FOUR YEAR UNDER GRADUATE (FYUG)

PROGRAMME UNDER

NEW EDUCATION POLICY, 2020

(1ˢᵗ and 2ⁿᵈ Semester)

Date of approval in Academic Council - 02.06.2023

STRUCTURE OF THE SYLLABUS, FYUG PROGRAMME, NEP 2020

(Example- Subject: Economics Major and History Minor)

1ST SEMESTER

COURSE CATEGORY	COURSE CODE	CREDIT	TOTAL CONTACT HOURS	REMARK
MAJOR	ECO-100*	4	60/75	
MINOR	HIS-100	4	60/75	Student to choose one course from other department
MDC		3	45	Student to choose one course out of the offered courses by the college under each category
AEC		3	45	Student to choose either English or any MIL and continue the same in 2nd Semester.
SEC				Student to choose one course out of the offered courses by the college under each category
VAC	VAC-104	3	45	Compulsory
Total		**20**		

2ND SEMESTER

COURSE CATEGORY	COURSE CODE	CREDIT	TOTAL CONTACT HOURS	REMARK
MAJOR	ECO-150	4	60/75	
MINOR	HIS-150	4	60/75	Student to choose one course from other department
MDC		3	45	Student to choose one course out of the offered courses by the college under each category
AEC		3	45	Student to continue the same as chosen in the 1st Semester.
SEC				Student to choose one course out of the offered courses by the college under each category
VAC		3	45	Student to choose one course out of the offered courses by the college under each category
Total		**20**		

NOTE: ALL MAJOR AND MINOR COURSES ARE THE CORE COURSES FOR MULTIDISCIPLINARY PROGRAMME

MAJOR/CORE PAPERS SEMESTER I & II

SL NO	SUBJECT	SEMESTER I		SEMESTER II	
		COURSE CODE	NAME OF THE COURSE	COURSE CODE	NAME OF THE COURSE
1	ANTHROPOLOGY	ANT-100	INTRODUCTION TO ANTHROPOLOGY	ANT-150	SOCIAL AND CULTURAL ANTHROPOLOGY
2	ASSAMESE	ASM-100	ASOMIYA SAHITYAR ASDHYAYON	ASM-150	ASOMIYA BHAXA ARU ASOMIYA LIPI
3	BENGALI	BEN-100	BANGLA SAHITYERITIHAS – ADIYUG O MADHYAYUG	BEN-150	BANGLASAHITYERITIHAS – ADI O ANT-MADHYAYUG
4	BIO CHEMISTRY	BCH-100	INTRODUCTORY BIOCHEMISTRY	BCH-150	BIOMOLECULES
5	BIOTECHNOLOGY	BIT-100	CELL BIOLOGY & GENETICS	BIT-150	BIOCHEMISTRY
6	BOTANY	BOT-100	PLANT DIVERSITY - I ALGAE, BRYOPHYTES AND PTERIDOPHYTES	BOT-150	PLANT DIVERSITY - II GYMNOSPERMS AND PALEOBOTANY, ANGIOSPERM MORPHOLOGY, PLANT ANATOMY
7	CHEMISTRY	CHE-100	INTRODUCTORY CHEMISTRY-I	CHE-150	INTRODUCTORY CHEMISTRY-II
8	CLINICAL NUTRITION AND DIETETICS	CND-100	BASIC NUTRITION	CND-150	HUMAN PHYSIOLOGY
9	COMMERCE	COM-100	ACCOUNTING FOR BUSINESS	COM-150	PRINCIPLES OF MANAGEMENT
10	COMPUTER APPLICATION	BCA-100	PROBLEM SOLVING AND PROGRAMMING IN C	BCA-150	INTERNET TECHNOLOGY WITH PHP AND MYSQL
11	COMPUTER SCIENCE	CSC-100	PROGRAMMING IN C AND INTRODUCTION TO DATA STRUCTURES	CSC-150	DATABASE MANAGEMENT SYSTEM
12	ECONOMICS	ECO-100	MICROECONOMICS I	ECO-150	MACROECONOMICS I
13	EDUCATION	EDU-100	INTRODUCTION TO EDUCATION	EDU-150	FOUNDATION OF EDUCATION

14	ELECTRONICS	ELE-100	BASIC NETWORK ANALYSIS	ELE-150	SEMICONDUCTOR DEVICES
15	ENGLISH	ENG-100	INTRODUCTION TO ENGLISH LITERATURE	ENG-150	BRITISH POETRY: MILTON TO THE PRESENT
16	ENVIRONMENTAL SCIENCE	EVS-100	CONCEPTS AND COMPONENTS OF ENVIRONMENT	EVS-150	POPULATION AND COMMUNITY ECOLOGY
17	FISHERY SCIENCE	FSC-100	INTRODUCTION TO FISH AND FISHERIES	FSC-150	FUNDAMENTALS OF AQUATIC ECOLOGY
18	GARO	GAR -0	INTRODUCTION TO GARO PROSE AND POETRY	GAR-150	ORAL NARRATIVES & FOLKLORE
19	GEOGRAPHY	GEO-100	INTRODUCTION TO HUMAN GEOGRAPHY	GEO-150	INTRODUCTION TO PHYSICAL GEOGRAPHY
20	GEOLOGY	GEL-100	INTRODUCTION TO GEOLOGY	GEL-150	ROCKS AND MINERALS
21	HINDI	HIN-100	हिन्दी भाषा एवं लिपि	HIN-150	हिन्दी व्याकरण
22	HISTORY	HIS-100	HISTORY OF INDIA: EARLIEST TIMES TO THE POST VEDIC PERIOD	HIS-150	HISTORY OF INDIA: MAURYA TO POST GUPTA PERIOD
23	HOME SCIENCE	HSC-100	INTRODUCTORY HOME SCIENCE	HSC-150	INTRODUCTORY HOME SCIENCE 2
24	KHASI	KHA-100	KA MAITPHANG ÏA KA LITERESHOR KHASI	KHA – 150	POITRI, SAWANGKA BAD PAROM MUTDUR
25	MASS COMMUNICATION AND VIDEO PRODUCTION	MVP-100	INTRODUCTION TO COMMUNICATION THEORY	MVP 150	VISUAL COMMUNICATION
26	MATHEMATICS	MTH-100	FUNDAMENTAL MATHEMATICS-I	MTH-150	FUNDAMENTAL MATHEMATICS-II
27	MEDIA TECHNOLOGY	MET-100	INTRODUCTION TO COMMUNICATION THEORY	MET 150	INTRODUCTION TO NEW MEDIA
28	MICROBIOLOGY	MIC-100	INTRODUCTORY MICROBIOLOGY	MIC-150	BACTERIOLOGY

