Update, Handling Unicode data.
D	Suggested Books/Readings	
	<ol style="list-style-type: none"> 1. Linguistics Group. <i>Computational Tools</i>. Department of Sanskrit. University of Delhi. Delhi; http://sanskrit.du.ac.in 2. <i>Basic concept and issues of multimedia</i>. http://www.newagepublishers.com/samplechapter/001697.pdf 3. <i>Content creation and E-learning in Indian languages: a model</i>: http://eprints.rclis.org/7189/1/vijayakumarjk_01.pdf 4. <i>HTML Tutorial - W3Schools</i>. www.w3schools.com/html 5. <i>The Unicode Consortium</i>. http://unicode.org 	



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UNDER CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER VI

	<ol style="list-style-type: none">6. Gupta, S. B. & Mittal, A. <i>Introduction to Database Management System</i>. Laxmi Publications, 2010.7. <i>Database Tutorial</i>. W3Schools: www.w3schools.com/sql8. Lai, Kwok-Wing. <i>E-Learning</i>. Otago: Teaching and Professional Development with the Internet, Otago University Press, 2001.9. Albert, Traver. <i>E-Learning: Methods, Modules and Infrastructure</i>. Clanrye International, 2015.10. Singh, P. P. & Sharma, Sandhir. <i>E-Learning: New Trends and Innovations</i>. -----Deep & Deep Publications Pvt. Ltd, 2005.11. Steinmetz, <i>Multimedia Fundamentals. Volume 1: Media Coding and Content Processing</i>. Pearson Education, 2004.
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SEMESTER VI

or		
BA SEMESTER- VI/V		
SANSKRIT		
PAPER CODE— S0A/SAN/UG/AEEC-6		
AEEC-6		
Yogasūtra of Patañjali		
M. Marks 70		
[A]	Prescribed Course:	
	Section 'A'	Yogasūtra of Patañjali: Samādhipāda
	Section 'B'	Yogasūtra of Patañjali: Sādhanapāda
	Section 'C'	Yogasūtra of Patañjali: Vibhūtipāda
[B]	Course Objectives:	
	This Yoga Darśana course aims to get the students to know about the world's most important texts and the vision of our ancient Yoga's tradition. For this, selected Sutras of Patañjali's Yogasūtra has been prescribed.	
[C]	Unit-Wise Division:	
	Section 'A'	
	Yogasūtra of Patañjali: Samādhipāda	
	Unit I	Yogasūtra of Patañjali: Samādhipāda (Sutras: 1-15)
	Unit II	Yogasūtra of Patañjali: Samādhipāda (Sutra: 16-29)
	Section 'B'	
	Yogasūtra of Patañjali: Sādhanapāda	
	Unit I	Yogasūtra of Patañjali: Sādhanapāda (Sutra: 29-45)
	Unit II	Yogasūtra of Patañjali: Sādhanapāda (Sutras: 46-55)
	Section 'C'	
	Yogasūtra of Patañjali: Vibhūtipāda	
	Unit I	Yogasūtra of Patañjali: Vibhūtipāda Sutras: 1-3)
D	Suggested Books/Readings	
	<ol style="list-style-type: none"> 1. पातञ्जल योगदर्शन, गोरखपुर, गीताप्रेस,----- 2. योगप्रदीप, गोरखपुर, गीताप्रेस,----- 3. पातञ्जल योगदर्शनम्, व्याख्याकार श्रीमत् स्वामी हरिहरानन्द आरण्य, सम्पादक डॉ० रामशंकर भट्टाचार्य, दिल्ली मोतीलाल बनारसीदास, 2003. 	



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SEMESTER VI

or			
BA SEMESTER- VI/V			
SANSKRIT			
PAPER CODE— S0A/SAN/UG/AEEC-7			
AEEC-7			
Indian Theatre			M. Marks 70
[A]	Prescribed Course:		
	Section 'A'	Tradition and History of Indian Theatre	15
	Section 'B'	Theatre: Types and Constructions	15
	Section 'C'	Acting: <i>Āngika, Vācika, Āhārya and Sāttvika</i>	15
	Section 'D'	Drama: Subject-Plot (<i>vastu</i>), Hero (<i>netā</i>) and Sentiment (<i>rasa</i>)	25
[B]	Course Objectives:		
	Objective of this course is to introduce Principles and practices of Indian Theatre to students.		
[C]	Unit-Wise Division:		
	Section 'A'		
	Tradition and History of Indian Theatre		
	Unit I	Origin and development of stage in different ages: pre-historic, Vedic age.	
	Unit II	Epic-purānic age, court theatre, temple theatre, open theatre, modern theatre, folk theatre, commercial theatre, national and state level theatre.	
	Section 'B'		
	Theatre: Types and Constructions		
	Unit I	Theatre: Types and Constructions	
	Section 'C'		
	<i>Acting: Āngika, Vācika, Āhārya and Sāttvika</i>		
	Unit I	<i>Acting: Āngika, Vācika</i>	
	Unit II	<i>Āhārya and Sāttvika</i>	
	Section 'D'		
	Drama: Subject-Plot (<i>vastu</i>), Hero (<i>netā</i>) and Sentiment (<i>rasa</i>)		
	Unit I	<i>Vastu</i> (Subject-Matter)	
	Unit II	<i>Netā</i> (Hero)	
	Unit II	<i>Rasa</i> (Sentiment)	
D	Suggested Books/Readings		
	<ol style="list-style-type: none"> त्रिपाठी राधाबल्लभ, संक्षिप्त नाटयशास्त्र हिन्दी भाषानुवाद सहित, दिल्ली, वाणी प्रकाशन 2008. त्रिपाठी राधाबल्लभ, भारतीय नाटय स्वरूप एवं परम्परा, सागर मध्यप्रदेश संस्कृत परिषद्, 1988. द्विवेदी, हजारीप्रसाद, नाटयशास्त्र की भारतीय परम्परा एवं दशरूपक, दिल्ली, राजकमल प्रकाशन, 1963 झा, सीताराम, नाटक और रंगमंच, पटना बिहार राष्ट्रभाषा परिषद् 1982. भरतमुनि नाटयशास्त्रम् (1-4 भाग), सम्पादक बाबूराम शुक्ल शास्त्री, वाराणसी चौखम्बा संस्कृत संस्थान, 1984. 		



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SEMESTER VI

4. त्रिपाठी, राधाबल्लभ, नाटयशास्त्र विश्वकोश (1-4 भाग) दिल्ली प्रतिभा प्रकाशन, 1999.
5. त्रिपाठी, राधाबल्लभ, भारतीय नाटयशास्त्र की परम्परा और विश्व रंगमंच दिल्ली, प्रतिभा प्रकाशन --.
6. भरतमुनि नाटयशास्त्रम्, सम्पादक ब्रजमोहन चतुर्वेदी दिल्ली विद्यानिधि प्रकाशन, 2003.
7. मुसलगांवकर, केशवराज, संस्कृत नाटयमीमांसा, दिल्ली परिमल प्रकाशन,-----
8. शर्मा, शिवचरण, आचार्य भरत भोपाल, मध्यप्रदेश हिन्दी अकादमी,-----
9. शुक्ल, रामलखन, संस्कृत नाटयकला दिल्ली, मोतीलाल बनारसीदास, 1970.
10. राय, गोविन्दचन्द्र, नाटयशास्त्र में रंगशालाओं के रूप, काशी, 1958.
11. मेहता, भानुशंकर, भरत-नाटयशास्त्र तथा आधुनिक प्रासंगिकता, वाराणसी-----
12. गैरोला, वाचस्पति, भारतीय नाटय परम्परा एवं अभिनवदर्पण, इलाहाबाद.. 1967.
13. लाल, लक्ष्मीनारायण, रंगमंच और नाटक की भूमिका, दिल्ली ,1965
14. गर्ग, लक्ष्मीनारायण, भारत के लोकनाटय, हाथरस संगीत कार्यालय, 1961.
15. चतुर्वेदी, सीताराम, भारतीय एवं पाश्चात्य रंगमंच, लखनऊ हिन्दी समिति, 1964.
16. माथुर, जगदीशचन्द्र, परम्पराशील नाटय. पटन बिहार राष्ट्रभाषा परिषद् 1961.
17. Gupta, C B. *Indian Theatre*. Vārāṇasi: 1954.
18. Yājñanik, R K. *Indian Theatre*. London: 1933.
19. Mehta, Tarala. *Sanskrit Play Production in Ancient India*. Delhi: Motilal Banarasi Dass, 1999.
20. Nicoll, Allardyce. *The Theatre and Dramatic Theory*. London: ----- 1962.



SEMESTER VI

		BA SEMESTER VI		
		SANSKRIT		
		PAPER CODE—AS0A/SAN/UG/DSE-3		
		DSE-3		
		Literary Criticism		M. Marks: 70
[A]	Prescribed Course:			
	Section 'A'	<i>Kavyaprakash: Kavyavaishistya and Kavya Prayojana</i>		15
	Section 'B'	<i>Kavyaprakasha: Kavya Karana</i>		15
	Section 'C'	<i>Kavyaprakasha: Kavya Swarupa and Kavyabheda</i>		20
	Section 'D'	<i>Kavyadarsha— Pratham Parichheda</i>		20
[B]	Course Objectives:			
	This Literary Criticism course aims to get the students know about the aims, essential resources, definition, and principal types of poetry on the basis of Mammāt's <i>Kavyaprakasha</i> . It also aims to get the students acquainted with the definition and characteristics of epic (<i>mahakavya</i>) and types of prose-poetry (<i>gadyakavya</i>) on the basis of mahakavi Dandi's <i>kavyadarsha</i>			
[C]	Unit-wise Division:			
		Section 'A'		
		<i>Kavyaprakasha: Kavyavaishistya and Kavya Prayojana</i>		
	Unit I	<i>Kavyaprakasha: Kavyavaishistya and Kavya Prayojana</i>		
		Section 'B'		
		<i>Kavyaprakasha: Kavyakarana</i>		
		<i>Kavyaprakasha: Kavyakarana</i>		
	Unit I	Section 'C'		
		<i>Kavyaprakasha: Kavyaswarupa and Kavyabheda</i>		
		<i>Kavyaprakasha: Kavyasvarupa and Kavyabheda</i>		
	Unit I	Section 'D'		
		<i>Kavyadarsha- Mahakavi Dandi, Pratham Parichheda</i>		
	Unit I	Mahakavi Dandi		
	Unit II	Kavya paribhasha, Kavyabheda, Mahakavya lakshana, Gadyakavya-bheda, Kavyakarana, Shailey (style) evam Guna		
[D]	Suggested books/ readings			
	<p>1. Mammāt. <i>Kavyaprakasha</i> Vol. 1 & 2 with the commentary Sampradayaprakashini of Srividyaachakravartin. Eng. Tran. Dr. Ramesh Chandra Dwivedi. Delhi: Motilal Banarasidas, 1977-1970.</p> <p>2. महकविदण्डिविरचिताः काव्यदर्शः प्रथमः परिच्छेदः, डॉ श्रीकान्ता पाण्डेय साहित्य भण्डार मेरठ।</p> <p>3. मम्मट काव्यप्रकाश हिन्दी अनुवाद सहित व्याख्याकार एवं सम्पादक डॉ श्रीनिवास शास्त्री, मेरठ साहित्यभण्डार, 1994.</p> <p>4. महकवि दण्डियाचक्रवर्तिरचिता काव्यदर्श (प्रकाश संस्कृत एवं हिन्दी व्याख्या सहित) व्याख्याकार. आचार्य रामचन्द्रमित्र, चौखम्बा विद्यामन्दन वाराणसी, द्वितीय संस्करण, 1972</p> <p>5. मम्मटकाव्यप्रकाशबालबोधिन्या टीकायोजना, टीकाकारः इच्छकीकरोयनामा भद्रवामननाथ, पुणे: भण्डारकर प्राच्यविद्या संशोधन मन्दिरम् 1983.</p>			



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or			
BA SEMESTER- VI			
SANSKRIT			
PAPER CODE— S0A/SAN/UG/DSE-4			
DSE-4			M. Marks 70
Nationalism in Sanskrit Literature			
[A]	Prescribed Course:		
	Section 'A'	Concepts and Basic Features of Indian Nationalism	
	Section 'B'	Name of Country, National Symbols and Rise of Nationalism	
	Section 'C'	Nationalistic Thought and Modern Sanskrit Literature	
[B]	Course Objectives:		
	The aim of this course is to make the students acquainted with the concept and historical development of Indian Nationalism with special reference to Sanskrit literature of past and present. The course tries to highlight the struggle of Indian people against colonialism in nineteenth century by focusing on the nationalistic ideologies of prominent national leaders of modern times. The course also emphasizes the relevance of Gandhian thought as propounded in modern Sanskrit literature.		
[C]	Unit-Wise Division:		
	Section 'A'		
	Concepts and Basic Features of Indian Nationalism		
	Unit I	Meaning, Definitions and Elements of Indian Nation 'Rā ra': Meaning of Nation, Definitions and Constituent Elements of Nation in Western Perspective. Indian Concept of Nation: 'Rastra', Meaning, Etymology and Definitions, Essential Elements of 'Rāstra' in Sanskrit Literature (Atharvaveda, 11.9.17; 12.1.1-12 Sukla Yajurveda, 22.22) 'Rāstra' in the Context of 'Saptāga' Theory of State (Kautilya's Arthaśāstra, 6.1, Mahābhārata, Sāntiparva, 56.5; Śukranīti, 1.61- 62)	
	Unit II	Meaning, Definitions and Elements of Indian Nationality: Meaning of Nationality, Definitions and Constituent Elements of Nationality, Essential Factors of Nationality: National Integration, Patriotism, Freedom, Religious Tolerance, National Pride, National Consciousness and Citizenship. Special Features of Indian Nationalism: Social Harmony (Sāmājika Samarsatā), Equality of the Religions, International Brotherhood, Unity in Diversity and Cultural Consciousness.	
	Section 'B'		
	Name of Country, National Symbols and Rise of Nationalism		
	Unit I	Name of the Country 'Bharatavarsha' and National Symbols: Different views regarding name of 'Bharatavarsha' in Vedic and Pauranic Literature, National Symbols of India: National Anthem-'Jana Gana Mana', National Song-'Vande Mataram', National Flag of India, National Emblem 'Ashok Chakra', National Calendar of India 'Śaka Savat'.	
	Unit II	Rise of Indian Nationalism and Freedom Struggle Movement: Major Factors which led to the rise of nationalist sentiments in modern period with special reference to Western Thought and Education, Rediscovery of India's Past, Socio-religious reform movements and Impact of	



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		contemporary national movements worldwide. Brief survey of Socio-religious nationalistic thought of modern India with special reference to Raja Ram Mohan Rai, Swami Dayanand Saraswati, Swami Vivekanand, Bankim Chandra Chatopadhyay, Mahatma Gandhi, Madan Mohan Malaviya, Vir Savarkar and Dr. B.R.Ambedkar.	
		Section 'C'	
		Nationalistic Thought and Modern Sanskrit Literature	
	Unit I	Contributions of Sanskrit Literature to Freedom Struggle Movement: Survey of nationalistic trends in modern Sanskrit literature before Independence; Survey of nationalistic trends in modern Sanskrit literature after Independence.	
	Unit II	Modern Nationalistic Thought and Gandhian Sanskrit Literature: Social, political and religious background of Gandhian Thought with special reference to 'Grama Svaraja' (Local Self Government), 'Satyāgraha' (Truth Fullness), 'Ahisā' (Non Violence), 'Prajātantra' (People's Democracy) and 'Dhārmika Sahisnuta' (Religious Tolerance). Contemporary Sanskrit Literature on Gandhian Thought with special reference to 'Satyagrahagita' of Pandita Ksamarava, Bhāratavijayanātakam' of Mathura Priad Dikshita, 'Gandhicaritam' of Charudeva Shastri, 'Gandhi Gita' of Prof. Indra.	
D	Suggested Books/Readings		
	<ol style="list-style-type: none"> 1. <i>Arthashastra of Kautilya</i>. Ed. R.P. Kangale. Delhi: Motilal Banarasidas, 1965. 2. <i>Atharvaveda Samhita</i> (2 Vols). Trans. R.T.H. Griffith. Banaras:-----,1968. 3. <i>Mahabharata</i> (7 Vols). Eng. Trans. H.P. Shastri London:----1952-59. 4. <i>Ramayana of Valmiki</i> (3 Vols). Eng. Trans. H.P. Shastri. London: --- , 1952-59. 5. <i>Visnu purana</i>. Eng. Trans. H.H. Wilson .Calcutta: Punthi Pustak, 1961. 6. कौटलीय अर्थशास्त्र, हिन्दी अनुवादक उदयवीर शास्त्री, दिल्ली मेहसूचन्द लक्ष्मणदास, 1968 		



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or			
BA SEMESTER- VI			
SANSKRIT			
PAPER CODE— S0A/SAN/UG/DSE-5			
DSE-5			
Mathematical Tradition in Sanskrit			M. Marks 70
[A]	Prescribed Course:		
	Section 'A'	Indian Mathematics	
	Section 'B'	Brief History of Mathematics in Sanskrit	
	Section 'C'	Ancient Indian Mathematicians	
[B]	Course Objectives:		
	The objective of this course is to introduce the Indian mathematical tradition to the students.		
[C]	Unit-Wise Division:		
	Section 'A'		
	Indian Mathematics		
	Unit I	Lagadh Jyotia (Yaju Jyotia) Verses: 4 and 42 Importance of Science of Mathematics and The Rule of Three.	
	Unit II	Lilavati of Bhaskaracarya, Verses: 1-20.	
	Unit III	Vedic Mathematics— First 5 sutras.	
	Unit IV	Technical Terms In Mathematics: Algebra (बीजगणित), Calculus (कलन), Numbers (संख्या), Digit (अङ्क), Zero (शून्य), Infinity (अनन्त), Decimal (दशमलव), Square & Square root (वर्ग एवं वर्गमूल), Cube & Cube root (घन एवं घनमूल)	
	Unit V	Āryabhattīyam of Āryabhatta गीतिष्वापाद (रन्पूर्व) एवं गणितपद: 1-5 verses	
	Section 'B'		
	Brief History of Mathematics in Sanskrit		
	Unit I	Vedic Period, Medieval Vedic Period, Post Vedic Period.	
	Unit II	Classical Period, Post classical Period.	
	Section 'C'		
	Ancient Indian Mathematicians		
	Unit I	Vararuci, Āryabhatta-I, Varāhmihira, Brahmgupta, Śrīdhar, Āryabhatta-II, Śrīpati, Bhāskarācārya, Gaṇeśadaivajña, Kamalākar, Jayasingh, Sudhākar Dvivedī.	
D	Suggested Books/Readings		
	1. Patwardhan, Krishnaji Shankara. Nainpally, S. A. and Singh, Shyam Lal <i>Lilavati of Bhāskarācārya: A Treatise of Mathematics of Vedic Tradition</i> , Delhi: Motilal Banarsidass, 2001.		
	2. <i>Bhāskarācārya's Bījaganita</i> . Trans. Shankar Keshav Abhyankar. --- : Bhāskarācārya		



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<p>Pratishthana, 1980.</p> <p>3. Frank, J. Swetz and Victor, J. Katz. <i>"Mathematical Treasures - Lilavati of Bhaskara,"</i> Loci, 2011.</p> <p>4. Sharma, K. V. <i>Līlavatī of Bhāskarācārya with Kriyākramakarī</i>, Hoshiarpur: VVBIS & IS Panjab University,-----</p> <p>5. भास्कराचार्य, लीलावती वाराणसी, चौखम्बा कृष्णदत्त अकादमी, 2001</p> <p>6. आर्यभट्ट, आर्यभट्टीयन् सन्यदक सुरकन्त झा, वाराणसी चौखम्बा संस्कृत सिरीज,-----</p> <p>7. <i>Studies in the History of Science in India</i> (Anthology) Ed. Debiprasad Chattopadhyaya. ----- , Juskevic, A P. Demidov, S S. Medvedev, F A and Slavutin, E I. <i>Studies in the history of mathematics</i>. Pages 220-222; 302. Moscow: Nauka, 1974.</p>
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BA SEMESTER- VI			
SANSKRIT			
PAPER CODE— S0A/SAN/UG/GE-1			
GE-1			M. Marks 70
Political Thought in Sanskrit			
[A]	Prescribed Course:		
	Section 'A'	Basic Features of Ancient Indian Political Thought	
	Section 'B'	Ancient Indian Political Thought : Origin and Development	
	Section 'C'	Cardinal Theories and Ancient Indian Political Thinkers	
[B]	Course Objectives:		
	Fundamental Concepts of Indian Political thought have been discussed in Dharma-śāstra literature as the scientific branches of knowledge in ancient India. The aim of this course is to make the students acquainted with various aspects of Indian Political Thought and institutions of Polity as propounded in the ancient Sanskrit texts such as Vedic Samhitas, Mahābhārata, Purā as, Kautilya's Arthaśāstra and other works known as Nītiśāstra.		
[C]	Unit-Wise Division:		
	Section 'A'		
	Basic Features of Ancient Indian Political Thought		
	Unit I	Name, Scope and Sources of Ancient Indian Political Thought: Name of the Science: 'Dandanīti', 'Dharmaśāstra', 'Nītiśāstra'. Scope of Indian Political Thought: relation with Dharma, Artha and Nīti; Sources of Ancient Indian Political Thought: Vedic Literature, Purāna, Rāmāyaṇa, Mahābhārata, Dharmaśāstra, Nītiśāstra Kautilya's Arthaśāstra and Rajaśāsana (Inscriptions).	
	Unit II	Nature, Types and Theories of the State: Nature of the State in Arthaśāstra (6.1) and Manusmṛti (9.294) with Special reference to Saptāṅga- Theory: Svāmi, Amātya, Janapada, Pura, Kośa, Danda and Mitra. Types of the State: Rājya, Svarājya, Bhojya, Vairājya, Mahārājya, Sāmarājya (Aitreya Brāhmana, 8.3.13-14; 8.4.15-16).	
	Section 'B'		
	Ancient Indian Political Thought : Origin and Development		
	Unit I	Indian Political Thought from Vedic Period to Buddhist Period: Election of King by the People Visas in Vedic period: (Rgveda 10.173, 10.174, Atharvaveda 3.4.2; 6.87.1-2), Parliamentary Institutions: Sabhā, Samiti and Vidatha in Vedic period (Atharvaveda, 7.12.1, 12.1.6; Rgveda 10.85.26), King-maker Council: 'Rājakartārah 'and Ratnih' in Vedic period (Atharvaveda, 3.5.6- and Śatapathabrāhmana, 5.2.5.1); Coronation Ceremony of the King 'Samrāta' (Śatapathabrāhmana, 51.1.8-13; 9.4.1.1-5) Republics in the Buddhist Period (Dīggnikāya, Mahāparinibbāna Sutta, Anguttaranikāya, 1.213;4.252,256).	
	Unit II	Indian Political Thought from Kautilya to Mahatma Gandhi: Kautilya's concept of Welfare State (Arthaśāstra 1.13); Essential Qualities of King (Arthaśāstra 6.1.16-18); Duties of King and State 'Rājadharma' (Mahābhārata, Śāntiparva, 120.1-15; Manusmṛti, 7.1-15; Śukranīti 1.1-15) Constituent Elements of Jain political thought (Somadeva's Nītivākyāmṛta, 9.1.18 and 19.1.10); Relevance of Gandhian political thoughts in modern	



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		period (Gandhi Gītā of Prof. Indra, 5.1-25)	
		Section 'C'	
		Cardinal Theories and Ancient Indian Political Thinkers	
	Unit I	Cardinal Theories of Indian Political Science: 'Saptāṅga' Theory of State: Svāmī, Amātya, Janapada, Pura, Kośa, Danda and Mitra (Arthasāstra- 6.1, Mahābhārata Sāntiparva- 56.5, Śukranīti, 1.61-62). Mandala Theory of Inter-State Relations: Sādgunya Policy of War and Peace Diplomacy: Sandhi, Vighraha, Yāna, Āsana, Samśraya and Dvaidhībhāva. 'Caturvidha Upāya' for balancing the power of State: Śāma, Dāma, Danda, Bheda. Three types of State power Śakti: Prabhu Śakti, Mantra Śakti, Utsāha Śakti.	
	Unit II	Prominent Indian Political Thinkers: Manu, Śukrācārya, Kautilya, Kāmandaka, Somadeva Sūri and Mahatma Gandhi.	
D	Suggested Books/Readings		
	<ol style="list-style-type: none"> 1. <i>Arthashastra of Kautilya</i>. Ed. R.P. Kangale. Delhi: Motilal Banarasidass, 1965. 2. <i>Atharvaveda Samhita</i>. Trans. R.T.H. Griffith 1896-97, rept. (2 Vols) 1968. 3. <i>Mahabharata</i> (7Vols). H.P. Shastri. London:----- 1952-59. 4. Olivelle, P. <i>Manu's Code of Law: A Critical Edition and Translation of the Mānavadharmasāstra</i>. New Delhi: OUP, 2006. 5. <i>Ramayana of Valmiki</i> (3 Vols). Trans. H.P. Shastri, London, 1952-59. 6. <i>Rgveda samhita</i> (6 Vols). Trans. H.H. Wilson. Bangalore: Bangalore Printing & Publishing Co., 1946. 7. <i>Śatapathabrāhmaṇa</i> (3 Vols), Ed. Jeet Ram Bhatt, Delhi: EBL, 2009. 8. Altekar, A.S. <i>State and Government in Ancient India</i>. Delhi: Motilal Banarsidass, 2001. 9. Belvalkar, S.K. <i>Mahabharata: Santi Parvam</i>, 1954. 10. Bhandarkar, D.R. <i>Some Aspects of Ancient Indian Hindu Polity</i>. Banaras : Banaras Hindu University. 11. Gharpure, J.R. <i>Teaching of Dharmashastra</i>. Lucknow: Lucknow University, 1956. 12. Ghosal, U.N. <i>A History of Indian Political Ideas</i>. Bombay:-----, 1959. 13. Jayaswal, K.P. <i>Hindu Polity</i>. Bangalore:-----, 1967. 14. Law, N.S. <i>Aspect of Ancient Indian Polity</i>. Calcutta:-----, 1960. 15. Maheshwari, S.R. <i>Local Government in India</i>. New Delhi: Orient Longman, ---- 16. Beni Prasad, <i>Theory of Government in Ancient India</i>. Allahabad: --- , 1968. 17. Saletore, B.A. <i>Ancient Indian Political Thought and Institutions</i>. Bombay:---- , 1963. 18. Sharma, R.S. <i>Aspects of Political Ideas and Institutions in Ancient India</i>. Delhi: --- , 1996. 19. Sinha, K.N. <i>Sovernity in Ancient Indian Polity</i>. London: --- 1938. 20. Verma, V.P. <i>Studies in Hindu Political Thought and its Metaphysical Foundations</i>. Delhi: ---, 1954. 21. कौटलीय अर्थशास्त्र, हिन्दी अनुवादक उदयवीर शास्त्री, दिल्ली मेहरचन्द लक्ष्मनदास, 1968 22. महाभारत (1-6 भाग), हिन्दी अनुवादक रामनारायण दत्त शास्त्री पाण्डेय, गोरखपुर, गीताप्रेस 23. शतपथब्राह्मण (1-5) माध्यन्दिन शास्त्रीय भाष्यकार सायण और हरिस्वामी, दिल्ली 		



24. शुकुनीति, हिन्दी अनुवादक और सम्पादक ब्रह्मशंकर मिश्र, वाराणसी, चौखम्बा संस्कृत सिरीज, 1968
25. श्रीमद्वाल्मीकियरामायणम् (1-2 भाग) हिन्दी अनुवाद सहित, सम्पादक जानकीनाथ शर्मा, गोरखपुर
26. तिवारी, शशि, संस्कृत साहित्य में राष्ट्रवाद एवं भारतीय राजशास्त्र, दिल्ली विद्यानिधि प्रकाशन, 2013
27. दीगनिकाय (1-2 भाग) सम्पादक जे. कश्यप, बिहार
28. मनुस्मृति (1-13 भाग) सम्पादिका उर्मिला रुस्तगी, दिल्ली, जे.पी. पब्लिशिंग हाउस
29. काणे, पी.वी. हिस्ट्री ऑफ धर्मशास्त्र हिन्दी अनुवाद धर्मशास्त्र का इतिहास, अनुवादक अर्जुन चौबे, लखनऊ, हिन्दी समिति, 1966
30. गार्नर, जे. डब्ल्यू, हिस्ट्री ऑफ धर्मशास्त्र हिन्दी अनुवाद, राज्यविज्ञान और शासन, रामनारायण यादवेन्दु, आगरा, 1972
31. दीक्षित, प्रेमकुमारी, प्राचीन भारत में अन्तरराष्ट्रीय सम्बन्ध, लखनऊ, उत्तरप्रदेश हिन्दी ग्रन्थ अकादमी, 1977
32. नाटाणी, प्रकाश नारायण, प्राचीन भारत में राजनौतिक विचारक, जयपुर पोइन्टर पब्लिशर्स, 2002
33. मोहनचन्द्र, जैन महाकाव्यों में भारतीय समाज, दिल्ली, ईस्टर्न बुक लिंकर्स, 1989
34. वाजपेयी, अम्बिकाप्रसाद, हिन्दू राजशास्त्र, प्रयाग, 2006
35. विद्यालंकार, सरयकेतु, प्राचीन भारतीय शासन व्यवस्था एवं राजशास्त्रमसूरी, सरस्वती सदन, 1968
36. सिन्हा, विनोद एवं सिन्हा, रेखा, प्राचीन भारतीय इतिहास एवं राजनतिक चिन्तन, दिल्ली, राधा पब्लिकेशन, 1989



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER VI

or			
BA SEMESTER- VI			
SANSKRIT			
PAPER CODE— S0A/SAN/UG/GE-5			
GE-5			
Ethical and Moral Issues in Sanskrit Literature			M. Marks 70
[A]	Prescribed Course:		
	Section 'A'	Issues in the Mahābhārata	30
	Section 'B'	Issues in the Rāmāyana	15
	Section 'C'	Issues of personal conduct	10
	Section 'D'	Issues in Freedom	15
[B]	Course Objectives:		
	This course aims to get the students familiar with the Ethical and Moral Values in Sanskrit Literature.		
[C]	Unit-Wise Division:		
	Section 'A'		
	Issues in the Mahābhārata		
	Unit I	Half-truths and false hoods– Yudhisthira's declaration of Aśvatthāma's death.	
	Unit II	Choosing the lesser evil –Dusyanata's rejection of Śakuntalā in the Abhijñāna Śakuntalam, Act V.	
	Unit III	Critique of war in the Mahābhārata (strī parva, Chapters 13-15). War – as it should be and as it is – (Manusmṛti Chapter VII 199-200, 87-93 and Kṛishṇa's stratagems in war).	
	Unit IV	Yearning for revenge– Aśvatthāmā's revenge on Pāndava progeny; Duryodhana's revenge on Draupadī	
	Section 'B'		
	Issues in the Rāmāyana		
	Unit I	Conflict of duty – Rāma the king versus Rāma the Husband.	
	Unit II	Obedience and Loyalty– Laksmana's allenge to Dasharatha and submission to Rāma in Vālmiki's Rāmāyana.	
	Section 'C'		
	Issues of personal conduct		
	Unit I	Self respect – Nītiśatakam, Verses 21 – 30.	
	Section 'D'		
	Issues in Freedom		
	Unit I	Poetic freedom and poetic license– restraints on creative expression in Indian poetics and dramaturgy, assessment of popular Indian cinema in the light of these principles.	
	Unit II	The person– svadharma and sthitaprajñā in the Gītā: Chapter II.	



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER VI

D	Suggested Books/Readings
	<ol style="list-style-type: none">1. <i>Mahabharata</i> with Hindi translation. Gorakhpur: Gita Press,-----2. Matilal Bimal Krishna. <i>Moral Dilemmas in the Mahabharata</i>.-----3. Sharma, Kavita. A. <i>Ethical Dilemmas in the Mahabharata</i>. http://www.drkavitasharma.org/pdf/Ethical%20Dilemmas%20in%20Mahabharat.pdf.4. <i>The Difficulty of Being Good</i>. Hindi Trans. Gurcharan Das. Penguin: --- -, ----2009. http://www.wisdomtimes.com/blog/lessons-from-the-mahabharata-dealing-withmoral-dilemmas/#5. http://jaiarjun.blogspot.in/2011/07/epic-fictions-rashomon-like-world-of.html http://blogs.bu.edu/core/2011/02/16/on-arjunas-moral-dilemma/ http://www.cse.iitk.ac.in/users/amit/books/matilal-2002-ethics-epics-collectedv2.html6. श्रीमद्भगवद्गीता हिन्दी अनुवाद सहित, गोरखपुर, गीताप्रेस-----7. <i>Śrimadbhagavad Gita</i> with Hindi translation. Gorakhpur: Gita Press, -----8. Koshāmbi, D.D. <i>Nitiśatakam</i>. Mumbai: Bhartiya Vidya Bhawan, 19469. शास्त्री, सुरेन्द्रदेव, अभिज्ञानशाकुन्तलम्, मेरठ, साहित्य भण्डार,-----10. Shastri, Surendra Dev. <i>Abhijñānaśakuntalam</i>. Meerut: Sahitya Bhandar,-----11. Soma Dev. <i>Vasudev</i>. (Translation) New York: Clay Sansrit Series New York Unievrstity Press,-----12. <i>Ramayana of Valmiki</i> Ayodhyakanda. sanskritdocuments.org.



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER VI

or			
BA SEMESTER- VI			
SANSKRIT			
PAPER CODE— S0A/SAN/UG/GE-6			
GE-6			
Basics of Sanskrit Linguistics			M. Marks 70
[A]	Prescribed Course:		
	Section 'A'	Introduction to Linguistics and Classification of Languages	
	Section 'B'	Phonetics and Phonology	
	Section 'C'	Morphology and Syntax	
	Section 'D'	Semantics and Pragmatics	
[B]	Course Objectives:		
	This course will introduce the basic fundamental of linguistics based on Sanskrit Language. After completing this course, the students will be able to understand concepts of Linguistics for further studies.		
[C]	Unit-Wise Division:		
	Section 'A'		
	Introduction to Linguistics and Classification of Languages		
	Unit I	Introduction to Linguistics, Language and Linguistics	
	Unit II	Classification of Languages: Language Family in India	
	Section 'B'		
	Phonetics and Phonology		
	Unit I	<i>Phonetics and Phonology</i> : Acoustic, Auditory and Articulatory, Places of Articulation: Bilabial: lips together Labiodental: lower lip against front teeth Interdental: tongue between teeth Alveolar: tongue near alveolar ridge on roof of mouth (in between teeth and hard palate) Palatal: tongue on hard palate Velar: tongue near velum Glottal: space between vocal folds Manners of Articulation Stop: obstruct airstream completely Fricative: partial obstruction with friction Affricate: stop airstream, then release Liquids: partial obstruction, no friction Glides: little or no obstruction, must occur with a vowel.	
	Section 'C'		
	Morphology and Syntax		
	Unit I	Morphology: Morphemes, Affixes: prefixes, suffixes, infixes, and circumfixes Derivational and inflectional affixes Syntax: Phrase structure rules, Passive Sentences, Active.	
	Section 'D'		
	Unit I	Semantics: Thematic Roles, Sentential Meaning Pragmatics:	
D	Suggested Books/Readings		
	<ol style="list-style-type: none"> Fromkin, Victoria and Rodman, Robert. <i>An Introduction to Language. 6th Ed</i> Schmitt, N. <i>An Introduction to Applied Linguistics</i>. Oxford: Oxford University Press, 2002. Chomsky, Noam and Lightfoot, David W. <i>Syntactic Structures</i>. Walter de Gruyter, 2002. 		



BA (UNDER GRADUATE) COURSES FOR SANSKRIT PROGRAMME
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER VI

<ol style="list-style-type: none">3. कर्णसिंह, भाषाविज्ञान, मेरठ, साहित्य भण्डार -----4. तिवारी, भोलानाथ, भाषाविज्ञान, इलाहाबाद, किताब महल, 1973.5. कपिलदेव, भाषाविज्ञान एवं भाषाशास्त्र, वाराणसी विश्वविद्यालय प्रकाशन, 2012.6. शर्मा, देवेन्द्र, भाषाविज्ञान की भूमिका, दिल्ली, राजकमल प्रकाशन7. Gune, P.D. <i>An Introduction to Comparative Philology</i>. Delhi: Chaukhamba Sanskrit Pratishthan. 38 U.A. Bungalow Road. Jawahar Nagar, 2005.8. T. Burrow, <i>Sanskrit Language</i>. -----9. Ghosh, Batakrna. <i>Linguistics Introduction to Sanskrit</i>. Calcutta: Sanskrit Pustaka Bhandar, 1977.10. Verma, S.K. and N. Krishnaswamy. <i>Modern Linguistics</i>. Delhi: Oxford University Press, ----
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DEPARTMENT OF ZOOLOGY
HEMVATI NANDAN BAHUGUNA GARHWAL UNIVERSITY
SRINAGAR (GARHWAL), UTTARAKHAND



COURSE CONTENT AND SYLLABUS
OF
B.Sc. ZOOLOGY (CBCS)
w.e.f. 2015-16

B.Sc. ZOOLOGY (CBCS)

COURSE CONTENT

Core Courses: Zoology

1. Animal Diversity (1st semester)
2. Comparative Anatomy and Developmental Biology (2nd semester)
3. Physiology and Biochemistry (3rd semester)
4. Genetics and Evolutionary Biology (4th semester)

Ability Enhancement Compulsory Courses (AECC)

1. English/MIL Communication (1st semester)
2. Environmental Science (2nd semester)

Skill Enhancement Courses: Zoology (Any four) (One each in 3rd, 4th, 5th and 6th semester, if opted from Zoology)

1. Public Health and Hygiene
2. Aquarium Fish Keeping
3. Pisciculture
4. Poultry Farming
5. Sericulture
6. Apiculture

Discipline Specific Electives: Zoology (Any two) – One each in 5th and 6th semester

1. Reproductive Biology
2. Wild Life Conservation and Management
3. Molecular Biology
4. Immunology
5. Applied Zoology
6. Animal behaviour and Ecology

SYLLABUS OF 1st SEMESTER (Zoology)

Core Course: Zoology I

ANIMAL DIVERSITY

(Credits: Theory-4, Practicals-2)

THEORY

Lectures: 60

Unit 1. Kingdom Protista: General characters and classification up to classes; Locomotory Organelles and locomotion in Protozoa

Unit 2. Phylum Porifera: General characters and classification up to classes; Canal System in *Sycon*

Unit 3. Phylum Cnidaria: General characters and classification up to classes; Polymorphism in Hydrozoa

Unit 4. Phylum Platyhelminthes: General characters and classification up to classes; Life history of *Taenia solium*

Unit 5. Phylum Nemathelminthes: General characters and classification up to classes; Life history of *Ascaris lumbricoides* and its parasitic adaptations

Unit 6. Phylum Annelida: General characters and classification up to classes; Metamerism in Annelida

Unit 7. Phylum Arthropoda: General characters and classification up to classes; Vision in Arthropoda, Metamorphosis in Insects

Unit 8. Phylum Mollusca: General characters and classification up to classes; Torsion in gastropods

Unit 9. Phylum Echinodermata: General characters and classification up to classes Water-vascular system in Asteroidea

Unit 10. Protochordates: General features and Phylogeny of Protochordata

Unit 11. Agnatha: General features of Agnatha and classification of cyclostomes up to classes

Unit 12. Pisces: General features and Classification up to orders; Osmoregulation

Unit 13. Amphibia: General features and Classification up to orders; Parental care

Unit 14. Reptiles: General features and Classification up to orders; Poisonous and non- poisonous snakes, Biting mechanism in snakes

Unit 15. Aves: General features and Classification up to orders; Flight adaptations

Unit 16 Mammals: Classification up to orders; Origin of mammals

SUGGESTED READINGS

1. Barnes, R.D. (1982). Invertebrate Zoology, V Edition. Holt Saunders International Edition.
2. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). The Invertebrates: A New Synthesis, III Edition, Blackwell Science
3. Barrington, E.J.W. (1979). Invertebrate Structure and Functions. II Edition, E.L.B.S. and Nelson
4. Young, J. Z. (2004). The Life of Vertebrates. III Edition. Oxford university press.
5. Pough H. Vertebrate life, VIII Edition, Pearson International.
6. Hall B.K. and Hallgrimsson B. (2008). Strickberger's Evolution. IV Edition. Jones and Bartlett Publishers Inc.
7. Kotpal, Agrawal & Khetrapal: Modern Text-book of Zoology, Invertebrates. Rastogi, 1976.