29	MIZO	MIZ-100	INTRODUCTION TO MIZO LANGUAGE	MIZ– 150	MIZO POETRY SHORT PLAY AND LEGENDS
30	NEPALI	NPL-100	HISTORY OF NEPALI LITERATURE AND POETRY	NPL-150	LINGUISTICS, POETICS AND GRAMMAR
31	PHILOSOPHY	PHI-100	UNDERSTANDING PHILOSOPHY	PHI-150	ETHICS
32	PHYSICS	PHY-100	MATHEMATICAL PHYSICS, PROPERTIES OF MATTER AND WAVES	PHY-150	ELECTRICITY AND MAGNETISM, OPTICS AND ELECTRONICS
33	POLITICAL SCIENCE	POL-100	POLITICAL THEORY	POL-150	INDIAN POLITICAL SYSTEM
34	SOCIAL WORK	BSW-100	SOCIAL WORK : AN INTRODUCTION	BSW-150	ORIENTATION FOR FIELD WORK
35	SOCIOLOGY	SOC-100	INTRODUCTION TO SOCIOLOGY	SOC-150	PRINCIPLES OF SOCIOLOGY
36	STATISTICS	STA-100	INTRODUCTORY STATISTICS	STA-150	INTRODUCTORY TO PROBABILITY AND APPLIED STATISTICS
37	ZOOLOGY	ZOO-100	TAXONOMY AND ANIMAL DIVERSITY	ZOO -150	FUNCTIONAL AND COMPARATIVE ANATOMY

1. ANTHROPOLOGY

A. Preface

Anthropology poises itself as a discipline of infinite curiosity about human beings. As the study of humankind, it seeks to produce useful generalisations about people and their behaviour to arrive at the fullest possible understanding of human diversity. Anthropologists try to seek answers to an enormous variety of questions about humans. They are interested in discovering when, where and why humans first appeared on the earth, by uncovering the fossil remains or tools of people who lived long ago; how and why they have changed since then; how and why modern human populations vary/overlap in certain physical features. They are also interested in knowing how and why societies in the past and present have similar/different norms, values, customs, beliefs and practices. In fact, every human population, and not just the tribes and forest tribes as is often made out, is of interest to anthropologists.

Anthropologists not only study all varieties of people, they also study all aspects of human population. For example, when describing a group of people, an anthropologist might discuss the history of the area in which the people live, the physical environment, the organisation of family life, the general features of their language, the group's settlement patterns, political and economic systems, religion, styles of art and dress. Some are of course concerned primarily with biological or physical characteristics of human populations; others are interested principally in what we call cultural characteristics. There are also some who study the prehistoric cultures and still others who study the human languages in order to understand their culture and society.

Learning outcomes-based approach to curriculum planning and development

The fundamental premise underlying the learning outcomes-based approach to curriculum planning and development is that higher education qualifications such as Bachelor's Degree and Master's Degree programmes are awarded on the basis of demonstrated achievement of outcomes (expressed in terms of knowledge, understanding, skills, attitudes and values) and academic standards expected of the under- and post- graduates in Anthropology. Learning outcomes specify what students completing a particular programme of study are expected to know and be able to do at the end of their programme of study. The learning outcomes indicate the knowledge, skills, attitudes and values that are required to enable the students to effectively participate in knowledge production and in the knowledge economy, improve national competitiveness in a globalized world and for equipping young people with skills relevant for global and national labour markets and enhancing the opportunities for social mobility.

Programme Outcomes (POs):
- help formulate graduate attributes, qualification descriptors, programme learning outcomes and course learning outcomes that are expected to be demonstrated by the holder of a qualification;
- enable prospective students, parents, employers and others to understand the nature and level of learning outcomes (knowledge, skills, attitudes and values) or attributes a graduate/postgraduate should be capable of demonstrating on successful completion of a

programme of study;
- maintain national standards and international comparability of standards to ensure global competitiveness, and to facilitate graduate/postgraduate mobility; and
- provide higher education institutions and their external examiners an important point of reference for setting and assessing standards.

ANT- 100: INTRODUCTION TO ANTHROPOLOGY

(Contact Hours: 60, Credits: 4)

Course Objective: Introduce the subject of study 'Anthropology' as an academic discipline

Learning Outcomes:
- Students will learn about the genesis and development of anthropology.
- Learn about the aspects of anthropology – branches, field practice and pioneer anthropologists.

Unit 1: Introduction: Definition, Meaning and Scope of Anthropology; Historical Development; Anthropology, Relationship with other related disciplines: sociology, political science, economics, and psychology.

Unit 2: Branches: major branches of anthropology and their interrelatedness – Social and Cultural Anthropology, Biological Anthropology, Archaeological Anthropology, Linguistic Anthropology.

Unit 3: Ethnology, comparative method, ethnography, fieldwork, holism and cultural relativism.

Unit 4: Anthropologists at work: Bronislaw Malinowski, Radcliffe-Brown, Edmund Leach, Franz Boas, Ruth Benedict, Margaret Mead, N. K. Bose, D. N. Majumdar, Iravati Karve, M.N. Srinivas.

Suggested Reading:
Barnouw, Victor. 1971. *An Introduction to Anthropology*. Illinois: Dorsey Press.
Coleman, Simon. 1990. *An Introduction to Anthropology*. N.J.: Chartwell Books.
Coleman Simon, Ann Kingsolver and Susan Hyatt (Eds.). 2017. *Routledge Companion to Contemporary Anthropology*.
Delaney, C. L. 2004. *Investigating Culture*. Malden: Blackwell.

Haviland W.A., E.L.P. Harald, W. Dana and Bunny McBride. 2008. *Cultural Anthropology*. New Delhi: Cengage India Learning Private Limited.

Hawkes, C., Jennifer Watt et al. 2001. *Images of Society.* Toronto: McGraw-hill Ryerson.

Ingold Tim (Ed.) 1994. *Routledge Companion Encyclopedia of Anthropology*.

Jha Makhan. 2019. *An Introduction to Social Anthropology* (2nd Revised edition). New Delhi: Vikas Publication House Private Limited.

Lewis, R. Barry et al. 2010. *Understanding Humans*. Belmount: Wadsworth Cengage Learning.

Majumdar, D. N. and T. N. Madan. 2022. *An Introduction to Social Anthropology.* New Delhi: Mayur Books

Marcus, J. 2010. *Introduction to Anthropology*. Workbook Edition US: Kendall Hunt Publishing Company.

Miller, E. S. and C. A. Weitz. 1979. *Introduction to Anthropology*. N.J.: Prentice-Hall.

Montagu, A. 1969. *Man: His First Two Million Years*. New York: Columbia University Press.

Moore Henrietta and Tod Saunders (eds). 2014. *Anthropology in Theory:Issues in Epistemology.* Sussex, UK: John Wiley & Sons Inc. (2nd editon).

Rapport Nigel and Joanna Overing. 2000. *Social and Cultural Anthropology: The Key Concepts.* London and New York: Routledge (Taylor and Francis Company – e Edition 2003)

Sproule, W. 2001. *Our Social World*. Toronto: Prentice-Hall.

Srivastava, A.R.N. 2013. *Essentials of Cultural Anthropology.* (2nd edition) Delhi: PHI Learning Private Limited

Titiev, M. 1964. *The Science of Man.* New York: Holt.

ANT-150: SOCIAL AND CULTURAL ANTHROPOLOGY
(Contact Hours: 60, Credits: 4)

Course Objective: Provide understanding of the essence of Social and Cultural Anthropology.

Learning Outcomes:

- Students will learn about the genesis and historical development of Social and Cultural Anthropology.
- Learn basic concepts of society and culture, family, marriage and kinship extending to the understanding of socio-cultural life that includes religion, economic and political institutions.

Unit 1: Introduction: scope and aims; historical development; relationship with other branches of anthropology and with other social sciences and humanities.

Unit 2: Basic concepts: society, community, social institutions, association, social group, band and tribe; social structure and social function; culture, material & non-material culture, dynamism of culture, multiculturalism, transculturalism, cultural identity.

Unit 3: Family, marriage & kinship: definitions, forms, types and function; clan, phratry, moiety, rules of descent and kinship terminologies.

Unit 4: Anthropology of Religion: Concept of sacred, animism, totemism, naturism; magic, witchcraft and sorcery myth and cosmology; Economic Anthropology: Economic institutions, principles of production, distribution and consumption in simple societies, monetary and non-monetary economies, market exchange and commodities ; Political Anthropology: Political institutions; concepts of power and authority; types of authority; state and stateless societies; law and justice in simple and societies, development of legal institutions.

Suggested readings:

Beattie, John. 1976. *Other Cultures.* London: Oxford University Press.

Deliege, R. 2011. *Anthropology of the Family and Kinship.* New Delhi: PHI Learning Pvt. Ltd.

Ember, C.R. and M. Ember. 1981. *Cultural Anthropology.* New Jersey: Prentice Hall.

Evans-Pritchard, E.E. 1951. *Social Anthropology.* London: Cohen and West Ltd.

Fox Robin. 1984. *Kinship and Marriage: An Anthropological Perspective* (Cambridge Studies in

Social and Cultural Anthropology) (reprint 1998) London: Cambridge University Press.

Haviland W.A., E.L.P. Harald, W. Dana and Bunny McBride. 2008. *Cultural Anthropology*. New Delhi: Cengage India Learning Private limited.

Honigman, J.J. 1976. *Handbook of Cultural and Social Anthropology*. New York: Harper & Row.

Jha Makhan. 2019. *An Introduction to Social Anthropology* (2nd Revised edition). New Delhi: Vikas Publication House Private Limited.

Johnson Allen W. and Timothy Earle**.** 2000. *The Evolution of Human Societies: From Foraging Group to Agrarian State* (Second Edition) California: Stanford University Press

Leach, E.R. 1982. *Social Anthropology*. London: Fontana.

Lewis, I.M. 1994. *Social Anthropology in Perspective*. Cambridge: Cambridge Univ. Press.

Linton, Ralph. 1936. *The Study of Man*. New York: Appleton Century Crafts.

Mair, Lucy. 1985. *An Introduction to Social Anthropology*. Delhi: OUP.

Majumdar, D. N. and T. N. Madan. 2022. *An Introduction to Social Anthropology.* New Delhi: Mayur Books

Miller, B. 2011. *Cultural Anthropology*. New Delhi: PHI Learning Pvt. Ltd.

Royal Anthropological Institute. 1954. *Notes and Queries on Anthropology*. London: RKP.

Srivastava, A.R.N. 2005. *Essentials of Cultural anthropology*. New Delhi: Prentice Hall of India Pvt Ltd.

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2. ASSAMESE

Preface

The FYUG programme in Assamese, up to the second semester, comprises two Major/ Minor Courses and two Ability Enhancement Courses (AEC). The Major/ Minor Courses, being subjects in a core discipline and comprising Introduction to Assamese Literature and History of Assamese literature. The Ability Enhancement Courses, comprising of History of Assamese literature and Communicative Assamese are included in the second semester.

The two Major/ Minor Courses are designed to introduce students to the origin and development of Assamese literature and provide a comprehensive guide to Assamese prose, poetry, drama and short stories and their development, forms and movements over the ages. So is the Alternative Assamese paper under AEC. Communicative Assamese is designed to enhance their communication skills in dealing with day to day situations.

Programme Outcome

Through these courses, the students are expected to gain the knowledge of various literary texts. These courses will enable the students to think critically and demonstrate a coherent and systematic knowledge of the different aspects of the Assamese language and literature. In addition, Communicative Assamese will help them develop effective communication skills.

ASM-100: ASOMIYA SAHITYAR ASDHYAYON

(Study of Assamese Literature)

(Contact Hours: 60, Credits: 4)

Course Objective: This paper will introduce the student to the poetry and drama of the early and early modern periods of Assamese Literature including Assamese prose and short stories. The selection of texts is representative of the historical and socio-cultural periods mentioned above. It aims at acquainting students with the history and development of Assamese literary forms from the early periods, especially poetry, drama and prose. The paper also includes short stories from early modern to contemporary. This course will enable the students to read and respond to select texts of major Assamese poetry, drama, prose and short stories

Learning Outcome: Students will be able to learn the various literary genres in Assamese including early and short stories belonging to early and early modern periods.

Students would also be familiar with the socio-cultural period. The students will understand the growth and development of various Assamese literary genres like poetry, poetry, drama, prose and also short stories. Besides students will be able to analyze interpret and appreciate Assamese literary texts from the early periods to modern times.

Unit-I:Kabita (Poetry)

1. SaratBornona; Sankardeva
2. TezoreKomolaPoti; Madhabdev
3. Niyor; ChandrakumarAgarwala
4. Garha Kori MokJharudar; AmbikagiriRaychoudhury
5. MorDesh; Hiren Bhattacharjya

Unit-- II: Prabandha (Prose)

1. Guru ShisyarMonikanchanSanjog;Kothaguruchorit
2. Jibonor Omiya;Satyanath Bora
3. MoniramDewanorPhanchi; Benudhar Sharma

Unit-- III: (Drama)
   Chordhara; Madhabdev
Unit-- IV: Sutigalpa (Short stories)

1. Lakhminath Bezbaroa "Dhowakhowa"
2. BhabendranathSaikia, "Prohori"
3. HomenBorgohain"Hati"

Suggested Readings:

1. Barua, Bhaben: AsamiyaKabita: *BivartanarParba*. Guwahati: Grantha, 2012.

2. Baruah, Satya Prasad:*Natak aru AbhinayaPrasanga*. Guwahati: Banalata, 2016.

3. Bordoloi, N.P.(ed.)   : *KabitaManjuri*,University Publication Deptt, Gauhati University 11[th]ed 2003

4. Neog, Maheswar (ed) : *SnatokorKothabondho*, Gauhati University, Published by Gauhati University,1995

5. Neog, Maheswar, et al: ed. *AsamiyaGalpagucca*. Jorhat: AsamSahitya Sabha, 1978.

6. Sarma, Benudhar: ed. *HemchandraGoswamiRacanavali*. Jorhat: AsamSahitya Sabha, 1972.

7. Talukdar Nanda: *Kabi aru Kabita*, Bandana Publisher, 2014

ASM-150: ASOMIYA BHAXA ARU ASOMIYA LIPI

(Assamese Language and Assamese Script)

(Contact Hours: 60, Credits: 4)

Objective: The paper aims at introducing students to the history and development of the Assamese language and Assamese scripts including its various sub-dialents.