PRACTICALS

Kingdom Protista: *Amoeba*, *Euglena*, *Plasmodium*, *Paramecium*

Phylum Porifera: *Sycon* (including T.S. and L.S.), *Hyalonema* and *Euplectella*

Phylum Cnidaria: *Obelia*, *Physalia*, *Aurelia*, *Tubipora*, *Metridium*

Phylum Platyhelminthes: *Taenia solium* and study of its life history stages

Phylum Nemathelminthes: Male and female *Ascaris lumbricoides*

Phylum Annelida: *Aphrodite*, *Nereis*, *Pheretima*, *Hirudinaria*

Phylum Arthropoda: *Palaemon*, *Cancer* *Limulus*, *Palamnaeus*, *Scolopendra*, *Julus*, *Periplaneta*, *Apis*

Phylum Mollusca: *Chiton*, *Dentalium*, *Pila*, *Unio*, *Loligo*, *Sepia*, *Octopus*

Phylum Echinodermata: *Pentaceros*, *Ophiura*, *Echinus*, *Cucumaria* and *Antedon*

Protochordata: *Balanoglossus*, *Herdmania*, *Branchiostoma*, Agnatha: *Petromyzon*

Pisces: *Sphyrna, Pristis, Torpedo, Labeo, Exocoetus, Anguilla,*

Amphibia: *Ichthyophis/ Ureotyphlus, Salamandra, Bufo, Hyla*

Reptilia: *Chelone, Hemidactylus, Chamaeleon, Draco, Vipera, Naja, Crocodylus, Gavialis;* Key for Identification of poisonous and non-poisonous snakes

Aves: Study of six common birds from different orders

Mammalia: *Sorex, Bat, Funambulus, Loris,* An "animal album" containing photographs, cut outs, with appropriate write up about the above mentioned taxa. Different taxa/ topics may be given to different sets of students for this purpose. These need not be repeated as drawings by the album maker.

SYLLABUS OF 2nd SEMESTER (Zoology)

Core Course: Zoology II

COMPARATIVE ANATOMY AND DEVELOPMENTAL BIOLOGY OF VERTEBRATES)

(Credits: Theory-4, Practicals 2)

THEORY

Lectures: 60

A. COMPARATIVE ANATOMY

Unit 1: Integumentary System: Derivatives of integument w.r.t. glands and digital tips

Unit 2: Skeletal System: Evolution of visceral arches

Unit 3: Digestive System: Brief account of alimentary canal and digestive glands

Unit 4: Respiratory System: Gills, lungs, air sacs and swim bladder

Unit 5: Circulatory System: Evolution of heart and aortic arches

Unit 6: Urinogenital System: Succession of kidney, Evolution of urino-genital ducts

Unit 7: Nervous System: Comparative account of brain

Unit 8: Sense Organs: Types of receptors

SUGGESTED READINGS

1. Kardong, K.V. (2005) *Vertebrates' Comparative Anatomy, Function and Evolution*. IV Edition. McGraw-Hill Higher Education.
2. Kent, G.C. and Carr R.K. (2000). *Comparative Anatomy of the Vertebrates*. IX Edition. The McGraw-Hill Companies.
3. Weichert C.K and William Presch (1970). *Elements of Chordate Anatomy*, Tata McGraw Hills
4. Hilderbrand, M and Gaslow G.E. *Analysis of Vertebrate Structure*, John Wiley and Sons.
5. Walter, H.E. and Sayles, L.P; *Biology of Vertebrates*, Khosla Publishing House.

B. DEVELOPMENTAL BIOLOGY

Unit 1: Early embryonic development

Gametogenesis: Spermatogenesis and oogenesis in mammals, vitellogenesis in birds;

Fertilization: external (amphibians), internal (mammals), blocks to polyspermy; Early development of frog and humans (structure of mature egg and its membranes, patterns of cleavage, fate map, up to formation of gastrula); types of morphogenetic movements; Fate of germ layers; Neurulation in frog embryo.

Unit 2: Late embryonic development

Implantation of embryo in humans, Formation of human placenta and functions, other types of placenta on the basis of histology; Metamorphic events in frog life cycle and its hormonal regulation.

Unit 3: Control of Development

Fundamental processes in development (brief idea) – Gene activation, determination, induction, Differentiation, morphogenesis, intercellular communication, cell movements and cell death.

SUGGESTED READINGS

1. Gilbert, S.F. (2006). Developmental Biology, VIII Edition, Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts, USA.
2. Balinsky, B.I. (2008). An introduction to Embryology, International Thomson Computer Press.
3. Carlson, Bruce M (1996). Patten's Foundations of Embryology, McGraw Hill, Inc.

PRACTICALS

A. COMPARATIVE ANATOMY

1. Osteology:

- a. Disarticulated skeleton of fowl and rabbit
- b. Carapace and plastron of turtle/tortoise
- c. Mammalian skulls: One herbivorous and one carnivorous animal.

B. DEVELOPMENTAL BIOLOGY

2. Frog - Study of developmental stages - whole mounts and sections through permanent slides – cleavage stages, blastula, gastrula, neurula, tail bud stage, tadpole external and internal gill stages.
 3. Study of the different types of placentae- histological sections through permanent slides or photomicrographs.
 4. Study of placental development in humans by ultrasound scans.
 5. Examination of gametes - frog/rat - sperm and ova through permanent slides or photomicrographs.
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SYLLABUS OF 3rd SEMESTER (Zoology)

Core Course: Zoology III

Physiology and Biochemistry (Credits: Theory-4, Practicals-2)

THEORY

Lectures: 60

A. PHYSIOLOGY

Unit 1. Nerve and muscle: Structure of a neuron, Resting membrane potential, Graded potential, Origin of Action potential and its propagation in myelinated and non-myelinated nerve fibres, Ultrastructure of skeletal muscle, Molecular and chemical basis of muscle contraction

Unit 2. Digestion: Digestion in different segments of the alimentary canal; Absorption of carbohydrates, proteins, lipids

Unit 3. Respiration: Pulmonary ventilation, Respiratory volumes and capacities, Transport of Oxygen and carbon dioxide in blood.

Unit 4. Excretion: Structure of nephron, mechanism of Urine formation

Unit 5. Cardiovascular system: Blood: Composition, Hemostasis, Heart structure, Origin and conduction of the cardiac impulse, cardiac cycle

Unit 6. Reproduction and Endocrine Glands: Physiology of male reproduction: hormonal control of spermatogenesis; Physiology of female reproduction: hormonal control of menstrual cycle; Structure and function of pituitary, thyroid, parathyroid, pancreas and adrenal

SUGGESTED READINGS

1. Tortora, G.J. & Derrickson, B.H. (2009). Principles of Anatomy and Physiology, 12th edn., John Wiley & Sons, Inc.
2. Widmaier, E.P., Raff, H. & Strang, K.T. (2008) Vander's Human Physiology, 11th edn., McGraw Hill
3. Guyton, A.C. & Hall, J.E. (2011) Textbook of Medical Physiology, 12th edn., Harcourt Asia Pvt. Ltd/ W.B. Saunders Company
4. Nielson: Animal Physiology, Cambridge.
5. Textbook of Physiology by A K Jain; APC New Delhi
6. Animal Physiology and related Biochemistry, H R Singh and N. Kumar SL, Nagin Chand and Co, Delhi

B. BIOCHEMISTRY

Unit 7. Carbohydrate Metabolism: Glycolysis, Krebs Cycle, Pentose phosphate pathway, Gluconeogenesis, Glycogen metabolism, Review of electron transport chain

Unit 8. Lipid Metabolism: Biosynthesis and β oxidation of palmitic acid

Unit 9. Protein metabolism: Transamination, Deamination and Urea Cycle

Unit 10 Enzymes: Introduction, Mechanism of action, Kinetics, Inhibition and Regulation

SUGGESTED READINGS

1. Berg, J. M., Tymoczko, J. L. and Stryer, L. (2006). *Biochemistry*. VI Edition. W.H Freeman and Co.
2. Nelson, D. L., Cox, M. M. and Lehninger, A.L. (2009). *Principles of Biochemistry*. IV Edition. W.H Freeman and Co.
3. Murray, R. K., Granner, D. K., Mayes, P. A. and Rodwell, V. W. (2009). *Harper's Illustrated Biochemistry*. XXVIII Edition. Lange Medical Books/Mc Graw3Hill.

PRACTICALS

A. PHYSIOLOGY

1. Preparation of hemin and hemochromogen crystals
2. Examination of permanent histological sections of mammalian pituitary, thyroid, parathyroid, pancreas, adrenal
3. Examination of permanent slides of spinal cord, duodenum, liver, lung, kidney, bone, cartilage

B. BIOCHEMISTRY

1. Identification of unknown carbohydrates in given solutions (Starch, Sucrose, Lactose, Galactose, Glucose, Fructose)
 2. Colour reactions to identify functional group in the given solution of proteins
 3. Study of activity of salivary amylase under optimum conditions
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SYLLABUS OF 4th SEMESTER (Zoology)

Core Course: Zoology IV

Genetics and Evolutionary Biology (Credits: Theory-4, Practicals-2)

THEORY

Lectures: 60

A. GENETICS

Unit 1. Introduction to Genetics: Mendel's work on transmission of traits, Genetic Variation, Molecular basis of Genetic Information.

Unit 2. Mendelian Genetics and its Extension: Principles of Inheritance, Chromosome theory of inheritance, Pedigree analysis, Incomplete dominance and codominance, Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, Environmental effects on phenotypic expression, sex linked inheritance, extrachromosomal inheritance involving mitochondria and chloroplast.

Unit 3. Linkage, Crossing Over and Chromosomal Mapping: Linkage and crossing over, Cytological basis of crossing over, Molecular mechanism of crossing over, Recombination frequency as a measure of linkage intensity, two factor and three factor crosses, Interference and coincidence, Somatic cell genetics – an alternative approach to gene mapping.

Unit 4. Mutations: Chromosomal Mutations: Deletion, Duplication, Inversion, Translocation, Aneuploidy and Polyploidy; Gene mutations: Induced versus Spontaneous mutations, Back versus Suppressor mutations, Molecular basis of Mutations

Unit 5. Sex Determination: Chromosomal mechanisms, dosage compensation

Unit 6. Quantitative Genetics: Quantitative and multifactor inheritance, Transgressive variations, Heterosis

SUGGESTED READINGS

1. Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). *Principles of Genetics*. VIII Edition. Wiley India.
2. Snustad, D.P., Simmons, M.J. (2009). *Principles of Genetics*. V Edition. John Wiley and Sons Inc.
3. Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). *Concepts of Genetics*. X Edition. Benjamin Cummings.
4. Russell, P. J. (2009). *Genetics- A Molecular Approach*. III Edition. Benjamin Cummings.

5. Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. and Carroll, S.B. *Introduction to Genetic Analysis*. IX Edition. W. H. Freeman and Co.
6. P S Verma and V K Agrwal (2010) Cell biology, genetics, molecular biology and Evolution. S Chand & Company.

B. EVOLUTIONARY BIOLOGY

Unit 1: History of Life: Major Events in History of Life

Unit 2: Introduction to Evolutionary Theories: Lamarckism, Darwinism, Neo-Darwinism

Unit 3: Direct Evidences of Evolution: Types of fossils, Incompleteness of fossil record, Dating of fossils, phylogeny of horse

Unit 4: Processes of Evolutionary Change: Organic variations; Isolating Mechanisms; Natural selection (Example: Industrial melanism); Types of natural selection (Directional, Stabilizing, Disruptive), Artificial selection

Unit 5: Species Concept: Biological species concept (Advantages and Limitations); Modes of speciation (Allopatric, Sympatric)

Unit 6: Evolution above species level: Macro-evolutionary Principles (example: Darwin's Finches)

Unit 7: Extinction: Mass extinction (Causes, Names of five major extinctions, K-T extinction in detail), Role of extinction in evolution

SUGGESTED READINGS

1. Ridley, M. (2004). *Evolution*. III Edition. Blackwell Publishing
2. Barton, N. H., Briggs, D. E. G., Eisen, J. A., Goldstein, D. B. and Patel, N. H. (2007). *Evolution*. Cold Spring, Harbour Laboratory Press.
3. Hall, B. K. and Hallgrímsson, B. (2008). *Evolution*. IV Edition. Jones and Bartlett Publishers
4. Campbell, N. A. and Reece J. B. (2011). *Biology*. IX Edition, Pearson, Benjamin, Cummings.
5. Douglas, J. Futuyma (1997). *Evolutionary Biology*. Sinauer Associates.
6. Minkoff, E. (1983). *Evolutionary Biology*. Addison-Wesley.

PRACTICAL

A. GENETICS

1. Study of Mendelian Inheritance and gene interactions (Non Mendelian Inheritance) using suitable examples. Verify the results using Chi-square test.
2. Study of Linkage, recombination, gene mapping using the data.
3. Study of Human Karyotypes (normal and abnormal).

B. EVOLUTIONARY BIOLOGY

1. Study of fossil evidences from plaster cast models and pictures
2. Study of homology and analogy from suitable specimens/ pictures
3. Charts:
 - a. Phylogeny of horse with diagrams/ cut outs of limbs and teeth of horse ancestors
 - b. Darwin's Finches with diagrams/ cut outs of beaks of different species
4. Visit to Natural History Museum, submission of report

Discipline Specific Elective Zoology (Any One in 5th and 6th Semester)

Reproductive Biology (DSEZ-01) (Credits: Theory-4, Practicals-2)

THEORY

Lectures: 60

Unit 1: Reproductive Endocrinology: Gonadal hormones and mechanism of hormone action, steroids, glycoprotein hormones, and prostaglandins, hypothalamo–hypophyseal–gonadal axis, regulation of gonadotrophin secretion in male and female; Reproductive System: Development and differentiation of gonads, genital ducts, external genitalia, mechanism of sex differentiation.

Unit 2: Functional anatomy of male reproduction: Outline and histological of male reproductive system in rat and human; Testis: Cellular functions, germ cell, stem cell renewal; Spermatogenesis: kinetics and hormonal

regulation; Androgen synthesis and metabolism; Epididymal function and sperm maturation; Accessory glands functions; Sperm transportation in male tract

Unit 3: Functional anatomy of female reproduction: Outline and histological of female reproductive system in rat and human; Ovary: folliculogenesis, ovulation, corpus luteum formation and regression; Steroidogenesis and secretion of ovarian hormones; Reproductive cycles (rat and human) and their regulation, changes in the female tract; Ovum transport in the fallopian tubes; Sperm transport in the female tract, fertilization; Hormonal control of implantation; Hormonal regulation of gestation, pregnancy diagnosis, foeto–maternal relationship; Mechanism of parturition and its hormonal regulation; Lactation and its regulation

Unit 4: Reproductive Health: Infertility in male and female: causes, diagnosis and management; Assisted Reproductive Technology: sex selection, sperm banks, frozen embryos, in vitro fertilization, ET, EFT, IUT, ZIFT, GIFT, ICSI, PROST; Modern contraceptive technologies; Demographic terminology used in family planning

SUGGESTED READINGS

1. Austin, C.R. and Short, R.V. reproduction in Mammals. Cambridge University Press.
2. Degroot, L.J. and Jameson, J.L. (eds). Endocrinology. W.B. Saunders and Company.
3. Knobil, E. et al. (eds). The Physiology of Reproduction. Raven Press Ltd.
4. Hatcher, R.A. et al. The Essentials of Contraceptive Technology. Population Information Programme.

PRACTICALS

1. Study of animal house: set up and maintenance of animal house, breeding techniques, care of normal and experimental animals.
2. Examination of vaginal smear rats from live animals.
3. Surgical techniques: principles of surgery in endocrinology. Ovariectomy, hysterectomy, castration and vasectomy in rats.
4. Examination of histological sections from photomicrographs/ permanent slides of rat/human: testis, epididymis and accessory glands of male reproductive systems; Sections of ovary, fallopian tube, uterus (proliferative and secretory stages), cervix and vagina.
5. Human vaginal exfoliate cytology.
6. Sperm count and sperm motility in rat
7. Study of modern contraceptive devices

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Discipline Specific Elective Zoology (Any One in 5th and 6th Semester)

WILD LIFE CONSERVATION AND MANAGEMENT (DSEZ-02) (Credits: Theory-4, Practicals-2)

THEORY

Lectures: 60

Unit 1: Wild life - Values of wild life - positive and negative; Our conservation ethics; Importance of conservation; causes of depletion; World conservation strategies

Unit 2: Habitat analysis, Evaluation and management of wild life - Physical parameters: Topography, Geology, Soil and water; Biological Parameters: food, cover, forage, browse and cover estimation; Standard evaluation procedures: remote sensing and GIS

Unit 3: Management of habitats - Setting back succession; Grazing logging; Mechanical treatment; Advancing the successional process; Cover construction; Preservation of general genetic diversity.

Unit 4: Population estimation: Population density, Natality, Birth rate, Mortality, fertility schedules and sex ratio computation; Faecal analysis of ungulates and carnivores: Faecal samples, slide preparation, Hair identification, Pug marks and census method.

Unit 5: National Organizations involved in wild life conservation; Wild life Legislation – Wild Protection act - 1972, its amendments and implementation

Unit 6: Management planning of wild life in protected areas; Estimation of carrying capacity; Ecotourism / wild life tourism in forests; Concept of climax persistence; Ecology of disturbance

Unit 7: Management of excess population & translocation; Bio- telemetry; Care of injured and diseased animal; Quarantine; Common diseases of wild animal.

Unit 8: Protected areas National parks & sanctuaries, Community reserve; Important features of protected areas in India; Tiger conservation - Tiger reserves in India; Management challenges in Tiger reserve.

SUGGESTED READINGS

1. Sharma, BD: High Altitude Wildlife of India. Oxford 7 IBH Publ. Co. Pvt. Ltd. 1994.
2. Negi, SS: Himalayan Wildlife: Habitat and Conservation. 1992. Indus Publ. Company, New Delhi.
3. Pullin, AS: Conservation Biology, Cambridge, 2002.

PRACTICALS

1. Identification of flora, mammalian fauna, avian fauna, herpeto-fauna
2. Demonstration of basic equipment needed in wildlife studies use, care and maintenance (Compass, Binoculars, Spotting scope, Range Finders, Global Positioning System, Various types of Cameras and lenses)
3. Familiarization and study of animal evidences in the field; Identification of animals through pug marks, hoof marks, scats, pellet groups, nest, antlers etc.
4. Demonstration of different field techniques for flora and fauna
5. PCQ, Ten tree method, Circular, Square & rectangular plots, Parker's 2 Step and other methods for ground cover assessment, Tree canopy cover assessment, Shrub cover assessment.
6. Trail/ transect monitoring for abundance and diversity estimation of mammals and bird (direct and indirect evidences)

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Discipline Specific Elective Zoology (Any One in 5th and 6th Semester)

MOLECULAR BIOLOGY (DSEZ-03) (Credits: Theory-4, Practicals-2)

THEORY

Lectures: 60

UNIT I:

DNA as genetic material, Structure of DNA, Types of DNA, Replication of DNA in prokaryotes and eukaryotes: Semiconservative nature of DNA replication, Bi-directional replication, DNA polymerases; The replication complex: primosome, replisome, Rolling circle replication, Unique aspects of eukaryotic chromosome replication.