Learning Outcome: Students will be able to learn about the history, development and characteristics ofthe Assamese language and the Assamese sub-languages. The course will also enable the students to read Assamese scripts and texts.

Unit-I:
        Asomiya vasarutbhav aru bikash
Unit-II:
        Asomiya vasarbhasatatik baisistha
Unit-III:
        Asomiya vasarupavasar parisoy
Unit-IV:
        Asomiya lipirutbhav aru bikash
Suggested Readings:
1. Baruah, Bhimkanta: *Asomiya Bhasa,*Banalata Publisher, 2012

2. Goswami, UpendraNath: *Asomiya vasarutbhav aru bikash*, Collecor: Digital Libraryindia, JaiGyan, 1991

3. Goswami, Keshavananda Deva. *PuraniPuthi Adhyayan aru Sampadana*. Ghy.: AsamPrakasanParisad, 2015

4. Kakati, Sarbeswar Sarma: *Asomiya prasinlipi*, Library collection 2003

5. Goswami, *UpendraNathAsamiyaLipi*. Guwahati: Assam PrakasanParisad, 1987.

6. Neog, Maheswar. *Path-Samiksa.* Guwahati: Chandra Prakash, 2012.

7. Sharma, Dimbeswar, ed. *Kamarupasasanavali.* Guwahati, 1981

3. BENGALI

Preface

According to the National New Education Policy **2020**, this curriculum has been developed. Through this curriculum, students will become familiar with the glorious history of Bengal, its socio-political and cultural rise and fall, and the transformation of the Bengali language. They will gain knowledge about the impact of contemporary influences on the Bengali mindset, values, and literature. The curriculum will also provide vocational benefits. Furthermore, through the study of neighboring states, local cultures, folktales, and other related subjects, the curriculum aims to acquaint students with the diverse values and rich literature of a broader India.

রাষ্ট্রীয়নব্যশিক্ষানীতি২০২০অনুসারেএইপাঠ্যক্রমটিতরীকরাহয়েছে।এইপাঠ্যক্রমেরমাধ্যমেছাত্ররা বাংলারগৌরবোজ্জ্বলইতিহাস, তারসামাজিক-রাজৈনতিকওসাংস্কৃতিকউত্থানপতনএবংবাংলাভাষারবিবর্তনসম্পর্কেঅবহিতহতেপারবে।ঔপনিবে শিকআধুনিকতারসংস্পর্শেএসেবাঙালীরচিন্তা-চেতনা, জীবনমানওসাহিত্যেযেআধুনিকতারসঞ্চারহয়েছেসেসম্পর্কেছাত্ররাজ্ঞানলাভকরবে।পেশাগতদিক থেকেওপাঠ্যক্রমটিসুবিধাপ্রদানকরবে।এছাড়াওপ্রতিবেশীরাজ্যওলোকসংস্কৃতি, লোকগাথাইত্যাদিপঠনপাঠনেরমাধ্যমেএকবৃহত্তরভারতবর্ষেরমূল্যবোধওবৈচিত্রময়সাহিত্যেরসাথেছা ত্রেদেরপরিচয়করানোওএইপাঠ্যক্রমেরউদ্দেশ্য।

BEN-100: BANGLA SAHITYERITIHAS – ADIYUG O MADHYAYUG
(History of Bengali Literature)

(Contact Hours: 60, Credits: 4)

Course Objective:*The purpose of this lesson is to introduce students to the history of Bengali literature from its inception during the emergence period to the end of the medieval period.*

Learning Outcomes:*Students will acquire the skills to analyze and interpret the language, literary works, history, and potential themes of the ancient and early medieval Bengali literature (Charyapada) in depth.*

UNIT 1.   A. Charyapad, Srikrishnakirtan

    B. BhaisnavPadaboli (Bidyapati, Chandidas, Gyanadas, Gobindodas)

UNIT 2.   A. MangalKavya (ManasaMangal, ChandiMangal, Dharma Mangal).

  C. ChaitanyaJiboni (Brindabandas, KrishnadasKabiraj)

UNIT 3.   Charyapad (Selective poems)-1
                   i.   Kaya tarubarapanchwidaal
                   ii.   Bhabanoigahanganbhirbegebahi
                   iii.   SoneBharati karunanawi

UNIT4.   Charyapad (Selective poems)-2
                   i.   Nagar bahiredombitoharikuriya
                   ii.   Unchunchapawattahibasoisabaribali
                   iii.   Talatmorgharnahipabeshi

Suggested Reading:
1. BandopadhyayAsit kr. *Bangla SahityerItihas*,(Vol. 1-3)
2. HaldarGopal, *Bangla SahityerRuprekha* (1-2)
3. Choudhury Bhudeb, *Bangla SahityerItikotha* (1-2)
4. BhattacharjeeAsutosh, *Bangla MongalKavyerItihas*.
5. Acharya Debesh Kr, *Bangla SahityerItihas* (Adi O Madhyayug)
6. NathroyAmarendra,(Edited) *ShaktoPodaboli (Chayan*)
7.BasuArun Kr. *Shaktopodaboli*
8. DeySatyabrata, *CharyagetiParichay*
9. Basu,Manindramohan, *Charyageeti.*

BEN-150: BANGLA SAHITYERITIHAS–ADI O ANT-MADHYAYUG
(History of BengaliLiterature)

(Contact Hours: 60, Credits: 4)

Course Objective:The purpose of this lesson is to acquaint students with the history of early and later part of medieval Bengal and a specific aspect of the medieval era, the association with the Shakta poetry.

Learning Outcomes:Students will acquire knowledge about the history of Bengali literature (ancient and medieval periods) and gain knowledge about a specific aspect of literature, the subject matter of Shakta poetry, and the relationship between poets and poetic style.

UNIT 1. A.AnubadSahitya (Krittibas, Kashiramdas, Maladharbasu).
B.Arakanrajsabharsahitya (Doulatkaji, SaiyadAalaul)

UNIT 2. A. ShaktoPodaboli (Ramprasad, Kamalakanto).
D. Bharatchandra (Annadamangal).

UNIT3. ShaktoPodaboli :<u>Agamoni O Bijoya</u> (Selective poems)
Ramprasad   Giriebaramar Uma ele
  Aajsubhonishipohailotomar
  Oheprananathgiriboro he

UNIT 4. Kamalakanto   Kobe jabe bolo giriraj
  Ki holonabaminishi

Suggested Reading:
1. BandopadhyayAsit kr. *Bangla SahityerItibritta*
2. Choudhury Bhudeb, *Bangla SahityerItikotha*
3. Dutta, Hirendranath, *banglagadyerkramabikash*.
4. SenSukumar, *banglasahityegadya*.
5. Mukhopadhay, Arun kr. *Bangla gadyaritiritihas*
6. Roy, Rathindranath, *Dwijendralalrayersahjahan.*
7. Gangopadhay, Narayan, *kothakobita Rabindranath.*
8. Chakraborty, satinath, *Rabindranathke Rabindranath*.
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4. BIOCHEMISTRY

Programme in Biochemistry: A student will learn in-depth about how the chemical properties of molecules determine the ways in which they interact and react with each other in creating and sustaining life; there will be comprehensive teaching on enzymology, metabolism, structural biology, bioenergetics, molecular biology and genetic engineering leading to understanding of life as chemical process.

Programme Outcomes (POs): A biochemistry graduate will acquire exhaustive knowledge and understanding of biochemical reactions that he/she would be able to apply in research in fields of pharmacology, drug discovery, bioremediation, medicine, immunology, neurochemistry, endocrinology, etc. Other attributes gained from working in the laboratories would be hands-on training on scientific equipment, developing patience, learning to modify research protocols and being disciplined. There are ample job opportunities for a biochemistry graduate in higher studies, as academic researcher, analytical chemist, biomedical scientist, biotechnologist, clinical research associate, clinical scientist, forensic scientist, medicinal biochemist.

BCH-100: INTRODUCTORY BIOCHEMISTRY

(Contact Hours: 75, Credits: 4)

Course Objectives (COs):
1. To impart foundation in chemical nature of life
2. To clarify numerical concepts used in biochemistry
3. To teach concepts such as buffer, chemical bonds, functional groups and their importance
4. To relate the significance of biochemistry in everyday life

Learning Outcomes (LOs):
1. A graduate will have specific knowledge of biochemical concepts of origin and sustenance of life

2. Will be proficient in calculating strength/concentration of solutions and in preparing reagents and buffers

3. Will have a comprehensive knowledge of application of biochemistry in scientific fields such as agriculture, medicine, pharmaceutical, forensic science, nutrition and food processing, etc.

Unit I
Foundations of biochemistry: Physical foundations; chemical foundations; cellular foundations; distinguishing features of living organisms; energy source in living organisms

(chemotrophs and phototrophs); micromolecules and macromolecules; significance of *in vitro* and *in vivo* studies.

Historical perspective in biochemistry: Carl Neuberg, Lavoisier and oxidation of food, Wohler and synthesis of urea, Emil Fischer, Claude Bernard, Louis Pasteur and fermentation, Buchner Experiment, payen and diastase; Joseph Priestly and oxygen; Friedrich Miescher, Meyer and von Helmholtz, Hans Adolf Krebs, James B Sumner, Meyerhof and Hill, Miller-Urey Experiment.

Applications of biochemistry: Role of biochemistry in agriculture, medical science, pharmaceutical, nutrition and food processing, forensic science.

Unit II

Numerical concept: An overview on the metric system, atomic weight, molecular weight, equivalent weight, basicity of acids, acidity of bases, Avogadro's number, mole concept, percentage, molarity, molality, normality, Dalton concept, density, specific gravity, assay percentage, stock solution and working reagent, dilution factor, standard conditions in biological system.

Chemical bonds and common functional groups in biomolecules: Formation and properties of covalent bonds, non-covalent bonds (hydrogen bonds, ionic bonds, Vander Waals interactions, London forces, dipole-dipole interactions, electrostatic interactions and hydrophobic interactions), sigma, pi and co-ordinate bonds. versatility of carbon bonding in living organisms; some common functional groups in biomolecules.

Unit III:

Water and buffer: Biological significance of water, physical and chemical properties of water, colligative properties of water, molecular structure of water, ionization of water; ionic product of water, pH and pOH of water, water as a reactant, ultrapure water, deionized water, RO water, distilled water and double distilled water; buffer, pH and pKa, Henderson-Hasselbach equation, titration curve of weak acids, buffering capacity, buffering region, buffers in living organisms: phosphate buffer, bicarbonate buffer, proteins buffering ability.

Unit IV: Practical

1. Preparation of x gm/ml of Glucose and conversion into y M Glucose.
2. Preparation of 1MPotassium Dichromate and performing serial dilution of 0.1 M, 0.2 M,...to.., 0.9 M, 1M Potassium dichromate.
3. Calibration of pH meter.
4. Finding the pKa of Sodium acetate buffer.
5. Preparation of Buffer by Henderson-Hasselbalch Equation& Study on the Effect of different concentrations of buffer on the Buffering Capacity.
6. Titration Curve of acetic acid with NaOH.

Suggested readings:

1. Berg J M, John L, Stryer L (2012) Biochemistry 7th Ed., W H Freeman & Co. Ltd.
2. Garrett R H & Grisham C M (2012) Biochemistry 5th Ed., Brooks Cole Publ.
3. Harper's Illustrated Biochemistry 32nd Ed. (2022), Murray et al. McGraw Hill Publ.

4. Jayaraman (2011) Laboratory Manual in Biochemistry, New Age Int. Publ.
5. Nelson D L and Cox M M (2021) Lehninger's Principles of Biochemistry, Macmillan Publ.
6. Plummer D T (2008 reprint) An Introduction to Practicals in Biochemistry3rd Ed., Tata McGraw- Hill .
7. Powar C B & Chatwal G R , Biochemistry (2011), Himalaya Publishing House
8. Rosenberg J, Epstein L (2015) College Chemistry, McGraw Hill Education, India
9. Sadasivam S and Manickam A (2018) Biochemical Methods, 3rd Ed. New Age Int. Publ., New Delhi.
10. Segel Irwin H. (2010), Biochemical Calculations 2nd Ed., John Wiley & Sons.
11. Solomon T W G, Frhyle C B & Snyder S A (2016) Organic Chemistry 11th Ed., Wiley Madan R D (2018) Modern Inorganic Chemistry, S Chand Publ.
12. Voet D &Voet J G (2010) Biochemistry 4th Ed., John Wiley & Sons.
13. Zubay G (2020) Biochemistry 5th Ed., W C Brown Commun, Inc.

BCH-150: BIOMOLECULES

(Contact Hours: 75, Credits: 4)

Course Objectives (COs)
1. To understand the organization of simple molecules into macromolecular and supra molecular structure
2. To recall the Classification of Biomolecules
3. To compare the function of the various Biomolecules to sustain Life
4. To examine the role played by the functional groups and chemical bonds in Biomolecules
5. To estimate the concentration of Biomolecules

Learning Outcomes (LOs):
1. A graduate will have specific knowledge on the organization of monomers into macromolecular and supra molecular structure
2. Will be able to analyze the structure-function relation of a biomolecule
3. Will be able to estimate the amount of any biomolecule in a sample
4. Will be able to explain the importance of the various biomolecules to sustain Life

Unit I

Carbohydrates and sugars: Properties, structure and classification of monosaccharides (glucose & fructose), disaccharides (sucrose, maltose and lactose) and polysaccharides (dextrins, starch, glycogen and cellulose); glycosidic bonds, ketal, hemiketal, acetal and hemi acetal, reducing and non- reducing sugars; Stereochemistry of sugars: chiral carbon, epimers, anomers, mutarotation, chair and boat forms, glycosides, glucopyranose and fructopyranose; Fischer projection, Haworth projection; ABO blood group.