UNIT II:

DNA damage and repair: causes and types of DNA damage, mechanism of DNA repair: Photoreactivation, base excision repair, nucleotide excision repair, mismatch repair, recombinational repair, nonhomologous end joining; Homologous recombination: models and mechanism.

UNIT III:

RNA structure and types of RNA, Transcription in prokaryotes: Prokaryotic RNA polymerase, role of sigma factor, promoter, Initiation, elongation and termination of RNA chains

UNIT IV:

Transcription in eukaryotes: Eukaryotic RNA polymerases, transcription factors, promoters, enhancers, mechanism of transcription initiation, promoter clearance and elongation RNA splicing and processing: processing of pre-mRNA: 5' cap formation, polyadenylation, splicing, rRNA and tRNA splicing.

UNIT IV: Regulation of gene expression and translation

Regulation of gene expression in prokaryotes: Operon concept (inducible and repressible system), Genetic code and its characteristics. Ribosome structure and assembly, Charging of tRNA, aminoacyl tRNA synthetases, Mechanism of initiation, elongation and termination of polypeptides, Fidelity of translation, Inhibitors of translation, Post-translational modifications of proteins.

SUGGESTED READINGS

1. Freifelder, D: Molecular Biology. Narosa Publ. House.
2. De Robertis E.D.P.: Cell and Molecular Biology, Lea & Febiger, U.S. 1987
3. Alberts et al.: Molecular Biology of the cell. Garland Publ., New York.
4. Verma, P.S. and Agrwal, V. K. Cell Biology, Genetics, Molecular biology, Evolution and Ecology (S. Chand & Co.)

PRACTICALS

1. Preparation of solutions for Molecular Biology experiments.
2. Isolation of chromosomal DNA from bacterial cells.

3. Isolation of Plasmid DNA by alkaline lysis method
4. Agarose gel electrophoresis of genomic DNA & plasmid DNA
5. Preparation of restriction enzyme digests of DNA samples
6. Demonstration of AMES test or reverse mutation for carcinogenicity

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**Discipline Specific Elective Zoology
(Any One in 5th and 6th Semester)**

**Immunology (DSEZ-04)
(Credits: Theory-4, Practicals-2)**

THEORY

Lectures: 60

Unit 1: Overview of the immune system- Introduction to basic concepts in immunology, components of immune system, principles of innate and adaptive immune system

Unit 2: Cells and organs of the immune system- Haematopoiesis, cells of immune system and organs (primary and secondary lymphoid organs) of the immune system

Unit 3: Antigens- Basic properties of antigens, B and T cell epitopes, haptens and adjuvants

Unit 4: Antibodies- Structure, classes and function of antibodies, monoclonal antibodies, antigen antibody interactions as tools for research and diagnosis

Unit 5: Working of the immune system I- Structure and functions of MHC, exogenous and endogenous pathways of antigen presentation and processing

Unit 6: Working of immune system II- Basic properties and functions of cytokines, types and functions of complement system

Unit 7: Immune system in health and disease I- Hypersensitivity: types and functions, introduction to concepts of autoimmunity and immunodeficiency

Unit 8: Immune system in health and disease II- Infectious agents and how they cause diseases, course of adaptive response to infection, general introduction to vaccines

SUGGESTED READINGS

1. Kindt, T. J., Goldsby, R. A., Osborne, B. A., Kuby, J. (2006). VI Edition. Immunology. W.H. Freeman and Company.
2. Delves, P. J., Martin, S. J., Burton, D. R., Roitt, I.M. (2006). XI Edition. Roitt's Essential Immunology, Blackwell Publishing.

PRACTICALS

1. Study of lymphoid organs (by slides or micrographs)
2. ABO blood group determination
3. Ouchterlony's double diffusion assay
4. Preparation, cell count and percentage viability of spleenocytes
5. Enzyme linked immunosorbent assay (DOT-ELISA)
6. Demonstration of immunoelectrophoresis

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**Discipline Specific Elective Zoology
(Any One in 5th and 6th Semester)**

**APPLIED ZOOLOGY (DSEZ-05)
(Credits: Theory-4, Practicals-2)**

THEORY

Lectures: 60

Unit 1: Introduction to Host-parasite Relationship: Host, Definitive host, Intermediate host, Parasitism, Symbiosis, Commensalism, Reservoir, Zoonosis

Unit 2: Epidemiology of Diseases: Transmission, Prevention and control of diseases: Tuberculosis, swine flu, typhoid

Unit 3: Rickettsiae and Spirochaetes: Brief account of *Rickettsia prowazekii*, *Borrelia recurrentis* and *Treponema pallidum*

Unit 4: Parasitic Protozoa: Life history and pathogenicity of *Entamoeba histolytica*, *Plasmodium vivax* and *Trypanosoma gambiense*

Unit 5: Parasitic Helminthes: Life history and pathogenicity of *Schistosoma haematobium*, *Ancylostoma duodenale* and *Wuchereria bancrofti*

Unit 6: Insects of Economic Importance: Biology, Control and damage caused by *Helicoverpa armigera*, *Pyrilla perpusilla* and *Papilio demoleus*, *Callosobruchus chinensis*, *Sitophilus oryzae* and *Tribolium castaneum*; Safe storage of stored grains

Unit 7: Insects of Medical Importance: Life cycle, medical importance and control of *Pediculus humanus corporis*, *Anopheles*, *Culex*, *Aedes*, *Xenopsylla cheopis*, *Phlebotomus argentipes*

Unit 8: Animal Husbandry: Preservation and artificial insemination in cattle; Induction of early puberty and synchronization of estrus in cattle

Unit 9: Poultry Farming: Principles of poultry breeding, Management of breeding stock and broilers, Processing and preservation of eggs

Unit 10: Fish Technology: Genetic improvements in aquaculture industry; Induced breeding and transportation of fish seed

SUGGESTED READINGS

1. Park, K. (2007). *Preventive and Social Medicine*. XVI Edition. B.B Publishers.
2. Arora, D. R and Arora, B. (2001). *Medical Parasitology*. II Edition. CBS Publications and Distributors.
3. Kumar and Corton. *Pathological Basis of Diseases*.
4. Atwal, A.S. (1986). *Agricultural Pests of India and South East Asia*, Kalyani Publishers.
5. Dennis, H. (2009). *Agricultural Entomology*. Timber Press (OR).
6. Hafez, E. S. E. (1962). *Reproduction in Farm Animals*. Lea & Fabiger Publisher
7. Dunham R.A. (2004). *Aquaculture and Fisheries Biotechnology Genetic Approaches*. CABI publications, U.K.
8. Pedigo, L.P. (2002). *Entomology and Pest Management*, Prentice Hall.

PRACTICALS

1. Study of permanent slides/photomicrographs and specimens of *Plasmodium vivax*, *Entamoeba histolytica*, *Trypanosoma gambiense*, *Schistosoma haematobium*, *Ancylostoma duodenale* and *Wuchereria bancrofti*
2. Study of arthropod vectors associated with human diseases: *Pediculus*, *Culex*, *Anopheles*, *Aedes* and *Xenopsylla*.
3. Study of insect damage to different plant parts/stored grains through damaged products/photographs.
4. Identifying feature and economic importance of *Helicoverpa (Heliothis) armigera*, *Papilio demoleus*, *Pyrilla perpusilla*, *Callosobruchus chinensis*, *Sitophilus oryzae* and *Tribolium castaneum*
5. Visit to poultry farm or animal breeding centre. Submission of visit report
6. Maintenance of freshwater aquarium

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Discipline Specific Elective Zoology (Any One in 5th and 6th Semester)

ANIMAL BEHAVIOUR AND ECOLOGY (DSEZ-06) (Credits: Theory-4, Practicals-2)

THEORY

Lectures: 60

UNIT I

ANIMAL BEHAVIOUR: The science of behaviour: History, scope and terminology. Proximate and ultimate causes of behaviour. Instinct: Definition and characteristics (sign stimuli and Fixed Action Pattern). Learning behaviour: Definition. Spatial learning. Associative learning, classical conditioning, operant conditioning, language learning. Imprinting. Kin recognition. Instinct versus learning behaviour.

UNIT II

Biological rhythms. The Biological Clock. Circadian rhythms and their synchronisation seasonal rhythms. Photoperiodism. Communication: Visual, olfactory, acoustic. Chemoreception: Chemicals (pheromones) as signals in insects, fish and mammals. Hormonal Control of behaviour. Cooperation and conflict: Evolution of altruism.

UNIT III

ECOLOGY: Definition, Scope, Importance, Application. Limiting Factors: Liebig's law of the minimum, Shelford's law of tolerance. Combined concept of limiting factor, Factor interaction. Homeostasis. Biogeochemical cycle: Concept & Types of biogeochemical cycle (nitrogen, phosphorus, carbon & water cycle).

UNIT- IV

Ecosystem Concept; Abiotic and Biotic factors and their interdependence. Energy flow; Food chains & Ecological pyramids. Habitat Ecology: Concept of habitats & ecological niche.

UNIT V

Population: Concept & attributes: Biotic potential, Density, Natality, Mortality; Population growth forms; Carrying capacity; Community: Concept & characteristics: Density, Dominance, Diversity & Stratification. Environmental pollution (Air, water, solid waste, Radioactive); Environmental Impact Assessment.

SUGGESTED READINGS

1. Alcock, John: Animal Behavior: An Evolutionary Approach Published by Oxford University Press, ISBN 10: 0878930205 ISBN 13: 9780878930203 1989
2. Goodenough, Judith, Betty McGuire, Elizabeth Jakob: Perspectives on Animal Behavior, Wiley & Sons, New York. 1993
3. Grier, JW: Biology of Animal Behaviour, Mosby 1984.
4. Davies, NB and Krebs: An Introduction to Behavioural Ecology (3rd ed.) Blackwell 1993.
5. Lehner, PN: Handbook of Ethological Methods, Garland STPM Press, New York, 1979.
6. Halliday, T.R.: Animal Behaviour Vol. 1 & 2 Communication, 1983.
7. Arora, M P. Animal Behaviour. Himalayan Publishing House 1996
8. Kendeigh, Charles: Animal Ecology, Prentice Hall 1961.
9. Odum, EP: Fundamentals of Ecology, Saunders Co. Publ., 1993 Indian ed.
10. Ricklefs, RE: Ecology, Newton Mass, Chiron Press 1974
11. Singh, HR and Neeraj Kumar: Ecology and Environmental Science, Vishal Publishing Co., Jalandhar 2014

PRACTICALS

1. Models Based on different aspects of animal behaviour and ecology
2. Population study of available terrestrial and aquatic animals
3. Physicochemical study of soil and water

SKILL ENHANCEMENT COURSES (One each in 3rd, 4th, 5th, and 6th Semester) (Credits 2)

PUBLIC HEALTH AND HYGIENE (SECZ-01)

Lectures: 30

Unit 1: Scope of Public health and Hygiene – nutrition and health – classification of foods – Nutritional deficiencies - Vitamin deficiencies.

Unit 2: Environment and Health hazards – Environmental degradation – Pollution and associated health hazards.

Unit 3: Communicable diseases and their control measures such as Measles, Polio, Chikungunya, Rabies, Plague, Leprosy and AIDS.

Unit 4: Non-Communicable diseases and their preventive measures such as Hypertension, Coronary Heart diseases, Stroke, Diabetes, Obesity and Mental ill-health.

Unit 5: Health Education in India – WHO Programmes – Government and Voluntary Organizations and their health services – Precautions, First Aid and awareness on sporadic diseases.

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SKILL ENHANCEMENT COURSES
(One each in 3rd, 4th, 5th, and 6th Semester)
(Credits 2)

AQUARIUM FISH KEEPING (SECZ-02)

Lectures: 30

Unit 1: The potential scope of Aquarium Fish Industry as a Cottage Industry. Exotic and endemic species of Aquarium fishes. General Aquarium maintenance – Budget for setting up an aquarium fish farm as a Cottage Industry.

Unit 2: Common characters and sexual dimorphism of Fresh water and Marine Aquarium fishes such as Guppy, Molly, Gold fish, Angel fish, Blue morph, *Puntius conchoni* and *Barilius bendelisis*

Unit 3: Food and feeding of Aquarium fishes – Use of live fish feed organisms. Preparation and composition of formulated fish feeds.

Unit 4: Live fish transport – Fish handling, packing and forwarding techniques.

Unit 5: General Aquarium maintenance – budget for setting up an Aquarium Fish Farm as a Cottage Industry.

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SKILL ENHANCEMENT COURSES
(One each in 3rd, 4th, 5th, and 6th Semester)
(Credits 2)

PISCICULTURE (SECZ-03)

Lectures: 30

Unit 1: Scope of Aquaculture. Importance of cultivable fresh water, marine ornamental species.

Unit 2: Fish farm Maintenance – Farm management technique, water quality, temperature and accessories in Farm management viz Aerator, Filter, paddler

Unit 3: Fish culture technique, Monoculture, Polyculture and monosex culture, Induced fish breeding, Integrated fish farming

Unit 4: Fish nutrition and fish formulations live fish live fish transport.

Unit 5: Prevention and control of fish diseases.

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SKILL ENHANCEMENT COURSES
(One each in 3rd, 4th, 5th, and 6th Semester)
(Credits 2)

POULTRY FARMING (SECZ-04)

Lectures: 30

Unit 1: External morphology of variety of Fowls such as Plymouth Rock, Light Sussex, Minorca, Rhode Island, Red and White Leghorn.

Unit 2: Classification of Fowls based on their use: Meat type such as Broilers, Egg type such as White Leghorn and Commercial layers, Dual purpose varieties, Game and Ornamental purpose varieties.

Unit 3: Feeding Poultry – Management of Egg Layers – Management of Broilers in large scale farms.

Unit 4: Poultry diseases Viral, Bacterial, Fungal, Protozoan and Parasitic Lice etc., Prevention and precautions during vaccination.

Unit 5: Management of a modern Poultry Farms – Progressive plans to promote Poultry as a Self-Employment venture.

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SKILL ENHANCEMENT COURSES
(One each in 3rd, 4th, 5th, and 6th Semester)
(Credits 2)

SERICULTURE (SECZ-05)

Lectures: 30

Unit 1: Classification of commercial varieties of mulberry. Mulberry plantation establishment and cultivation practices.

Unit 2: Diseases of mulberry – fungal, bacterial, viral and Nematode diseases, Deficiency diseases and their remedial measures.

Unit 3: Silkworm rearing operations – Chawki rearing and Late age rearing techniques.

Unit 4: Physical and commercial characters of Cocoons. Reeling operations, Importance of by-products of Sericulture.

Unit 5: Economics of Sericulture – Future and progress of Sericulture Industry in India. Prospects of Sericulture as Self-Employment venture.

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SKILL ENHANCEMENT COURSES
(One each in 3rd, 4th, 5th, and 6th Semester)
(Credits 2)

APICULTURE (SECZ-06)

Lectures: 30

Unit 1: History – Biology and classification of honey bees, species of honey bees, social organization of honey bee colony.

Unit 2: Bee hive – Flora for apiculture – Selection of bees for apiculture, Method of bee Keeping – Indigenous method of Extraction of honey

Unit 3: Modern method of apiculture – Appliances for modern method. Diseases of Honey bee and control measures.

Unit 4: Products of bee keeping: Honey–Bee wax–Honey: Production, Chemical composition – Economic importance of Honey bee wax.

Unit 5: Bee enemies – Bee keeping industry – Recent efforts – Modern method in employing honey bees for cross pollination in horticultural gardens.

Proposed scheme for choice based credit system in B. Sc. with Botany

	DISCIPLINE CORE COURSE (12)	Ability Enhancement Compulsory Course (AECC) (2)	Skill Enhancement Course (SEC) (2)	Discipline Specific Elective DSE (6)
I	Discipline-1 Botany Paper I: Biodiversity (Microbes, Algae, Fungi and Archegoniate)	(English/MIL Communication)/ Environmental Science		
	DSC- 2 Paper I			
	DSC- 3 Paper I			
II	Discipline-1 Botany Paper II: Plant Ecology and Taxonomy	Environmental Science /(English/MIL Communication)		
	DSC- 2 Paper II			
	DSC- 3 Paper II			
III	Discipline-1 Botany Paper III: Plant Anatomy and Embryology		SEC-1	
	DSC- 2 Paper III			
	DSC- 3 Paper III			
IV	Discipline-1 Botany		SEC -2	

	Paper IV: Plant Physiology and Metabolism			
	DSC- Discipline 2 Paper IV			
	DSC- Discipline 3 Paper IV			
V			SEC -3	DSE-Botany Paper I
				DSE-Discipline 2 Paper I
				DSE- Discipline 3 Paper I
VI			SEC -4	DSE-Botany Paper II
				DSE- Discipline 2 Paper II
				DSE- Discipline 3 Paper II

HISTORY (UG)

Vth

GE 1

Women in Indian History

I. Theory and concepts

- [a] Understanding gender and patriarchy
- [b] Historiography: women's history in India

II. Women in ancient India

- [a] Brahmanical patriarchy in India
- [b] Women and property
- [c] Women and work: voices from Tamilakam

III. Women in medieval India

- [a] Political processes, the harem and household
- [b] Imperial women: Razia Sultan, Nur Jahan, Jahanara
- [c] Women and literary activities

IV. Women in Modern India

- [a] Social reforms and women in the 19th century: social base, issues, Achievements and limitations
- [b] Women and Indian Nationalism: prior to 1920; Gandhi and women's participation; programmes; limitations and constraints
- [c] Women and Partition: trauma, dislocation and disruption; refugee women and rehabilitation

ESSENTIAL READINGS

- Bhasin, Kamla. *Understanding Gender*. New Delhi: Women Unlimited, 2000.
- Bokhari, Afshan. 'Between Patron and Piety: Jahān Ārā Begam's Sufi Affiliations and Articulations in Seventeenth-century Mughal India'. In *Arrangements of the Mystical in the Muslim World, 1200–1800*. Taylor and Francis, 2011.
- Chakravarti, Uma. 'Conceptualising Brahmanical Patriarchy in Early India: Gender, Class, Caste and State'. *Economic and Political Weekly*, 28(14), 3 April 1993, pp.579-85.
- Forbes, Geraldine. *Women in Modern India*. Cambridge: Cambridge University Press, 1996.
- Gupta, Charu, ed. *Gendering Colonial India: Reforms, Print, Caste and Communalism*. Delhi: Orient Blackswan, 2012 [Introduction].
- Kumar, Radha. *The History of Doing: An Illustrated Account of Movements for Women's Rights and Feminism in India, 1800-1990*. Delhi: Zubaan, 1997 [Also available in Hindi].

VI

SEC VI

Popular Culture

- I. Defining popular culture
- II. Theatre-folk, tales, songs and dances
- III. Folklore and oral traditions of kathas, narratives, legends
- IV. Festivals, fairs and rituals
- V. Pilgrimage and pilgrim practices
- VI. Food cultures of India

A visit to a cultural event/ exhibition/performance is part of this course.

ESSENTIAL READINGS:

- Acharya, K.T. *Indian Food: A Historical Companion*. New Delhi: OUP, 1994.
- Bhardwaj, R.M. *Vratas and Utsavas in North and Central India (Literary and Epigraphic Sources : c400-1200)*, New Delhi: Eastern Book Linkers, 2015.
- Buck, C.H. *Faiths, Fairs and Festivals of India*. New Delhi: Asian Publishing Services, 1977.
- Jha, M., ed. *Social Anthropology of Pilgrimage*. New Delhi: Inter-India Publication, 1991.
- Storey, J. *Cultural Theory and Popular Culture*. Delhi: Pearson Prentice Hall, 2009.
- Thakran, R.C., Shiv Dutt and Sanjay Kumar, eds. *भारतीय उपमहाद्वीप की संस्कृतियों*, Vol. I&II, Delhi: Hindi Madyam Karyanvay Nideshalay, 2013.
- Verma, L.B. *भारत की जन्कथा*. Allahabad: Itihasbodh Prakashan, 2012.