Fatty acids and lipids: Fatty acids: nomenclature and chemical properties; Lipid classification: simple and complex; general structure and function of the major lipid sub-classes; acylglycerols, phosphoglycerides, sphingolipids, waxes and terpenes, steroids and prostaglandins; Supra molecular structure: lipid membrane.

Unit II

Amino acids and proteins: Alpha amino acids: structure and properties of amino acids; Proteins: primary structure (structure of peptide bond-restricted rotation, *cis/trans*); secondary structure (α, β and super secondary structures); tertiary structure and quaternary structure of proteins, Ramachandran plot.

Unit III

Nucleotides and nucleic acids: Nucleotides: chemistry and properties. Nucleic acids: double helical structure of DNA, different forms and function of DNA; Functions of RNA: mRNA, tRNA, rRNA, siRNA, miRNA; Supra molecular complexes: chromosomes & ribosomes.

Application of spectrophotometry in the analysis of biomolecules: Absorption of UV-Vis light by biomolecules & spectral analysis, maximal wavelength of absorbance, Beer-Lambert's Law, instrumentation of spectrophotometer, chromogen, concept of blank, glass cuvette, quartz cuvette.

Unit IV: Practical
1. Verification of Beer-Lambert's Law
2. Estimation of amino acid using ninhydrin
3. Estimation of protein by Lowry's method
4. Estimation of protein by Bradford's method.
5. Estimation of DNA using diphenylamine
6. Estimation of RNA using orcinol
7. Estimation of Carbohydrates by Anthrone's Method
8. Estimation of Cholesterol by Zak's Method

Suggested readings:

1. Berg J M, John L, Stryer L (2012) Biochemistry 6th Ed., W H Freeman & Co. Ltd.
2. Boyer R F (2009) Modern Experimental Biochemistry 3rd Ed., 5th Impression Pearson Educ.
3. Damodaran G (2011) Practical Biochemistry, Jaypee Bros. Publ.
4. Devlin T. M. (2010) Textbook of Biochemistry with Clinical Correlations 7th Ed., Wiley Publ.
5. Freifelder D (1983) Physical Biochemistry, W H Freeman.
6. Garrett R H & Grisham C M (2012) Biochemistry 5th Ed., Brooks Cole Publ.
7. Harper's Illustrated Biochemistry 32nd Ed. (2022), Murray et al. McGraw Hill Publ.
8. Jayaraman (2011) Laboratory Manual in Biochemistry, New Age Int. Publ.
9. Nelson D L and Cox M M (2021) Lehninger's Principles of Biochemistry, Macmillan Publ.

10. Nigam A & Ayyagiri A (2008) Lab Manual in Biochemistry, Immunology &Biotechnology, Tata McGraw Hill.

11. Plummer D T (2008 reprint) An Introduction to Practicals in Biochemistry 3rd Ed., Tata McGraw- Hill Sambrook J and Russel D W (2012) Molecular Cloning 4th Ed., CSH Lab Press.

12. Rao B S & Deshpande V (2005) Experimental Biochemistry Students Companion I K International Publ.

13. Sadasivam S and Manickam A (2018) Biochemical Methods, 3rd Ed. New Age Int. Publ., New Delhi.

14. Voet D &Voet J G (2010) Biochemistry 4th Ed., John Wiley & Sons.

15. Wilson K and Walker J (2002) Principles and Techniques of Practical Biochemistry 5thEd. Cambridge Publ.

16. Yadav V. K. et al (2012) Biochemistry & Biotechnology- A Lab Manual, Pointer Publ.

17. Zubay G (2020) Biochemistry 5th Ed., W C Brown Commun, Inc.

5. BIOTECHNOLOGY

Programme in Biotechnology:

Under Graduate Biotechnology Programme is aimed at providing platform for students to get trained to become a scientist, researcher, or entrepreneur to work in the fields of medicine, agriculture, and food production as well as prepare them for industries R & D. The course covers aspects from fundamentals and principles of cellular systems, bioprocess engineeringto advancementin genetic engineering and recombinant DNA technology.

Programme outcomes (PO):

At the end of the B.ScBiotechnology Programme, the graduates will be able to:

PO 1: Apply knowledge of Bio-techniques and experiments at an appropriate level to the discipline

PO 2: Analyse a problem and define the Biological requirements, appropriate to its solution

PO3: Understand new concepts and be articulate while executing knowledge with peers

PO4: Acquire knowledge in domain of biotechnology enabling their applications in industry and research

PO5: Recognize social and ethical responsibilities of a professional working in the discipline.

PO6: Acquire technological knowhow by connecting disciplinary and interdisciplinary aspects of biotechnology

PO7: Apply written and oral communication skills to communicate effectively in healthcare, industry, academia and research.

BIT-100: CELL BIOLOGY AND GENETICS
(Contact Hours: 75, Credits: 4)

Course Objective (CO):

Students will be taught to undertand the concepts of cellular structure and function, application of of cell biology tools and to anlayse the complex idea of genetics.

Learning Outcomes (LO): At the end of the course, students will be able to:

LO1	Able to understand the concepts of cellular structure & functions
LO2	Characterize the various aspects of cell biology and its wider applications
LO3	Analyze the complex idea in genetics into its constituent parts and an elaborate study of their organization
LO4	Evaluation of mental construction of ideas and concepts from genetics to form new, integrated, and meaningful pattern.
LO5	Demonstrate skills to use modern analytical tools to analyze and solve problems in various aspects of cell biology & genetics

THEORY

Unit I

Structure, composition and general functions of plasma membrane, cytoskeleton, mitochondria, endoplasmic reticulum, Golgi complex, ribosomes, centrioles, and lysosomes. Nucleus-Nuclear envelope, nuclear matrix, nucleolus. Chromosome types and structure; Special types of chromosomes (polytene, lamp brush, supernumerary-B Chromosome); Eu- and heterochromatin, Sex chromosomes and sex determination, genic-balance theory of sex determination, Dosage compensation, Cell cycle and checkpoints, Mitosis and meiosis.

Unit II

Mendelian genetics: Law of dominance, law of segregation and independent assortment. Gene Interactions (complementary, supplementary, inhibitory, and pleiotropic genes). Chromosome theory of inheritance. Lethal alleles (coat color in mice), multiple alleles (ABO blood groups in man), multifactorial inheritance (skin color in man), Introduction to Linkage, crossing over and recombination of genes.; coupling and repulsion hypothesis, two point and three-point test cross, crossing over, recombination frequencies and mapping of genes. Basic concept of cytoplasmic inheritance (with examples human mitochondrial inheritance kappa particles in *Paramecium*, maternal effect on *Lymnaea*).