SEC IV

Archives and Museums

I. Defining museums and archives

II. History of the setting up of museums: case study of Indian Museum, Calcutta; Salarjung Museum, Hyderabad; and National Museum, Delhi (one case study)

III. History of the setting up of archives: Case study of the National Archives of India, Delhi (one case study)

IV. New kinds of museums and archives: virtual; digital; crafts; media.

A visit to a museum and/or archive is part of this course.

ESSENTIAL READINGS:

- *A Guide to the National Museum*. New Delhi: National Museum, 1997.
- Agarwal, O.P. *Essentials of Conservation and Museology*. Delhi: Sundeep Prakashan, 2007.
- Agarwal, O.P. *Pustakalaya Samagri Aur Kala-Vastuon Ka Parirakshan*. Delhi: NBT, 1999.
- Edson, G. and D. David. *Handbook for Museums*. London: Routledge, 1986.
- Guha Thakurta, Tapati. *Monuments, Objects, Histories: Institutions of Art in Colonial India*. Delhi: Permanent Black, 2004.
- Kathpalia, Y.P. *Conservation and Restoration of Archive Materials*. UNESCO, 1973.
- Ridener, J. *From Folders to Post Modernism: A Concise History of Archival Theory*. LLC: Litwin Books, 2009.

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- Agarwal, O.P. *Essentials of Conservation and Museology*. Delhi: Sundeep Prakashan, 2007.
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- Edson, G. and D. David. *Handbook for Museums*. London: Routledge, 1986.
- Guha Thakurta, Tapati. *Monuments, Objects, Histories: Institutions of Art in Colonial India*. Delhi: Permanent Black, 2004.
- Kathpalia, Y.P. *Conservation and Restoration of Archive Materials*. UNESCO, 1973.
- Ridener, J. *From Folders to Post Modernism: A Concise History of Archival Theory*. LLC: Litwin Books, 2009.

SEC III

An Introduction to Archaeology

- I. Defining archaeology; understanding its origins and development
- II. The variety of archaeological evidence
- III. Survey and excavation of sites and features
- IV. Discovering human experience through archaeology – environment, technology, subsistence, society, trade and ways of thinking

A visit to a site/museum is part of this course.

ESSENTIAL READINGS:

- ASI publications
- Bahn, P. *Archaeology – A Very Short Introduction*. Oxford: Oxford University Paperback, 1996.
- Chakrabarti, D. K. *The Oxford Companion to Indian Archaeology*. New Delhi: Oxford University Press, 2006.
- Hall, M. & W. Silliman, *Historical Archaeology*. USA: Wiley-Blackwell, 2006.
- Renfrew, C. and Paul Bahn. *Archaeology – Theories Methods and Practice*. London: Thames and Hudson Paperback, 1991.

SEC II

Introducing Indian Art

I. Understanding key terms in art appreciation: art, craft, etc.

II. Sculpture

[a] Iconography: Hindu, Buddhist and Jaina

[b] Modern sculpture

III. Architecture

[a] Temple architecture -- Nagara, Dravida and Vesara

[b] Mosques and Mausoleums -- Qutb Complex; Humayun's tomb; Jama Masjid; Taj Mahal (any one)

[c] Colonial architecture

[e] Modern and contemporary architecture

IV. Painting

[a] Mural painting -- Ajanta

[b] Mughal and Rajput- miniature styles

[c] Raja Ravi Verma and the Bengal School

[d] Modern and contemporary artists

A visit to a museum/monument/art gallery is part of this course.

ESSENTIAL READINGS:

- Beach, M.C. *The New Cambridge History of India: 3, Mughal and Rajput Painting*. Delhi: CUP, 1992.

VI

SEC I

History and Tourism

I. Defining heritage

Art and architecture in India: an overview

II. Understanding built heritage

Stupa architecture – Sanchi

Temple architecture -- a case study of any temple/temple complex

Indo-Persian architecture, forts, palaces, mosques: Delhi

Colonial architecture: Delhi

IV. Varieties of tourism

Tourism management

Tour packages

A visit to a historical site/museum is part of this course.

ESSENTIAL READINGS:

- Agarwal, V.S. *Indian Art*. Varanasi: PrithviPrakashan, 1972.
- Bhowmik, S. K. *Heritage Management: Care, Understanding & Appreciation of Cultural Heritage*, Jaipur, 2004.
- Harle, J. *The Art and Architecture of the Indian Subcontinent*. Harmondsworth: Penguin, 1988.
- Howard, P. *Heritage: Management, Interpretation, Identity and London*. London: Continuum International Publishing, 2003.
- Kumar, S. *The Present in Delhi's Past*. Delhi: Gyan Publishing House, 2002.
- Ghosh, B. *Tourism and Travel Management*. New Delhi: Vikas Publishing House, 1998.

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SEC I

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- Agarwal, V.S. *Indian Art*. Varanasi: PrithviPrakashan, 1972.
- Bhowmik, S. K. *Heritage Management: Care, Understanding & Appreciation of Cultural Heritage*, Jaipur, 2004.
- Harle, J. *The Art and Architecture of the Indian Subcontinent*. Harmondsworth: Penguin, 1988.
- Howard, P. *Heritage: Management, Interpretation, Identity and London*. London: Continuum International Publishing, 2003.
- Kumar, S. *The Present in Delhi's Past*. Delhi: Gyan Publishing House, 2002.
- Ghosh, B. *Tourism and Travel Management*. New Delhi: Vikas Publishing House, 1998.

Revised syllabus of B.Sc. Chemistry from 2016-17
CBCS system – BSc - CHEMISTRY Courses

	DSC 6 credits each	SEC 2 credits each (maximum two)	DSE 6 credits each
Semester I	DSC-2A-Theory Inorganic Chemistry-I Organic Chemistry-I DSC-2A-Practical		
Semester II	DSC-2B-Theory Physical Chemistry-I Organic Chemistry-II DSC-2B-Practical		
Semester III	DSC-2C-Theory Physical Chemistry-II Organic Chemistry-III DSC-2C-Practical	SEC-1	
Semester IV	DSC-2D-Theory Inorganic Chemistry-II Physical Chemistry-III DSC-2D-Practical	SEC-2	
Semester V		SEC-3	DSE-2A-Chemistry
Semester VI		SEC-4	DSE-2B-Chemistry

Chemistry Course [**DSC – 2**]

(Sem I)

DSC-2A - Atomic Structure Bonding, & General Organic Chemistry, Aliphatic hydrocarbon
 Inorganic Chemistry-I
 Organic Chemistry-I

DSC-2A Lab- Atomic Structure Bonding, & General Organic Chemistry, Aliphatic hydrocarbon
 Inorganic Chemistry-I
 Organic Chemistry-I

(Sem II)

DSC-2B ó Chemical Energetics, Equilibria & Functional Organic Chemistry
 Physical Chemistry-I
 Organic Chemistry-II

DSC-2B Lab - Chemical Energetics, Equilibria & Functional Organic Chemistry

Physical Chemistry-I
Organic Chemistry-II

(Sem III)

DSC-2C ó Solutions, Phase Equilibrium, Conductance, Electrochemistry & Functional group
Organic Chemistry

Physical Chemistry-II
Organic Chemistry-III

DSC-2C Lab ó Solutions, Phase Equilibrium, Conductance, Electrochemistry & Functional group
Organic Chemistry

Physical Chemistry-II
Organic Chemistry-III

(Sem IV)

DSC-2D ó **Coordination chemistry**, States of Matter & Chemical Kinetics
Inorganic Chemistry-II
Physical Chemistry-III

DSC-2D Lab ó **Coordination chemistry**, States of Matter & Chemical Kinetics
Inorganic Chemistry-II
Physical Chemistry-III

Chemistry Courses [SEC]

Basic Analytical Chemistry
Green Methods in Chemistry
Chemistry and Cosmetics & Perfumes
Pesticides Chemistry

Chemistry Courses [DSE]

Semester- V (Any one)
Analytical Methods in Chemistry
Polymer Chemistry
Green Chemistry
Semester – VI (Any one)
Instrumental Methods of Chemical Analysis
Organometallics, Bio-inorganic, Polynuclear Hydrocarbon, UV and IR Spectroscopy
Molecules of Life

Semester I

CHEMISTRY-DSC 2A: ATOMIC STRUCTURE, BONDING, GENERAL ORGANIC CHEMISTRY & ALIPHATIC HYDROCARBONS

(Credits: Theory-04, Practicals-02)

Theory: 60 Lectures

Section A: Inorganic Chemistry-I (30 Periods)

Atomic Structure: Review of: Bohr's theory and its limitations, dual behaviour of matter and radiation, de Broglie's relation, Heisenberg Uncertainty principle. Hydrogen atom spectra. Need of a new approach to Atomic structure.

What is Quantum mechanics? Time independent Schrodinger equation and meaning of various terms in it. Significance of ψ and ψ^2 , Schrödinger equation for hydrogen atom. Radial and angular parts of the hydrogenic wavefunctions (atomic orbitals) and their variations for $1s$, $2s$, $2p$, $3s$, $3p$ and $3d$ orbitals (Only graphical representation). Radial and angular nodes and their significance. Radial distribution functions and the concept of the most probable distance with special reference to $1s$ and $2s$ atomic orbitals. Significance of quantum numbers, orbital angular momentum and quantum numbers m_l and m_s . Shapes of s , p and d atomic orbitals, nodal planes. Discovery of spin, spin quantum number (s) and magnetic spin quantum number (m_s).

Rules for filling electrons in various orbitals, Electronic configurations of the atoms. Stability of half-filled and completely filled orbitals, concept of exchange energy. Relative energies of atomic orbitals, Anomalous electronic configurations.

(14 Lectures)

Chemical Bonding and Molecular Structure

Ionic Bonding: General characteristics of ionic bonding. Energy considerations in ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Statement of Born-Landé equation for calculation of lattice energy, Born-Haber cycle and its applications, polarizing power and polarizability. Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment and percentage ionic character.

Covalent bonding: VB Approach: Shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements.

Concept of resonance and resonating structures in various inorganic and organic compounds.

MO Approach: Rules for the LCAO method, bonding and antibonding MOs and their characteristics for $s-s$, $s-p$ and $p-p$ combinations of atomic orbitals, nonbonding combination of orbitals, MO treatment of homonuclear diatomic molecules of 1st and 2nd periods (including idea of $s-p$ mixing) and heteronuclear diatomic molecules such as CO, NO and NO^+ . Comparison of VB and MO approaches.

(16 Lectures)

Section B: Organic Chemistry-1 (30 Periods)

Fundamentals of Organic Chemistry

Physical Effects, Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation. Cleavage of Bonds: Homolysis and Heterolysis.

Structure, shape and reactivity of organic molecules: Nucleophiles and electrophiles. Reactive Intermediates: Carbocations, Carbanions and free radicals.

Strength of organic acids and bases: Comparative study with emphasis on factors affecting pK values. Aromaticity: Benzenoids and Hückel's rule.

(8 Lectures)

Stereochemistry

Conformations with respect to ethane, butane and cyclohexane. Interconversion of Wedge Formula, Newmann, Sawhorse and Fischer representations. Concept of chirality (upto two carbon atoms). Configuration: Geometrical and Optical isomerism; Enantiomerism, Diastereomerism and Meso compounds). Threo and erythro; D and L; *cis - trans* nomenclature; CIP Rules: R/ S (for upto 2 chiral carbon atoms) and E / Z Nomenclature (for upto two C=C systems).

(10 Lectures)

Aliphatic Hydrocarbons

Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure.

Alkanes: (Upto 5 Carbons). *Preparation:* Catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, from Grignard reagent. *Reactions:* Free radical Substitution: Halogenation.

Alkenes: (Upto 5 Carbons) *Preparation:* Elimination reactions: Dehydration of alkenes and dehydrohalogenation of alkyl halides (Saytzeff's rule); *cis* alkenes (Partial catalytic hydrogenation) and *trans* alkenes (Birch reduction). *Reactions:* *cis*-addition (alk. KMnO₄) and *trans*-addition (bromine), Addition of HX (Markownikoff's and anti-Markownikoff's addition), Hydration, Ozonolysis, oxymercuration-demercuration, Hydroboration-oxidation.

Alkynes: (Upto 5 Carbons) *Preparation:* Acetylene from CaC₂ and conversion into higher alkynes; by dehalogenation of tetra halides and dehydrohalogenation of vicinal-dihalides. *Reactions:* formation of metal acetylides, addition of bromine and alkaline KMnO₄, ozonolysis and oxidation with hot alk. KMnO₄.

(12 Lectures)

Reference Books:

- Lee, J.D. *Concise Inorganic Chemistry* ELBS, 1991.
- Cotton, F.A., Wilkinson, G. & Gaus, P.L. *Basic Inorganic Chemistry*, 3rd ed., Wiley.
- Douglas, B.E., McDaniel, D.H. & Alexander, J.J. *Concepts and Models in Inorganic Chemistry*, John Wiley & Sons.
- Huheey, J.E., Keiter, E.A., Keiter, R.L. & Medhi, O.K. *Inorganic Chemistry: Principles of*

Structure and Reactivity, Pearson Education India, 2006.

- Graham Solomon, T.W., Fryhle, C.B. & Snyder, S.A. *Organic Chemistry*, John Wiley & Sons (2014).
- McMurry, J.E. *Fundamentals of Organic Chemistry*, 7th Ed. Cengage Learning India Edition, 2013.
- Sykes, P. *A Guidebook to Mechanism in Organic Chemistry*, Orient Longman, New Delhi (1988).
- Eliel, E.L. *Stereochemistry of Carbon Compounds*, Tata McGraw Hill education, 2000.
- Finar, I.L. *Organic Chemistry* (Vol. I & II), E.L.B.S.
- Morrison, R.T. & Boyd, R.N. *Organic Chemistry*, Pearson, 2010.
- Bahl, A. & Bahl, B.S. *Advanced Organic Chemistry*, S. Chand, 2010.

CHEMISTRY LAB: DSC 2A LAB: ATOMIC STRUCTURE, BONDING, GENERAL ORGANIC CHEMISTRY & ALIPHATIC HYDROCARBONS

60 Lectures

Section A: Inorganic Chemistry - Volumetric Analysis

1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.
2. Estimation of oxalic acid by titrating it with KMnO_4 .
3. Estimation of water of crystallization in Mohr's salt by titrating with KMnO_4 .
4. Estimation of Fe (II) ions by titrating it with $\text{K}_2\text{Cr}_2\text{O}_7$ using internal indicator.
5. Estimation of Cu (II) ions iodometrically using $\text{Na}_2\text{S}_2\text{O}_3$.

Section B: Organic Chemistry

1. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing upto two extra elements)
2. Separation of mixtures by Chromatography: Measure the R_f value in each case (combination of two compounds to be given)

Identify and separate the components of a given mixture of 2 amino acids (glycine, aspartic acid, glutamic acid, tyrosine or any other amino acid) by paper chromatography

Identify and separate the sugars present in the given mixture by paper chromatography.

Reference Books:

- Svehla, G. *Vogel's Qualitative Inorganic Analysis*, Pearson Education, 2012.
- Mendham, J. *Vogel's Quantitative Chemical Analysis*, Pearson, 2009.
- Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., *Textbook of Practical Organic Chemistry*, Prentice-Hall, 5th edition, 1996.
- Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry* Orient-Longman, 1960.

Semester II

CHEMISTRY-DSC 2B: CHEMICAL ENERGETICS, EQUILIBRIA & FUNCTIONAL ORGANIC CHEMISTRY

(Credits: Theory-04, Practicals-02)

Theory: 60 Lectures

Section A: Physical Chemistry-1 (30 Lectures)

Chemical Energetics

Review of thermodynamics and the Laws of Thermodynamics.

Important principles and definitions of thermochemistry. Concept of standard state and standard enthalpies of formations, integral and differential enthalpies of solution and dilution. Calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data. Variation of enthalpy of a reaction with temperature & Kirchhoff's equation.

Statement of Third Law of thermodynamics and calculation of absolute entropies of substances.

(10 Lectures)

Chemical Equilibrium:

Free energy change in a chemical reaction. Thermodynamic derivation of the law of chemical equilibrium. Distinction between G and G° , Le Chatelier's principle. Relationships between K_p , K_c and K_x for reactions involving ideal gases.

(08 Lectures)

Ionic Equilibria:

Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect. Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions. Solubility and solubility product of sparingly soluble salts & applications of solubility product principle.

(12 Lectures)

Section B: Organic Chemistry-2 (30 Lectures)

Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure.

Aromatic hydrocarbons

Preparation (Case benzene): from phenol, by decarboxylation, from acetylene, from benzene sulphononic acid.

Reactions: (Case benzene): Electrophilic substitution: nitration, halogenation and sulphonation. Friedel-Craft's reaction (alkylation and acylation) (upto 4 carbons on benzene). Side chain oxidation of alkyl benzenes (upto 4 carbons on benzene).

(8 Lectures)

Alkyl and Aryl Halides

Alkyl Halides (Upto 5 Carbons) Types of Nucleophilic Substitution (S_N1 , S_N2 and S_Ni) reactions.

Preparation: from alkenes and alcohols.

Reactions: hydrolysis, nitrite & nitro formation, nitrile & isonitrile formation. Williamson's ether synthesis: Elimination vs substitution.

Aryl Halides *Preparation:* (Chloro, bromo and iodo-benzene case): from phenol, Sandmeyer & Gattermann reactions.

Reactions (Chlorobenzene): Aromatic nucleophilic substitution (replacement by OH group) and effect of nitro substituent. Benzynes Mechanism: KNH_2/NH_3 (or $\text{NaNH}_2/\text{NH}_3$).

Reactivity and Relative strength of C-Halogen bond in alkyl, allyl, benzyl, vinyl and aryl halides.

(8 Lectures)

Alcohols, Phenols and Ethers (Upto 5 Carbons)

Alcohols: *Preparation:* Preparation of 1, 2 and 3 alcohols: using Grignard reagent, Ester hydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters.

Reactions: With sodium, HX (Lucas test), esterification, oxidation (with PCC, alk. KMnO_4 , acidic dichromate, conc. HNO_3). Oppeneauer oxidation *Diols:* (Upto 6 Carbons) oxidation of diols. Pinacol-Pinacolone rearrangement.

Phenols: (Phenol case) *Preparation:* Cumene hydroperoxide method, from diazonium salts. *Reactions:* Electrophilic substitution: Nitration, halogenation and sulphonation. Reimer-Tiemann Reaction, Gattermann-Koch Reaction, Houben-Hoesch Condensation, Schotten-Baumann Reaction.

Ethers (aliphatic and aromatic): Cleavage of ethers with HI.

Aldehydes and ketones (aliphatic and aromatic): (Formaldehyde, acetaldehyde, acetone and benzaldehyde)

Preparation: from acid chlorides and from nitriles.

Reactions & Reaction with HCN, ROH, NaHSO_3 , NH_2 -G derivatives. Iodoform test. Aldol Condensation, Cannizzaro's reaction, Wittig reaction, Benzoin condensation. Clemensen reduction and Wolff-Kishner reduction. Meerwein-Ponndorf-Verley reduction.

(14 Lectures)

Reference Books:

- Graham Solomon, T.W., Fryhle, C.B. & Snyder, S.A. *Organic Chemistry*, John Wiley & Sons (2014).
- McMurry, J.E. *Fundamentals of Organic Chemistry*, 7th Ed. Cengage Learning India Edition, 2013.
- Sykes, P. *A Guidebook to Mechanism in Organic Chemistry*, Orient Longman, New Delhi (1988).
- Finar, I.L. *Organic Chemistry* (Vol. I & II), E.L.B.S.
- Morrison, R.T. & Boyd, R.N. *Organic Chemistry*, Pearson, 2010.
- Bahl, A. & Bahl, B.S. *Advanced Organic Chemistry*, S. Chand, 2010.