Unit III

Human Genetics- background and history, Autosomal and Sex- linked Traits , Human pedigrees, genetic disorders (Color blindness, /haemophilia, sickle cell disease, Huntington's disease, vitamin D resistant rickets) in human and their pattern of inheritance. Mutation: mutation rates, mutation types (somatic, germline, induced, spontaneous, gene and chromosome mutations); Mutagenic agents, Detection of mutation in autosomes and X-chromosome in *Drosophila.*

Unit IV: PRACTICAL

- Demonstration of cytochemical methods: Fixation of plant material and nuclear staining for mitotic and meiotic studies.
- Preparation and study of mitotic stages from onion root tip cells.
- Preparation and study of different stages of meiosis in male grasshopper.
- Construction of linkage maps; two and three point test cross (problem solving).
- Human Karyotype analysis.
- Preparation of Nuclear, Mitochondrial & cytoplasmic fractions
- Determination of relative sizes of nucleus and cytoplasm of squamous cells

Suggested Readings:

1. Alberts B, Johnson A, Lewis J, Raff M, Roberts K & Walter P, 2002. Molecular Biology of the Cell, 4th Edition, New York & London, Garland Science
2. DeRobertis EDP, Francisco AS & DeRobertis EMF2005. Cell Biology 6th Edition, WB Saunders Co Ltd.
3. Gardner EJ and Snustad DP, 2008. Principles of Genetics, John Wiley & Sons.
4. Gupta PK, 2005. Cytology Genetics and Evolution, Rastogi Publications.
5. Hartl DL, 1991. Basic Genetics, Jones & Bartlett Publications.
6. Harvey L, Arnold B, Chris AK, Monty K, Matthew PS, Anthony B &Paul M, 2016. Molecular Cell Biology 8th Edition, WH Freeman & Co Ltd
7. James W, Richard L, Michael L, Alexander G, Tania B &Stephen B, 2003. Molecular Biology of the Gene, 5th Edition, Benjamin-Cummings Publishing Company.
8. Julie B. Wolf, 2008. Molecular Biology Lab Manual, Department of Biological Sciences, UMBC IHC World Life Science Products and services.

9. Strachan T & Read A, 2010. Human Molecular Genetics, 4th revised Edition, Garland Science, USA.

10. Wilson K and Walker J, 2006. Principles and Techniques of Practical Biochemistry, Cambridge University Press.

BIT-150: BIOCHEMISTRY
(Contact Hours: 75, Credits: 4)

Course Objective (CO):

The course aims to develop concepts and understaning of biomolecules, metabolic pathways, enzymes amd analytical reasoning on biochemical techniques.

Learning Outcomes (LO): At the end of the course, students will be able to :

LO1	Conceptualize the understanding of Biomolecules and their utility in Industries
LO2	Establish a comprehensive understanding of the biological & metabolic pathways.
LO3	Execute and analyze the different bio techniques and its various biological sources.
LO4	Interpret the concepts of Enzymes and their daily applications.
LO5	Derive conclusions based on analytical reasoning and experimental evidence

Unit I

Chemical basis of life, Composition of living matter, Ionization of water, pH, pKa, buffer system and their applications; Henderson-Hasselbalch equation, Bio-energetic: Concept of entropy, free energy, electrical properties of biological compartments, electro-chemical gradients, membrane potential, electron transport chain in bacteria, plants and animals.chemiosmotic hypothesis. Classification, Properties and structure of carbohydrates, amino acids, proteins and fats, and nucleic acids, Oxidative phosphorylation, mechanism of ATP synthesis,

Unit II

Metabolism: Introduction to metabolism (catabolism and anabolism), Carbohydrate metabolism: Aerobic respiration- glycogenolysis, glycolysis, gluconeogenesis, Krebs cycle, glyoxylate shunt, cataplerosis and anaplerosis, pentose phosphate pathway. Anaerobic respiration- Fermentation

(ethanol and lactic acid) Lipid metabolism: Importance of fats, types of fatty acid, beta oxidation of fatty acids (odd number and even carbon number saturated and monosaturated fatty acids), ketone bodies.

Unit III

Enzymes: Nomenclature and classification of Enzymes, Holoenzyme, apoenzyme, Cofactors, coenzyme, prosthetic groups, metalloenzymes, monomeric & oligomeric enzymes, activation energy and transition state, complementarity. Regulation of enzyme activity (one example with allosteric and zymogenicity), coenzymes – structure & function (pyrodoxyl phosphate, $NAD^+/NADH/NADH_2$ and $FAD/FADH/FADH_2$), Enzyme Kinetics: enzyme substrate complex: concept of E-S complex, binding sites, active site, specificity, Michaelis-Menten equation and its derivation, Lineweaver-Burk plot, Eadie Hofstee plot. Enzyme inhibitions.

Unit IV: PRACTICAL

- Qualitative tests of sugars, amino acids and lipids
- Preparation of buffers using Handerson Hasselbalch equation.
- Verification of Beer-Lambert law
- Estimation of protein by Lowry's method.
- Paper chromatography of amino acids
- Paper chromatography of sugars
- Determination of K_m & V_{max} of an enzyme.

Suggested Readings:

1. Bowden Athel Cornish, 2004. Fundamentals of Enzyme Kinetics,Portland Press.
2. Jayaraman J, 1988. Laboratory manual of Biochemistry, Wiley East
3. Jo Keith Willson, 2000. Principles and Techniques of Practical Biochemistry, 5th Edition, Cambridge University Press.
4. Murray R K et al., 2005. Harper's Biochemistry, Prentice Hall International
5. Nelson DL &Cox MM, 2008. Lehninger's Principle of Biochemistry, Worth Publishers.
6. Plummer M & Plummer DT, 2017.Introduction to Practical Biochemistry, McGraw Hill Education

7. Robert KM, Darryl KG, Peter AM & Victor WR, 2018. Harper's Illustrated Biochemistry, 31st Edition, Lange Publishers

8. Tanford, C., Physical Chemistry of Macromolecules, John Wiley & Sons (2005)

9. Voet Donald & Voet Judith , 1995. Biochemistry, 2nd Edition, John Wiley and Sons.

10. Wilson, K. and Walker, J. 2010. Principles and techniques of Biochemistry and Molecular Biology. 7th Edition. Cambridge University Press

11. Zubay G, Biochemistry, 2000. Wm. C Brown Publishers

6. BOTANY

The Botany curriculum provides students with a comprehensive understanding of plants, incorporating subject knowledge, technical skills, and interdisciplinary components. It equips them with cutting-edge technologies used in plant science research and emphasizes the social and environmental importance of plants. Students gain awareness of plants' role in maintaining ecological balance, conserving biodiversity, and mitigating environmental challenges. The curriculum also highlights the economic relevance of plants in sectors like agriculture, horticulture, and pharmaceuticals. By integrating these elements, the curriculum prepares students as well-rounded professionals capable of addressing complex challenges, contributing to scientific advancements, and making informed decisions for the benefit of society, the environment, and the economy.