- Barrow, G.M. *Physical Chemistry* Tata McGraw-Hill (2007).
- Castellan, G.W. *Physical Chemistry* 4th Ed. Narosa (2004).
- Kotz, J.C., Treichel, P.M. & Townsend, J.R. *General Chemistry* Cengage Learning India Pvt. Ltd., New Delhi (2009).
- Mahan, B.H. *University Chemistry* 3rd Ed. Narosa (1998).
- Petrucci, R.H. *General Chemistry* 5th Ed. Macmillan Publishing Co.: New York (1985).

60 Lectures

CHEMISTRY LAB- DSC 2B LAB: CHEMICAL ENERGETICS, EQUILIBRIA & FUNCTIONAL ORGANIC CHEMISTRY

Section A: Physical Chemistry

Thermochemistry

1. Determination of heat capacity of calorimeter for different volumes.
2. Determination of enthalpy of neutralization of hydrochloric acid with sodium hydroxide.
3. Determination of enthalpy of ionization of acetic acid.
4. Determination of integral enthalpy of solution of salts (KNO₃, NH₄Cl).
5. Determination of enthalpy of hydration of copper sulphate.
6. Study of the solubility of benzoic acid in water and determination of H .

Ionic equilibria pH

measurements

- a) Measurement of pH of different solutions like aerated drinks, fruit juices, shampoos and soaps (use dilute solutions of soaps and shampoos to prevent damage to the glass electrode) using pH-meter.
- b) Preparation of buffer solutions:
 - (i) Sodium acetate-acetic acid
 - (ii) Ammonium chloride-ammonium hydroxide

Measurement of the pH of buffer solutions and comparison of the values with theoretical values.

Section B: Organic Chemistry

1. Purification of organic compounds by crystallization (from water and alcohol) and distillation.
2. Criteria of Purity: Determination of melting and boiling points.
3. Preparations: Mechanism of various reactions involved to be discussed. Recrystallisation, determination of melting point and calculation of quantitative yields to be done.
 - (a) Bromination of Phenol/Aniline
 - (b) Benzoylation of amines/phenols
 - (c) Oxime and 2,4-dinitrophenylhydrazone of aldehyde/ketone

Reference Books

- Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., *Textbook of Practical Organic Chemistry*, Prentice-Hall, 5th edition, 1996.
- Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry* Orient-Longman, 1960.
- Khosla, B. D.; Garg, V. C. & Gulati, A. *Senior Practical Physical Chemistry*, R. Chand & Co.: New Delhi (2011).

**CHEMISTRY-DSC 2C: SOLUTIONS, PHASE EQUILIBRIUM, CONDUCTANCE,
ELECTROCHEMISTRY & FUNCTIONAL GROUP ORGANIC CHEMISTRY-II (Credits:
Theory-04, Practicals-02)
Theory: 60 Lectures**

Section A: Physical Chemistry-2 (30 Lectures)

Solutions

Thermodynamics of ideal solutions: Ideal solutions and Raoult's law, deviations from Raoult's law of non-ideal solutions. Vapour pressure-composition and temperature-composition curves of ideal and non-ideal solutions. Distillation of solutions. Lever rule. Azeotropes.

Partial miscibility of liquids: Critical solution temperature; effect of impurity on partial miscibility of liquids. Immiscibility of liquids- Principle of steam distillation. Nernst distribution law and its applications, solvent extraction.

(8 Lectures)

Phase Equilibrium

Phases, components and degrees of freedom of a system, criteria of phase equilibrium. Gibbs Phase Rule and its thermodynamic derivation. Derivation of Clausius - Clapeyron equation and its importance in phase equilibria. Phase diagrams of one-component systems (water and sulphur) and two component systems involving eutectics, congruent and incongruent melting points (lead-silver, FeCl₃-H₂O and Na-K only).

(8 Lectures)

Conductance

Conductivity, equivalent and molar conductivity and their variation with dilution for weak and strong electrolytes. Kohlrausch law of independent migration of ions.

Transference number and its experimental determination using Hittorf and Moving boundary methods. Ionic mobility. Applications of conductance measurements: determination of degree of ionization of weak electrolyte, solubility and solubility products of sparingly soluble salts, ionic product of water, hydrolysis constant of a salt. Conductometric titrations (only acid-base).

(6 Lectures)

Electrochemistry

Reversible and irreversible cells. Concept of EMF of a cell. Measurement of EMF of a cell. Nernst equation and its importance. Types of electrodes. Standard electrode potential. Electrochemical series. Thermodynamics of a reversible cell, calculation of thermodynamic properties: G , H and S from EMF data.

Calculation of equilibrium constant from EMF data. Concentration cells with transference and without transference. Liquid junction potential and salt bridge.

pH determination using hydrogen electrode and quinhydrone electrode.

Potentiometric titrations -qualitative treatment (acid-base and oxidation-reduction only).

(8 Lectures)

Section B: Organic Chemistry-3 (30 Lectures)

Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure.

Carboxylic acids and their derivatives

Carboxylic acids (aliphatic and aromatic)

Preparation: Acidic and Alkaline hydrolysis of esters.

Reactions: Hell δ Vohlard - Zelinsky Reaction.

Carboxylic acid derivatives (aliphatic): (Upto 5 carbons)

Preparation: Acid chlorides, Anhydrides, Esters and Amides from acids and their interconversion.

Reactions: Comparative study of nucleophilicity of acyl derivatives. Reformatsky Reaction, Perkin condensation.

(6 Lectures)

Amines and Diazonium Salts

Amines (Aliphatic and Aromatic): (Upto 5 carbons)

Preparation: from alkyl halides, Gabriel δ Phthalimide synthesis, Hofmann Bromamide reaction.

Reactions: Hofmann vs. Saytzeff elimination, Carbylamine test, Hinsberg test, with HNO₂, Schotten δ Baumann Reaction. Electrophilic substitution (case aniline): nitration, bromination, sulphonation.

Diazonium salts: *Preparation:* from aromatic amines.

Reactions: conversion to benzene, phenol, dyes.

(6 Lectures)

Amino Acids, Peptides and Proteins:

Preparation of Amino Acids: Strecker synthesis using Gabriel δ phthalimide synthesis. Zwitterion, Isoelectric point and Electrophoresis.

Reactions of Amino acids: ester of δ COOH group, acetylation of δ NH₂ group, complexation with Cu²⁺ ions, ninhydrin test.

Overview of Primary, Secondary, Tertiary and Quaternary Structure of proteins.

Determination of Primary structure of Peptides by degradation Edmann degradation (N-terminal) and C δ terminal (thiohydantoin and with carboxypeptidase enzyme). Synthesis of simple peptides (upto dipeptides) by N-protection (t-butyloxycarbonyl and phthaloyl) & C-activating groups and Merrifield solid-phase synthesis.

(10 Lectures)

Carbohydrates: Classification, and General Properties, Glucose and Fructose (open chain and cyclic

structure), Determination of configuration of monosaccharides, absolute configuration of Glucose and Fructose, Mutarotation, ascending and descending in monosaccharides. Structure of disaccharides (sucrose, cellobiose, maltose, lactose) and polysaccharides (starch and cellulose) excluding their structure elucidation.

(8 Lectures)

Reference Books:

- Barrow, G.M. *Physical Chemistry* Tata McGraw-Hill (2007).
- Castellan, G.W. *Physical Chemistry* 4th Ed. Narosa (2004).
- Kotz, J.C., Treichel, P.M. & Townsend, J.R. *General Chemistry*, Cengage Learning India Pvt. Ltd.: New Delhi (2009).
- Mahan, B.H. *University Chemistry*, 3rd Ed. Narosa (1998).
- Petrucci, R.H. *General Chemistry*, 5th Ed., Macmillan Publishing Co.: New York (1985).
- Morrison, R. T. & Boyd, R. N. *Organic Chemistry*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Finar, I. L. *Organic Chemistry (Volume 1)*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Finar, I. L. *Organic Chemistry (Volume 2)*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Nelson, D. L. & Cox, M. M. *Lehninger's Principles of Biochemistry* 7th Ed., W. H. Freeman.
- Berg, J.M., Tymoczko, J.L. & Stryer, L. *Biochemistry*, W.H. Freeman, 2002.

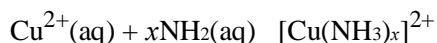
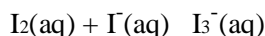
CHEMISTRY LAB-DSC 2C LAB: SOLUTIONS, PHASE EQUILIBRIUM, CONDUCTANCE, ELECTROCHEMISTRY & FUNCTIONAL ORGANIC CHEMISTRY-II

60 Lectures

Section A: Physical Chemistry

Distribution

Study of the equilibrium of one of the following reactions by the distribution method:



Phase equilibria

- a) Construction of the phase diagram of a binary system (simple eutectic) using cooling curves.
- b) Determination of the critical solution temperature and composition of the phenol water system and study of the effect of impurities on it.
- c) Study of the variation of mutual solubility temperature with concentration for the phenol water system and determination of the critical solubility temperature.

Conductance

- I. Determination of cell constant
- II. Determination of equivalent conductance, degree of dissociation and dissociation constant of a weak acid.
- III. Perform the following conductometric titrations:
 - i. Strong acid vs. strong base
 - ii. Weak acid vs. strong base

Potentiometry

Perform the following potentiometric titrations:

- i. Strong acid vs. strong base
- ii. Weak acid vs. strong base
- iii. Potassium dichromate vs. Mohr's salt

Section B: Organic Chemistry

I Systematic Qualitative Organic Analysis of Organic Compounds possessing monofunctional groups (-COOH, phenolic, aldehydic, ketonic, amide, nitro, amines) and preparation of one derivative.

II

1. Separation of amino acids by paper chromatography
2. Determination of the concentration of glycine solution by formylation method.
3. Titration curve of glycine
4. Action of salivary amylase on starch
5. Effect of temperature on the action of salivary amylase on starch.
6. Differentiation between a reducing and a nonreducing sugar.

Reference Books:

- Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., *Textbook of Practical Organic Chemistry*, Prentice-Hall, 5th edition, 1996.
- Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry* Orient-Longman, 1960.
- Khosla, B. D.; Garg, V. C. & Gulati, A. *Senior Practical Physical Chemistry*, R. Chand & Co.: New Delhi (2011).
- Ahluwalia, V.K. & Aggarwal, R. *Comprehensive Practical Organic Chemistry*, Universities Press.

Semester IV

CHEMISTRY-DSC 2D: **COORDINATION CHEMISTRY**, STATES OF MATTER & CHEMICAL KINETICS

(Credits: Theory-04, Practicals-02)

Theory: 60 Lectures

Transition Elements (3d series)

General group trends with special reference to electronic configuration, variable valency, colour, magnetic and catalytic properties, ability to form complexes and stability of various oxidation states (Latimer diagrams) for Mn, Fe and Cu.

Lanthanoids and actinoids: Electronic configurations, oxidation states, colour, magnetic properties, lanthanide contraction, separation of lanthanides (ion exchange method only).

(12 Lectures)

Coordination Chemistry

Valence Bond Theory (VBT): Inner and outer orbital complexes of Cr, Fe, Co, Ni and Cu (coordination numbers 4 and 6). Structural and stereoisomerism in complexes with coordination numbers 4 and 6.

Drawbacks of VBT. IUPAC system of nomenclature.

(8 Lectures)

Crystal Field Theory

Crystal field effect, octahedral symmetry. Crystal field stabilization energy (CFSE), Crystal field effects for weak and strong fields. Tetrahedral symmetry. Factors affecting the magnitude of D. Spectrochemical series. Comparison of CFSE for O_h and T_d complexes, Tetragonal distortion of octahedral geometry.

Jahn-Teller distortion, Square planar coordination.

(10 Lectures)

Section B: Physical Chemistry-3 (30 Lectures)

Kinetic Theory of Gases

Postulates of Kinetic Theory of Gases and derivation of the kinetic gas equation.

Deviation of real gases from ideal behaviour, compressibility factor, causes of deviation. van der Waals equation of state for real gases. Boyle temperature (derivation not required). Critical phenomena, critical constants and their calculation from van der Waals equation. Andrews isotherms of CO_2 .

Maxwell Boltzmann distribution laws of molecular velocities and molecular energies (graphic representation ó derivation not required) and their importance.

Temperature dependence of these distributions. Most probable, average and root mean square velocities (no derivation). Collision cross section, collision number, collision frequency, collision diameter and mean free path of molecules. Viscosity of gases and effect of temperature and pressure on coefficient of viscosity (qualitative treatment only).

(8 Lectures)

Liquids

Surface tension and its determination using stalagmometer. Viscosity of a liquid and determination of coefficient of viscosity using Ostwald viscometer. Effect of temperature on surface tension and coefficient of viscosity of a liquid (qualitative treatment only).

(6 Lectures)

Solids

Forms of solids. Symmetry elements, unit cells, crystal systems, Bravais lattice types and identification of lattice planes. Laws of Crystallography - Law of constancy of interfacial angles, Law of rational indices. Miller indices. X-ray diffraction by crystals, Bragg's law. Structures of NaCl, KCl and CsCl (qualitative treatment only). Defects in crystals. Glasses and liquid crystals.

(8 Lectures)

Chemical Kinetics

The concept of reaction rates. Effect of temperature, pressure, catalyst and other factors on reaction rates. Order and molecularity of a reaction. Derivation of integrated rate equations for zero, first and second order reactions (both for equal and unequal concentrations of reactants). Half-life of a reaction. General methods for determination of order of a reaction. Concept of activation energy and its calculation from Arrhenius equation.

Theories of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions. Comparison of the two theories (qualitative treatment only).

(8 Lectures)

Reference Books:

- Barrow, G.M. *Physical Chemistry* Tata McGraw-Hill (2007).
- Castellan, G.W. *Physical Chemistry* 4th Ed. Narosa (2004).
- Kotz, J.C., Treichel, P.M. & Townsend, J.R. *General Chemistry* Cengage Learning India Pvt. Ltd., New Delhi (2009).
- Mahan, B.H. *University Chemistry* 3rd Ed. Narosa (1998).
- Petrucci, R.H. *General Chemistry* 5th Ed. Macmillan Publishing Co.: New York (1985).
- Cotton, F.A. & Wilkinson, G. *Basic Inorganic Chemistry*, Wiley.
- Shriver, D.F. & Atkins, P.W. *Inorganic Chemistry*, Oxford University Press.
- Wulfsberg, G. *Inorganic Chemistry*, Viva Books Pvt. Ltd.
- Rodgers, G.E. *Inorganic & Solid State Chemistry*, Cengage Learning India Ltd., 2008.

CHEMISTRY LAB-DSC 2D LAB: COORDINATION CHEMISTRY, STATES OF MATTER & CHEMICAL KINETICS

60 Lectures

Section A: Inorganic Chemistry

Semi-micro qualitative analysis using H₂S of mixtures - not more than four ionic species (two anions and two cations and excluding insoluble salts) out of the following:

Cations : NH₄⁺, Pb²⁺, Ag⁺, Bi³⁺, Cu²⁺, Cd²⁺, Sn²⁺, Fe³⁺, Al³⁺, Co²⁺, Cr³⁺, Ni²⁺, Mn²⁺, Zn²⁺, Ba²⁺, Sr²⁺, Ca²⁺, K⁺

Anions : CO₃²⁻, S²⁻, SO₃²⁻, S₂O₃²⁻, NO₃⁻, CH₃COO⁻, Cl⁻, Br⁻, I⁻, NO₃⁻, SO₄²⁻, PO₄³⁻, BO₃³⁻, C₂O₄²⁻, F⁻

(Spot tests should be carried out wherever feasible)

1. Estimate the amount of nickel present in a given solution as bis(dimethylglyoximate) nickel(II) or aluminium as oximate in a given solution gravimetrically.
2. Draw calibration curve (absorbance at λ_{\max} vs. concentration) for various concentrations of a given coloured compound (KMnO₄/ CuSO₄) and estimate the concentration of the same in a given solution.
3. Determine the composition of the Fe³⁺-salicylic acid complex solution by Job's method.
4. Estimation of (i) Mg²⁺ or (ii) Zn²⁺ by complexometric titrations using EDTA.

5. Estimation of total hardness of a given sample of water by complexometric titration.
6. Determination of concentration of Na^+ and K^+ using Flame Photometry.

Section B: Physical Chemistry

(I) Surface tension measurement (use of organic solvents excluded).

- a) Determination of the surface tension of a liquid or a dilute solution using a stalagmometer.
- b) Study of the variation of surface tension of a detergent solution with concentration.

(II) Viscosity measurement (use of organic solvents excluded).

- a) Determination of the relative and absolute viscosity of a liquid or dilute solution using an Ostwald's viscometer.
- b) Study of the variation of viscosity of an aqueous solution with concentration of solute.

(III) Chemical Kinetics

Study the kinetics of the following reactions.

1. Initial rate method: Iodide-persulphate reaction
2. Integrated rate method:
 - a. Acid hydrolysis of methyl acetate with hydrochloric acid.
 - b. Saponification of ethyl acetate.
 - c. Compare the strengths of HCl and H_2SO_4 by studying kinetics of hydrolysis of methyl acetate

Reference Books:

- Svehla, G. *Vogel's Qualitative Inorganic Analysis*, Pearson Education, 2012.
 - Mendham, J. *Vogel's Quantitative Chemical Analysis*, Pearson, 2009.
 - Khosla, B. D.; Garg, V. C. & Gulati, A. *Senior Practical Physical Chemistry*, R. Chand & Co.: New Delhi (2011).
-

Skill Enhancement Course (Credit: 02 each, Any two maximum)- SEC1 to SEC4

BASIC ANALYTICAL CHEMISTRY (Credits: 02)

30 Lectures

Introduction: Introduction to Analytical Chemistry and its interdisciplinary nature. Concept of sampling. Importance of accuracy, precision and sources of error in analytical measurements. Presentation of experimental data and results, from the point of view of significant figures.

Analysis of soil: Composition of soil, Concept of pH and pH measurement, Complexometric titrations, Chelation, Chelating agents, use of indicators

Determination of pH of soil samples.

Estimation of Calcium and Magnesium ions as Calcium carbonate by complexometric titration.

Analysis of water: Definition of pure water, sources responsible for contaminating water, water sampling methods, water purification methods.

Determination of pH, acidity and alkalinity of a water sample.

Determination of dissolved oxygen (DO) of a water sample.

Analysis of food products: Nutritional value of foods, idea about food processing and food preservations and adulteration.

Identification of adulterants in some common food items like coffee powder, asafoetida, chilli powder, turmeric powder, coriander powder and pulses, etc.

Analysis of preservatives and colouring matter.

Chromatography: Definition, general introduction on principles of chromatography, paper chromatography, TLC etc.

Paper chromatographic separation of mixture of metal ion (Fe^{3+} and Al^{3+}).

To compare paint samples by TLC method. **Ion-exchange:** Column, ion-exchange chromatography etc.

Determination of ion exchange capacity of anion / cation exchange resin (using batch procedure if use of column is not feasible).

Analysis of cosmetics: Major and minor constituents and their function

Analysis of deodorants and antiperspirants, Al, Zn, boric acid, chloride, sulphate.

Determination of constituents of talcum powder: Magnesium oxide, Calcium oxide, Zinc oxide and Calcium carbonate by complexometric titration.

Suggested Applications (Any one):

To study the use of phenolphthalein in trap cases.

To analyze arson accelerants.

To carry out analysis of gasoline.

Suggested Instrumental demonstrations:

Estimation of macro nutrients: Potassium, Calcium, Magnesium in soil samples by flame photometry.

Spectrophotometric determination of Iron in Vitamin / Dietary Tablets.

Spectrophotometric Identification and Determination of Caffeine and Benzoic Acid in Soft Drink.

Reference Books:

Willard, H.H., Merritt, L.L., Dean, J. & Settoe, F.A. *Instrumental Methods of Analysis*. 7th Ed. Wadsworth Publishing Co. Ltd., Belmont, California, USA, 1988.

Skoog, D.A. Holler F.J. & Nieman, T.A. *Principles of Instrumental Analysis*, Cengage Learning India Ed.

Skoog, D.A.; West, D.M. & Holler, F.J. *Fundamentals of Analytical Chemistry 6th Ed.*, Saunders College Publishing, Fort Worth (1992).

Harris, D. C. *Quantitative Chemical Analysis*, W. H. Freeman.

Dean, J. A. *Analytical Chemistry Notebook*, McGraw Hill.

Day, R. A. & Underwood, A. L. *Quantitative Analysis*, Prentice Hall of India.

Freifelder, D. *Physical Biochemistry 2nd Ed.*, W.H. Freeman and Co., N.Y. USA (1982).

Cooper, T.G. *The Tools of Biochemistry*, John Wiley and Sons, N.Y. USA. 16 (1977).

Vogel, A. I. *Vogel's Qualitative Inorganic Analysis 7th Ed.*, Prentice Hall.

Robinson, J.W. *Undergraduate Instrumental Analysis 5th Ed.*, Marcel Dekker, Inc., New York (1995).

GREEN METHODS IN CHEMISTRY (Credits: 02)

Theory: 30 Lectures

Theory and Hand-on Experiments

Introduction: Definitions of Green Chemistry. Brief introduction of twelve principles of Green Chemistry, with examples, special emphasis on atom economy, reducing toxicity, green solvents, Green Chemistry and catalysis and alternative sources of energy, Green energy and sustainability

The following Real world Cases in Green Chemistry should be discussed:

Surfactants for carbon dioxide ó Replacing smog producing and ozone depleting solvents with CO₂ for precision cleaning and dry cleaning of garments.

Designing of environmentally safe marine antifoulant.

Rightfit pigment: Synthetic azo pigments to replace toxic organic and inorganic pigments.

An efficient, green synthesis of a compostable and widely applicable plastic (poly lactic acid) made from corn.

Practicals

Preparation and characterization of biodiesel from vegetable oil.

Extraction of D-limonene from orange peel using liquid CO₂ prepared from dry ice.

Mechano chemical solvent free synthesis of azomethine.

Solvent free, microwave assisted one pot synthesis of phthalocyanine complex of copper(II).

Reference Books:

Anastas, P.T. & Warner, J.K. *Green Chemistry- Theory and Practical*, Oxford University Press (1998).

Matlack, A.S. *Introduction to Green Chemistry*, Marcel Dekker (2001).

Cann, M.C. & Connely, M.E. *Real-World cases in Green Chemistry*, American Chemical Society, Washington (2000).

Ryan, M.A. & Tinnesand, M. *Introduction to Green Chemistry*, American Chemical Society, Washington (2002).

Sharma, R.K.; Sidhwani, I.T. & Chaudhari, M.K. *Green Chemistry Experiments: A monograph* I.K. International Publishing House Pvt Ltd. New Delhi, Bangalore.

Lancaster, M. *Green Chemistry: An introductory text* RSC publishing, 2nd Edition.

Sidhwani, I.T., Saini, G., Chowdhury, S., Garg, D., Malovika, Garg, N. Wealth from waste: A green method to produce biodiesel from waste cooking oil and generation of useful products from waste further generated "A Social Awareness Project", *Delhi University Journal of Undergraduate Research and Innovation*, **1(1)**: 2015

CHEMISTRY OF COSMETICS & PERFUMES (Credits: 02)

30 Lectures

A general study including preparation and uses of the following: Hair dye, hair spray, shampoo, suntan lotions, face powder, lipsticks, talcum powder, nail enamel, creams (cold, vanishing and shaving creams), antiperspirants and artificial flavours. Essential oils and their importance in cosmetic industries with reference to Eugenol, Geraniol, sandalwood oil, eucalyptus, rose oil, 2-phenyl ethyl alcohol, Jasmone, Civetone, Muscone.

Practicals

Preparation of talcum powder.

Preparation of shampoo.

Preparation of enamels.

Preparation of hair remover.

Preparation of face cream.

Preparation of nail polish and nail polish remover.

Reference Books:

E. Stocchi: *Industrial Chemistry*, Vol -I, Ellis Horwood Ltd. UK.

P.C. Jain, M. Jain: *Engineering Chemistry*, Dhanpat Rai & Sons, Delhi.

Sharma, B.K. & Gaur, H. *Industrial Chemistry*, Goel Publishing House, Meerut (1996).

PESTICIDE CHEMISTRY (Credits: 02)

30 Lectures

General introduction to pesticides (natural and synthetic), benefits and adverse effects, changing concepts of pesticides, structure activity relationship, synthesis and technical manufacture and uses of representative pesticides in the following classes: Organochlorines (DDT, Gammexene,); Organophosphates (Malathion, Parathion); Carbamates (Carbofuran and carbaryl); Quinones (

Chloranil), Anilides (Alachlor and Butachlor).

Practicals

To calculate acidity/alkalinity in given sample of pesticide formulations as per BIS specifications.

Preparation of simple organophosphates, phosphonates and thiophosphate

Reference Book:

Cremllyn, R. *Pesticides. Preparation and Modes of Action*, John Wiley & Sons, New York, 1978

CHEMISTRY-DSE I-IV (ELECTIVES)

DSE-2A-Chemistry (Semester V, Select any one course)

1. CHEMISTRY-DSE: ANALYTICAL METHODS IN CHEMISTRY

(Credits: Theory-04, Practicals-02)

Theory: 60 Lectures

Qualitative and quantitative aspects of analysis:

Sampling, evaluation of analytical data, errors, accuracy and precision, methods of their expression, normal law of distribution if indeterminate errors, statistical test of data; F, Q and t test, rejection of data, and confidence intervals.

(5 Lectures)

Optical methods of analysis:

Origin of spectra, interaction of radiation with matter, fundamental laws of spectroscopy and selection rules, validity of Beer-Lambert's law.

UV-Visible Spectrometry: Basic principles of instrumentation (choice of source, monochromator and detector) for single and double beam instrument;

Basic principles of quantitative analysis: estimation of metal ions from aqueous solution, geometrical isomers, keto-enol tautomers. Determination of composition of metal complexes using Job's method of continuous variation and mole ratio method.

Infrared Spectrometry: Basic principles of instrumentation (choice of source, monochromator & detector) for single and double beam instrument; sampling techniques.

Structural illustration through interpretation of data, Effect and importance of isotope substitution.

Flame Atomic Absorption and Emission Spectrometry: Basic principles of instrumentation (choice of source, monochromator, detector, choice of flame and Burner designs. Techniques of atomization and sample introduction; Method of background correction, sources of chemical interferences and their method of removal. Techniques for the quantitative estimation of trace level of metal ions from water samples.

(25 Lectures)

Thermal methods of analysis:

Theory of thermogravimetry (TG), basic principle of instrumentation.

Techniques for quantitative estimation of Ca and Mg from their mixture.

(5 Lectures)

Electroanalytical methods:

Classification of electroanalytical methods, basic principle of pH metric, potentiometric and conductometric titrations. Techniques used for the determination of equivalence points. Techniques used for the determination of pK_a values.

(10 Lectures)

Separation techniques:

Solvent extraction: Classification, principle and efficiency of the technique.

Mechanism of extraction: extraction by solvation and chelation.

Technique of extraction: batch, continuous and counter current extractions.

Qualitative and quantitative aspects of solvent extraction: extraction of metal ions from aqueous solution, extraction of organic species from the aqueous and nonaqueous media.

Chromatography: Classification, principle and efficiency of the technique.

Mechanism of separation: adsorption, partition & ion exchange.

Development of chromatograms: frontal, elution and displacement methods.

Qualitative and quantitative aspects of chromatographic methods of analysis: IC, GLC, GPC, TLC and HPLC.

Stereoisomeric separation and analysis: Measurement of optical rotation, calculation of Enantiomeric excess (ee)/ diastereomeric excess (de) ratios and determination of enantiomeric composition using NMR, Chiral solvents and chiral shift reagents. Chiral chromatographic techniques using chiral columns (GC and HPLC).

Role of computers in instrumental methods of analysis.

(15 Lectures)

Reference Books:

Jeffery, G.H., Bassett, J., Mendham, J. & Denney, R.C. *Vogel's Textbook of Quantitative Chemical Analysis*, John Wiley & Sons, 1989.

Willard, H.H., Merritt, L.L., Dean, J. & Settoe, F.A. *Instrumental Methods of Analysis*, 7th Ed. Wadsworth Publishing Company Ltd., Belmont, California, USA, 1988.

Christian, G.D; *Analytical Chemistry*, 6th Ed. John Wiley & Sons, New York, 2004.

Harris, D. C. *Exploring Chemical Analysis*, Ed. New York, W.H. Freeman, 2001.

Khopkar, S.M. *Basic Concepts of Analytical Chemistry*. New Age, International Publisher,

2009.

Skoog, D.A. Holler F.J. & Nieman, T.A. *Principles of Instrumental Analysis*, Cengage Learning India Ed.

Mikes, O. *Laboratory Hand Book of Chromatographic & Allied Methods*, Elles Harwood Series on Analytical Chemistry, John Wiley & Sons, 1979.

Ditts, R.V. *Analytical Chemistry; Methods of Separation*, van Nostrand, 1974.

PRACTICALS- DSE LAB: ANALYTICAL METHODS IN CHEMISTRY

60 Lectures

I. Separation Techniques

1. Chromatography:

(a) Separation of mixtures

(i) Paper chromatographic separation of Fe^{3+} , Al^{3+} , and Cr^{3+} .

(ii) Separation and identification of the monosaccharides present in the given mixture (glucose & fructose) by paper chromatography. Reporting the R_f values.

(b) Separate a mixture of Sudan yellow and Sudan Red by TLC technique and identify them on the basis of their R_f values.

(c) Chromatographic separation of the active ingredients of plants, flowers and juices by TLC

II. Solvent Extractions:

(i) To separate a mixture of Ni^{2+} & Fe^{2+} by complexation with DMG and extracting the Ni^{2+} -DMG complex in chloroform, and determine its concentration by spectrophotometry.

(ii) Solvent extraction of zirconium with amberliti LA-1, separation from a mixture of irons and gallium.

3. Determine the pH of the given aerated drinks fruit juices, shampoos and soaps.

4. Determination of Na, Ca, Li in cola drinks and fruit juices using flame photometric techniques.

5. Analysis of soil:

(i) Determination of pH of soil.

(ii) Total soluble salt (iii) Estimation of calcium, magnesium, phosphate, nitrate

6. Ion exchange:

(i) Determination of exchange capacity of cation exchange resins and anion exchange resins.

(ii) Separation of metal ions from their binary mixture.

(iii) Separation of amino acids from organic acids by ion exchange chromatography.

III Spectrophotometry

1. Determination of pK_a values of indicator using spectrophotometry.

- 2 Structural characterization of compounds by infrared spectroscopy.
- 3 Determination of dissolved oxygen in water.
- 4 Determination of chemical oxygen demand (COD).
- 5 Determination of Biological oxygen demand (BOD).
- 6 Determine the composition of the Ferric-salicylate/ ferric-thiocyanate complex by Jobø method.

Reference Books:

- Jeffery, G.H., Bassett, J., Mendham, J. & Denney, R.C. *Vogel's Textbook of Quantitative Chemical Analysis*, John Wiley & Sons, 1989.
- Willard, H.H., Merritt, L.L., Dean, J. & Settoe, F.A. *Instrumental Methods of Analysis*, 7th Ed. Wadsworth Publishing Company Ltd., Belmont, California, USA, 1988.
- Christian, Gary D; *Analytical Chemistry*, 6th Ed. John Wiley & Sons, New York, 2004.
- Harris, Daniel C: *Exploring Chemical Analysis*, Ed. New York, W.H. Freeman, 2001.
- Khopkar, S.M. *Basic Concepts of Analytical Chemistry*. New Age, International Publisher, 2009.
- Skoog, D.A. Holler F.J. & Nieman, T.A. *Principles of Instrumental Analysis*, Cengage Learning India Ed.
- Mikes, O. *Laboratory Hand Book of Chromatographic & Allied Methods*, Elles Harwood Series on Analytical Chemistry, John Wiley & Sons, 1979.
- Ditts, R.V. *Analytical Chemistry; Methods of Separation*, van Nostrand, 1974.

2. CHEMISTRY-DSE: POLYMER CHEMISTRY

(Credits: Theory-06, Practicals-02)

Theory: 60 Lectures

Introduction and history of polymeric materials:

Different schemes of classification of polymers, Polymer nomenclature, Molecular forces and chemical bonding in polymers, Texture of Polymers.

(4 Lectures)

Functionality and its importance:

Criteria for synthetic polymer formation, classification of polymerization processes, Relationships between functionality, extent of reaction and degree of polymerization. Bi-functional systems, Poly-functional systems.

(8 Lectures)

Kinetics of Polymerization:

Mechanism and kinetics of step growth, radical chain growth, ionic chain (both cationic and anionic) and coordination polymerizations, Mechanism and kinetics of copolymerization, polymerization techniques.

(8 lectures)

Crystallization and crystallinity:

Determination of crystalline melting point and degree of crystallinity, Morphology of crystalline polymers, Factors affecting crystalline melting point.

(4 Lectures)

Nature and structure of polymers-Structure Property relationships.

(2 Lectures)

Determination of molecular weight of polymers (M_n , M_w , etc) by end group analysis, viscometry, light scattering and osmotic pressure methods. Molecular weight distribution and its significance.

Polydispersity index.

(8 Lectures)

Glass transition temperature (T_g) and determination of T_g, Free volume theory, WLF equation, Factors affecting glass transition temperature (T_g).

(8 Lectures)

Polymer Solution ó Criteria for polymer solubility, Solubility parameter, Thermodynamics of polymer solutions, entropy, enthalpy, and free energy change of mixing of polymers solutions, Flory- Huggins theory, Lower and Upper critical solution temperatures.

(8 Lectures)

Properties of Polymers (Physical, thermal, Flow & Mechanical Properties).

Brief introduction to preparation, structure, properties and application of the following polymers: polyolefins, polystyrene and styrene copolymers, poly(vinyl chloride) and related polymers, poly(vinyl acetate) and related polymers, acrylic polymers, fluoro polymers, polyamides and related polymers. Phenol formaldehyde resins (Bakelite, Novalac), polyurethanes, silicone polymers, polydienes,

Polycarbonates, Conducting Polymers, [polyacetylene, polyaniline, poly(p-phenylene sulphide polypyrrole, polythiophene)].

(10 Lectures)

Reference Books:

- Seymour, R.B. & Carraher, C.E. *Polymer Chemistry: An Introduction*, Marcel Dekker, Inc. New York, 1981.
- Odian, G. *Principles of Polymerization*, 4th Ed. Wiley, 2004.
- Billmeyer, F.W. *Textbook of Polymer Science*, 2nd Ed. Wiley Interscience, 1971.
- Ghosh, P. *Polymer Science & Technology*, Tata McGraw-Hill Education, 1991.
- Lenz, R.W. *Organic Chemistry of Synthetic High Polymers*. Interscience Publishers, New York, 1967.

CHEMISTRY PRACTICAL - DSE LAB: POLYMER CHEMISTRY

60 Lectures

1. Polymer synthesis

1. Free radical solution polymerization of styrene (St) / Methyl Methacrylate (MMA) / Methyl Acrylate (MA) / Acrylic acid (AA).
 - a. Purification of monomer
 - b. Polymerization using benzoyl peroxide (BPO) / 2,2-azobisisobutyronitrile (AIBN)
2. Preparation of nylon 66/6
1. Interfacial polymerization, preparation of polyester from isophthaloyl chloride (IPC) and phenolphthalein
 - a. Preparation of IPC
 - b. Purification of IPC
 - c. Interfacial polymerization
3. Redox polymerization of acrylamide
4. Precipitation polymerization of acrylonitrile
5. Preparation of urea-formaldehyde resin
6. Preparations of novalac resin/resold resin.
7. Microscale Emulsion Polymerization of Poly(methylacrylate).

Polymer characterization

1. Determination of molecular weight by viscometry:
 - (a) Polyacrylamide-aq. NaNO₂ solution
 - (b) (Poly vinyl propylidene (PVP) in water
2. Determination of the viscosity-average molecular weight of poly(vinyl alcohol) (PVOH) and the fraction of head-to-head monomer linkages in the polymer.
3. Determination of molecular weight by end group analysis: Polyethylene glycol (PEG) (OH group).
4. Testing of mechanical properties of polymers.
5. Determination of hydroxyl number of a polymer using colorimetric method.

Polymer analysis

1. Estimation of the amount of HCHO in the given solution by sodium sulphite method
2. Instrumental Techniques
3. IR studies of polymers
4. DSC analysis of polymers
5. Preparation of polyacrylamide and its electrophoresis
*at least 7 experiments to be carried out.

Reference Books:

- M.P. Stevens, *Polymer Chemistry: An Introduction*, 3rd Ed., Oxford University Press, 1999.
- H.R. Allcock, F.W. Lampe & J.E. Mark, *Contemporary Polymer Chemistry*, 3rd ed. Prentice-Hall (2003)
- F.W. Billmeyer, *Textbook of Polymer Science*, 3rd ed. Wiley-Interscience (1984)
- J.R. Fried, *Polymer Science and Technology*, 2nd ed. Prentice-Hall (2003)
- P. Munk & T.M. Aminabhavi, *Introduction to Macromolecular Science*, 2nd ed. John Wiley & Sons (2002)
- L. H. Sperling, *Introduction to Physical Polymer Science*, 4th ed. John Wiley & Sons (2005)
- M.P. Stevens, *Polymer Chemistry: An Introduction* 3rd ed. Oxford University Press (2005).
- Seymour/ Carraher's Polymer Chemistry, 9th ed. by Charles E. Carraher, Jr. (2013).

3. CHEMISTRY-DSE: GREEN CHEMISTRY

(Credits: Theory-04, Practicals-02)

Theory: 60 Lectures

Introduction to Green Chemistry

What is Green Chemistry? Need for Green Chemistry. Goals of Green Chemistry. Limitations/ Obstacles in the pursuit of the goals of Green Chemistry

(4 Lectures)

Principles of Green Chemistry and Designing a Chemical synthesis

Twelve principles of Green Chemistry with their explanations and examples and special emphasis on the following:

- Designing a Green Synthesis using these principles; Prevention of Waste/ byproducts; maximum incorporation of the materials used in the process into the final products, Atom Economy, calculation of atom economy of the rearrangement, addition, substitution and elimination reactions.
- Prevention/ minimization of hazardous/ toxic products reducing toxicity. risk =

(function) hazard \times exposure; waste or pollution prevention hierarchy.

- Green solvents \acute{o} supercritical fluids, water as a solvent for organic reactions, ionic liquids, fluorous biphasic solvent, PEG, solventless processes, immobilized solvents and how to compare greenness of solvents.
- Energy requirements for reactions \acute{o} alternative sources of energy: use of microwaves and ultrasonic energy.
- Selection of starting materials; avoidance of unnecessary derivatization \acute{o} careful use of blocking/protecting groups.
- Use of catalytic reagents (wherever possible) in preference to stoichiometric reagents; catalysis and green chemistry, comparison of heterogeneous and homogeneous catalysis, biocatalysis, asymmetric catalysis and photocatalysis.
- Prevention of chemical accidents designing greener processes, inherent safer design, principle of ISD \acute{o} What you don't have cannot harm you \acute{o} , greener alternative to Bhopal Gas Tragedy (safer route to carbaryl) and Flixborough accident (safer route to cyclohexanol) subdivision of ISD, minimization, simplification, substitution, moderation and limitation.
- Strengthening/ development of analytical techniques to prevent and minimize the generation of hazardous substances in chemical processes.

(30 Lectures)

Examples of Green Synthesis/ Reactions and some real world cases

1. Green Synthesis of the following compounds: adipic acid, catechol, disodium iminodiacetate (alternative to Strecker synthesis)
2. Microwave assisted reactions in water: Hofmann Elimination, methyl benzoate to benzoic acid, oxidation of toluene and alcohols; microwave assisted reactions in organic solvents Diels-Alder reaction and Decarboxylation reaction
3. Ultrasound assisted reactions: sonochemical Simmons-Smith Reaction (Ultrasonic alternative to Iodine)

- 4 Surfactants for carbon dioxide replacing smog producing and ozone depleting solvents with CO₂ for precision cleaning and dry cleaning of garments.
- 5 Designing of Environmentally safe marine antifoulant.
- 6 Rightfit pigment: synthetic azopigments to replace toxic organic and inorganic pigments.
- 7 An efficient, green synthesis of a compostable and widely applicable plastic (poly lactic acid) made from corn.
- 8 Healthier fats and oil by Green Chemistry: Enzymatic interesterification for production of no Trans-Fats and Oils
- 9 Development of Fully Recyclable Carpet: Cradle to Cradle Carpeting

(16 Lectures)

Future Trends in Green Chemistry

Oxidation reagents and catalysts; Biomimetic, multifunctional reagents; Combinatorial green chemistry; Proliferation of solventless reactions; co crystal controlled solid state synthesis (C²S³); Green chemistry in sustainable development.

(10 Lectures)

Reference Books:

- Ahluwalia, V.K. & Kidwai, M.R. *New Trends in Green Chemistry*, Anamalaya Publishers (2005).
- Anastas, P.T. & Warner, J.K.: *Green Chemistry - Theory and Practical*, Oxford University Press (1998).
- Matlack, A.S. *Introduction to Green Chemistry*, Marcel Dekker (2001).
- Cann, M.C. & Connely, M.E. *Real-World cases in Green Chemistry*, American Chemical Society, Washington (2000).
- Ryan, M.A. & Tinnesand, M. *Introduction to Green Chemistry*, American Chemical Society, Washington (2002).
- Lancaster, M. *Green Chemistry: An Introductory Text* RSC Publishing, 2nd Edition, 2010.

CHEMISTRY PRACTICAL - DSE LAB: GREEN CHEMISTRY

60 Lectures

1. Safer starting materials

- Preparation and characterization of nanoparticles of gold using tea leaves.

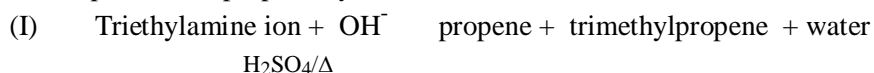
2. Using renewable resources

- Preparation of biodiesel from vegetable/ waste cooking oil.

3. Avoiding waste

Principle of atom economy.

- Use of molecular model kit to stimulate the reaction to investigate how the atom economy can illustrate Green Chemistry.
- Preparation of propene by two methods can be studied



(II) 1-propanol \longrightarrow propene + water

- Other types of reactions, like addition, elimination, substitution and rearrangement should also be studied for the calculation of atom economy.

4. Use of enzymes as catalysts

- Benzoin condensation using Thiamine Hydrochloride as a catalyst instead of cyanide.

5. Alternative Green solvents

Extraction of D-limonene from orange peel using liquid CO₂ prepared from dry ice.

Mechanochemical solvent free synthesis of azomethines

6. Alternative sources of energy

- Solvent free, microwave assisted one pot synthesis of phthalocyanine complex of copper (II).
- Photoreduction of benzophenone to benzopinacol in the presence of sunlight.

Reference Books:

- Anastas, P.T & Warner, J.C. *Green Chemistry: Theory and Practice*, Oxford University Press (1998).
- Kirchoff, M. & Ryan, M.A. *Greener approaches to undergraduate chemistry experiment*. American Chemical Society, Washington DC (2002).
- Ryan, M.A. *Introduction to Green Chemistry*, Tinnensand; (Ed), American Chemical Society, Washington DC (2002).
- Sharma, R.K.; Sidhwani, I.T. & Chaudhari, M.K. I.K. *Green Chemistry Experiment: A monograph International Publishing House Pvt Ltd. New Delhi. Bangalore* CISBN 978-93-81141-55-7 (2013).
- Cann, M.C. & Connelly, M. E. *Real world cases in Green Chemistry*, American Chemical Society (2008).

DSE-2B-Chemistry (Semester VI, select any one course)

1. CHEMISTRY-DSE: INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS

(Credits: Theory-04, Practicals-02)

Theory: 60 Lectures

Introduction to spectroscopic methods of analysis:

Recap of the spectroscopic methods covered in detail in the core chemistry syllabus: Treatment of analytical data, including error analysis. Classification of analytical methods and the types of instrumental methods. Consideration of electromagnetic radiation.

(4 Lectures)

Molecular spectroscopy:

Infrared spectroscopy:

Interactions with molecules: absorption and scattering. Means of excitation (light sources), separation of spectrum (wavelength dispersion, time resolution), detection of the signal (heat, differential detection), interpretation of spectrum (qualitative, mixtures, resolution), advantages of Fourier

Transform (FTIR). Samples and results expected. Applications: Issues of quality assurance and quality control, Special problems for portable instrumentation and rapid detection.

UV-Visible/ Near IR δ emission, absorption, fluorescence and photoacoustic. Excitation sources (lasers, time resolution), wavelength dispersion (gratings, prisms, interference filters, laser, placement of sample relative to dispersion, resolution), Detection of signal (photocells, photomultipliers, diode arrays, sensitivity and S/N), Single and Double Beam instruments, Interpretation (quantification, mixtures, absorption vs. fluorescence and the use of time, photoacoustic, fluorescent tags).

(16 Lectures)

Separation techniques

Chromatography: Gas chromatography, liquid chromatography, supercritical fluids, Importance of column technology (packing, capillaries), Separation based on increasing number of factors (volatility, solubility, interactions with stationary phase, size, electrical field), Detection: simple vs. specific (gas and liquid), Detection as a means of further analysis (use of tags and coupling to IR and MS), Electrophoresis (plates and capillary) and use with DNA analysis.

Immunoassays and DNA techniques

Mass spectroscopy: Making the gaseous molecule into an ion (electron impact, chemical ionization), Making liquids and solids into ions (electrospray, electrical discharge, laser desorption, fast atom bombardment), Separation of ions on basis of mass to charge ratio, Magnetic, Time of flight, Electric quadrupole. Resolution, time and multiple separations, Detection and interpretation (how this is linked to excitation).

(16 Lectures)

Elemental analysis:

Mass spectrometry (electrical discharges).

Atomic spectroscopy: Atomic absorption, Atomic emission, and Atomic fluorescence.

Excitation and getting sample into gas phase (flames, electrical discharges, plasmas), Wavelength separation and resolution (dependence on technique), Detection of radiation (simultaneous/scanning, signal noise), Interpretation (errors due to molecular and ionic species, matrix effects, other interferences).

(8 Lectures)

NMR spectroscopy: Principle, Instrumentation, Factors affecting chemical shift, Spin-coupling, Applications.

(4 Lectures)

Electroanalytical Methods: Potentiometry & Voltammetry

(4 Lectures)

Radiochemical Methods

(4 Lectures)

X-ray analysis and electron spectroscopy (surface analysis)

(4 Lectures)

Reference books:

- Skoog, D.A. Holler F.J. & Nieman, T.A. *Principles of Instrumental Analysis*, Cengage Learning India Ed.
- Willard, H.H., Merritt, L.L., Dean, J. & Settoe, F.A. *Instrumental Methods of Analysis*, 7th Ed. Wadsworth Publishing Company Ltd., Belmont, California, USA, 1988.
- P.W. Atkins: Physical Chemistry.
- G.W. Castellan: Physical Chemistry.
- C.N. Banwell: Fundamentals of Molecular Spectroscopy.
- Brian Smith: Infrared Spectral Interpretations: A Systematic Approach.
- W.J. Moore: Physical Chemistry.

PRACTICALS-DSE LAB: INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS

60 Lectures

1. Safety Practices in the Chemistry Laboratory
 2. Determination of the isoelectric pH of a protein.
 3. Titration curve of an amino acid.
 4. Determination of the void volume of a gel filtration column.
 5. Determination of a Mixture of Cobalt and Nickel (UV/Vis spec.)
 6. Study of Electronic Transitions in Organic Molecules (i.e., acetone in water)
 7. IR Absorption Spectra (Study of Aldehydes and Ketones)
 8. Determination of Calcium, Iron, and Copper in Food by Atomic Absorption
 9. Quantitative Analysis of Mixtures by Gas Chromatography (i.e., chloroform and carbon tetrachloride)
 10. Separation of Carbohydrates by HPLC
 11. Determination of Caffeine in Beverages by HPLC
 12. Potentiometric Titration of a Chloride-Iodide Mixture
 13. Cyclic Voltammetry of the Ferrocyanide/Ferricyanide Couple
 14. Nuclear Magnetic Resonance
 15. Use of fluorescence to do presumptive tests to identify blood or other body fluids.
 16. Use of presumptive tests for anthrax or cocaine
 17. Collection, preservation, and control of blood evidence being used for DNA testing
 18. Use of capillary electrophoresis with laser fluorescence detection for nuclear DNA (Y chromosome only or multiple chromosome)
 19. Use of sequencing for the analysis of mitochondrial DNA
 20. Laboratory analysis to confirm anthrax or cocaine
 21. Detection in the field and confirmation in the laboratory of flammable accelerants or explosives
 22. Detection of illegal drugs or steroids in athletes
 23. Detection of pollutants or illegal dumping
 24. Fibre analysis
- At least 10 experiments to be performed.*

Reference Books:

- Skoog, D.A. Holler F.J. & Nieman, T.A. *Principles of Instrumental Analysis*, Cengage Learning India Ed.
- Willard, H.H., Merritt, L.L., Dean, J. & Settoe, F.A. *Instrumental Methods of Analysis*, 7th Ed. Wadsworth Publishing Company Ltd., Belmont, California, USA, 1988.
- Cann, M. C. & Thomas, P. *Real world cases in Green Chemistry*, American Chemical Society (2008).

- Lancaster, M. *Green Chemistry: An Introductory Text* RSC Publishing, 2nd Edition, 2010.
- Pavia, D.L., Lampman, G.M., Kriz, G.S. & Engel, R.G. *Introduction to Organic Laboratory Techniques: A Microscale and Macro Scale Approach*, W.B.Saunders, 1995.

2. DSE: ORGANOMETALLICS, BIOINORGANIC CHEMISTRY, POLYNUCLEAR HYDROCARBONS AND UV, IR SPECTROSCOPY

(Credits: Theory-04, Practicals-02) Theory:

60 Lectures

Section A: Inorganic Chemistry-4 (30 Lectures)

Chemistry of 3d metals

Oxidation states displayed by Cr, Fe, Co, Ni and Co.

A study of the following compounds (including preparation and important properties);

Peroxo compounds of Cr, $K_2Cr_2O_7$, $KMnO_4$, $K_4[Fe(CN)_6]$, sodium nitroprusside, $[Co(NH_3)_6]Cl_3$, $Na_3[Co(NO_2)_6]$.

(6 Lectures)

Organometallic Compounds

Definition and Classification with appropriate examples based on nature of metal-carbon bond (ionic, s, p and multicentre bonds). Structures of methyl lithium, Zeiss salt and ferrocene. EAN rule as applied to carbonyls. Preparation, structure, bonding and properties of mononuclear and polynuclear carbonyls of 3d metals. p-acceptor behaviour of carbon monoxide. Synergic effects (VB approach)- (MO diagram of CO can be referred to for synergic effect to IR frequencies).

(12 Lectures)

Bio-Inorganic Chemistry

A brief introduction to bio-inorganic chemistry. Role of metal ions present in biological systems with special reference to Na^+ , K^+ and Mg^{2+} ions: Na/K pump; Role of Mg^{2+} ions in energy production and chlorophyll. Role of Ca^{2+} in blood clotting, stabilization of protein structures and structural role (bones).

(12 Lectures)

Section B: Organic Chemistry-4 (30 Lectures)

Polynuclear and heteronuclear aromatic compounds:

Properties of the following compounds with reference to electrophilic and nucleophilic substitution: Naphthalene, Anthracene, Furan, Pyrrole, Thiophene, and Pyridine.

(6 Lectures)

Active methylene compounds:

Preparation: Claisen ester condensation. Keto-enol tautomerism.

Reactions: Synthetic uses of ethylacetoacetate (preparation of non-heteromolecules having upto 6 carbon).

(6 Lectures)

Application of Spectroscopy to Simple Organic Molecules

Application of visible, ultraviolet and Infrared spectroscopy in organic molecules. Electromagnetic radiations, electronic transitions, λ_{\max} & ν_{\max} , chromophore, auxochrome, bathochromic and hypsochromic shifts. Application of electronic spectroscopy and Woodward rules for calculating λ_{\max} of conjugated dienes and ν_{\max} of σ unsaturated compounds.

Infrared radiation and types of molecular vibrations, functional group and fingerprint region. IR spectra of alkanes, alkenes and simple alcohols (inter and intramolecular hydrogen bonding), aldehydes, ketones, carboxylic acids and their derivatives (effect of substitution on $>C=O$ stretching absorptions).

(18 Lectures)

Reference Books:

- James E. Huheey, Ellen Keiter & Richard Keiter: *Inorganic Chemistry: Principles of Structure and Reactivity*, Pearson Publication.
- G.L. Miessler & Donald A. Tarr: *Inorganic Chemistry*, Pearson Publication.
- J.D. Lee: *A New Concise Inorganic Chemistry*, E.L.B.S.
- F.A. Cotton & G. Wilkinson: *Basic Inorganic Chemistry*, John Wiley & Sons.
- I.L. Finar: *Organic Chemistry* (Vol. I & II), E.L.B.S.
- John R. Dyer: *Applications of Absorption Spectroscopy of Organic Compounds*, Prentice Hall.
- R.M. Silverstein, G.C. Bassler & T.C. Morrill: *Spectroscopic Identification of Organic Compounds*, John Wiley & Sons.
- R.T. Morrison & R.N. Boyd: *Organic Chemistry*, Prentice Hall.
- Peter Sykes: *A Guide Book to Mechanism in Organic Chemistry*, Orient Longman.
- Arun Bahl and B. S. Bahl: *Advanced Organic Chemistry*, S. Chand.

DSE LAB

60 Lectures

Section A: Inorganic Chemistry

1. Separation of mixtures by chromatography: Measure the R_f value in each case. (Combination of two ions to be given)

Paper chromatographic separation of Fe^{3+} , Al^{3+} and Cr^{3+} or

Paper chromatographic separation of Ni^{2+} , Co^{2+} , Mn^{2+} and Zn^{2+}

2. Preparation of any two of the following complexes and measurement of their conductivity:

(i) tetraamminecarbonatocobalt (III) nitrate

(ii) tetraamminecopper (II) sulphate

(iii) potassium trioxalatoferrate (III) trihydrate

Compare the conductance of the complexes with that of M/1000 solution of NaCl, $MgCl_2$ and $LiCl_3$.

Section B: Organic Chemistry

Systematic Qualitative Organic Analysis of Organic Compounds possessing monofunctional groups (-COOH, phenolic, aldehydic, ketonic, amide, nitro, amines) and preparation of one derivative.

Reference Books:

- A.I. Vogel: Qualitative Inorganic Analysis, Prentice Hall, 7th Edn.
- A.I. Vogel: Quantitative Chemical Analysis, Prentice Hall, 6th Edn.
- Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., *Textbook of Practical Organic Chemistry*, Prentice-Hall, 5th edition, 1996.
- Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry* Orient-Longman, 1960.

3. DSE: MOLECULES OF LIFE

(Credits: Theory-04, Practicals-02)

Theory: 60 Lectures

Unit 1: Carbohydrates

(10 Periods)

Classification of carbohydrates, reducing and non-reducing sugars, General Properties of Glucose and Fructose, their open chain structure. Epimers, mutarotation and anomers. Determination of configuration of Glucose (Fischer proof).

Cyclic structure of glucose. Haworth projections. Cyclic structure of fructose.

Linkage between monosachharides, structure of disacharrides (sucrose, maltose, lactose) and polysacharrides (starch and cellulose) excluding their structure elucidation.

Unit 2: Amino Acids, Peptides and Proteins

(12 Periods)

Classification of *Amino Acids*, Zwitterion structure and Isoelectric point.

Overview of Primary, Secondary, Tertiary and Quaternary structure of proteins. Determination of primary structure of peptides, determination of N-terminal amino acid (by DNFB and Edman method) and C-terminal amino acid (by thiohydantoin and with carboxypeptidase enzyme). Synthesis of simple peptides (upto dipeptides) by N-protection (t-butyloxycarbonyl and phthaloyl) & C-activating groups and Merrifield solid phase synthesis.

Unit 3: Enzymes and correlation with drug action

(12 Periods)

Mechanism of enzyme action, factors affecting enzyme action, Coenzymes and cofactors and their role in biological reactions, Specificity of enzyme action(Including stereospecificity), Enzyme inhibitors and their importance, phenomenon of inhibition(Competitive and Non-competitive inhibition including allosteric inhibition). Drug action-receptor theory. Structure & activity relationships of drug molecules, binding role of -OH group, -NH₂ group, double bond and aromatic ring,

Unit 4: Nucleic Acids

(10 Periods)

Components of Nucleic acids: Adenine, guanine, thymine and Cytosine (Structure only), other components of nucleic acids, Nucleosides and nucleotides (**nomenclature**), Structure of polynucleotides; Structure of DNA (Watson-Crick model) and RNA(**types of RNA**), Genetic Code, Biological roles of DNA and RNA: Replication, Transcription and Translation.

Unit 5: Lipids

(8 Periods)

Introduction to lipids, classification.

Oils and fats: Common fatty acids present in oils and fats, Omega fatty acids, Trans fats, Hydrogenation, Saponification value, Iodine number.

Biological importance of triglycerides, phospholipids, glycolipids, and steroids (cholesterol).

Unit 6: Concept of Energy in Biosystems

(8 Periods)

Calorific value of food. Standard caloric content of carbohydrates, proteins and fats. Oxidation of foodstuff (organic molecules) as a source of energy for cells. Introduction to Metabolism (catabolism, anabolism), ATP: the universal currency of cellular energy, ATP hydrolysis and free energy change.

Conversion of food into energy. Outline of catabolic pathways of Carbohydrate- Glycolysis, Fermentation, Krebs Cycle. Overview of catabolic pathways of Fats and Proteins. Interrelationships in the metabolic pathways of Proteins, Fats and Carbohydrates.

Recommended Texts:

- Morrison, R. T. & Boyd, R. N. *Organic Chemistry*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Finar, I. L. *Organic Chemistry (Volume 1)*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Finar, I. L. *Organic Chemistry (Volume 2)*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Nelson, D. L. & Cox, M. M. *Lehninger's Principles of Biochemistry 7th Ed.*, W. H. Freeman.
- Berg, J.M., Tymoczko, J.L. & Stryer, L. *Biochemistry*, W.H. Freeman, 2002.

DSE LAB

60 Lectures

1. Separation of amino acids by paper chromatography
2. To determine the concentration of glycine solution by formylation method.
3. Study of titration curve of glycine
4. Action of salivary amylase on starch
5. Effect of temperature on the action of salivary amylase on starch.
6. To determine the saponification value of an oil/fat.
7. To determine the iodine value of an oil/fat
8. Differentiate between a reducing/ nonreducing sugar.
9. Extraction of DNA from onion/cauliflower
10. To synthesise aspirin by acetylation of salicylic acid and compare it with the ingredient of an aspirin tablet by TLC.

Recommended Texts:

- Furniss, B.S.; Hannaford, A.J.; Rogers, V.; Smith, P.W.G.; Tatchell, A.R. *Vogel's Textbook of Practical Organic Chemistry*, ELBS.
- Ahluwalia, V.K. & Aggarwal, R. *Comprehensive Practical Organic Chemistry*, Universities Press.