ProgrammeOutcomes(POs): Expectedoutcomeoftheprogramme:
1. Gain comprehensive understanding of different branches of Botany: Systematics, evolution, ecology,developmental biology, physiology, biochemistry, plant interactions, morphology, anatomy, reproduction, genetics, and molecular biology.
2. Acquire competence in analytical and technical skills relevant to plant sciences.
3. Develop abilities in plant identification, experimental design, database utilization, and statistical analysis.
4. Conduct short research projects using various tools and techniques in plant sciences, fostering a scientific and research-oriented mindset.

BOT-100: PLANT DIVERSITY–I:ALGAE, BRYOPHYTES AND PTERIDOPHYTES

(Contact Hours: 75, Credits: 4)

Course Objectives (Cos):
This paper aims to provide students with a comprehensive understanding of the lower groups of plants, enabling them to grasp the interrelationships and evolutionary affinities among these plant groups. Additionally, it will equip students with proficiency in experimental techniques for analyzing and studying these plant groups.

Learning Outcomes (LOs):
Afterthecompletionofthecourse,thestudentswillbeableto:
1. Acquire knowledge regarding the classification, diversity, and life cycles of various groups of algae, including their economic significance.
2. Develop a critical understanding of the morphology, anatomy, reproduction, and life cycles of bryophytes.
3. Gain a critical understanding of the morphology, anatomy, reproduction, and life cycles of pteridophytes.

4. Understand the ecological and economic uses of archegoniate plants.
5. Demonstrate proficiency in employing experimental techniques and methods for the appropriate analysis of algae, bryophytes, and pteridophytes.

Unit – I: Algae
1. Salient features of algae and Classification by Fritsch (1935) with characteristic features of each class.
2. Range of thallus and reproductive structures in algae.
3. Life cycles of *Chara*, *Oedogonium,* and *Polysiphonia*.
4. Economic importance of algae.

Unit – II: Bryophytes Salient features of bryophytes and classification by Proskauer (1957).
1. Origin and range of gametophytic structures in Bryophytes.
2. Life cycle of *Marchantia*, *Anthoceros* and *Funaria.*
3. Economic importance of Bryophytes.

Unit- III: Pteridophytes
1. Salient features of pteridophytes and classification by Smith (1955).
2. Types of stelar structures in Pteridophytes.
3. Life cycle of *Lycopodium* and *Selaginella.*
4. Economic importance of Pteridophytes.

Unit - IV: Practical

1. Study of vegetative and reproductive parts with the help of temporary preparations of all genera prescribed in Paper BOT-100-T.
2. Dissection, sectioning, drawing, description and identification of the specimens covered in the preparations.
3. Spotting: Includes those specimens not covered in experiments 1 and 2.
4. Field visit to nearby areas to observe different groups of plants prescribed in the theory syllabus.

Suggested Readings:
1. Bold, H.C. and Wynne, M.J. (1978). Introduction to Algae: Structure and Reproduction. Prentice Hall, New Jersey.
2. Bux, F. and Chisti, Y. (2018). Algae Biotechnology: Products and Processes. Springer, International Publishing, Cham.
3. Geissler, P and Greene, S.W. (1982). Bryophyte Taxonomy: Methods, Practices and Floristic Exploration. J Cramer, Germany.
4. Hait, G., Bhattacharya, K. and Ghosh, A.K. (2011). Textbook of Botany. Volume 1. New Central Book Agency (P) Ltd., New Delhi.
5. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West Press Pvt. Ltd., New Delhi.
6. Lee, R.E. (2008). Phycology. Fourth Edition. Cambridge University Press.

7. Mitra, J.N., Mitra, D. and Chaudhuri, S.K. (2023). Studies in Botany. Volume I. 10[th]Revised Edition. Moulik Library, Kolkata.

8. Pandey, B.P. (2017). Botany for degree students. Biodiversity. S. Chand & Company Ltd., New Delhi.

9. Shaw, A.J. and Goffinet, B. (2000). Bryophyte Biology. Cambridge University Press.

10. Stevenson, R.J., Bothwell, M.L. and Lowe, R.L. (1996). Algal Ecology: Freshwater Benthic Ecosystems. Academic Press, Cambridge.

11. Van den Hoek, C., Mann, D.G. and Jahns, H.M. (1995). Algae. An Introduction to Phycology, Cambridge University Press.

12. Vanderpoorten, A. and Goffinet, B. (2009). Introduction to Bryophytes. Cambridge University Press.

13. Vashishta, P.C., Sinha, A.K., and Kumar, A. (2006). Botany for degree students. Pteridophyta (Vascular Cryptogams). S. Chand & Company Ltd., New Delhi.

14. Vashishta, B.R., Sinha, A.K., and Singh, V.P. (2010). Botany for degree students. Part-I Algae. S. Chand & Company Ltd., New Delhi

15. Vashishta, B.R., Sinha, A.K., and Kumar, A. (2010). Botany for degree students. Part-III Bryophyta. S. Chand & Company Ltd., New Delhi.

BOT-150: PLANT DIVERSITY–II: GYMNOSPERMS, PALAEOBOTANY, ANGIOSPERM MORPHOLOGYAND ANATOMY

(Contact Hours: 75, Credits: 4)

Course Objectives (Cos):
This paper provides an overview of the higher groups of plants, focusing on the interrelationships and evolutionary pathways that connect them. By studying this topic, students will develop a comprehensive understanding of how different plant groups are related to each other and how they have evolved over time. Through exploring the interconnections and evolutionary trajectories of higher plant groups, students will gain valuable insights into the diversity and complexity of the plant kingdom, enriching their knowledge of plant biology and evolution.

Learning Outcomes (LOs):Upon completion of the course, students will be able to:

1. Develop a critical understanding of the morphology, anatomy, and reproduction of Gymnosperms and Angiosperms.

2. Gain knowledge about the geological history of the Earth and the life forms that existed during prehistoric periods.

3. Comprehend the process of fossil formation and recognize different types of fossils.

4. Understand the fundamental concepts of plant morphogenesis and the development of organs.

5. Analyze the variations in morphology and internal structures among different parts of plants and across various plant groups, supporting the concept of evolution.

6. Demonstrate proficiency in utilizing experimental techniques and methods for the appropriate analysis of Gymnosperms.

7. Master the techniques for preparing double-stained specimens and studying anomalous growth in angiosperms.

Unit–I: Gymnosperms and Paleobotany
1. Salient features and classification of gymnosperms by Coulter and Chamberlain (1910).
2. Phylogenetic relationship and affinities of gymnosperms.
3. Life cycle of *Cycas*, *Pinus,* and *Gnetum*.
4. Economic importance of gymnosperms.
5. Geological time scale; Fossil formation and plant fossil types.

Unit–II: Angiosperm Morphology
1. Leaf morphology: Phyllotaxy and venation.
2. Types of stipules, bracts and inflorescence.
3. Floral morphology: Forms of calyx, corolla, and their aestivation.
4. Types of stamens and carpels.
5. Types of fruits, ovule forms, and placentation.
6. Types of seeds: albuminous and exalbuminous

Unit- III: Plant Anatomy
1. Organization of apical meristem.
2. Types of stomata in angiosperms.
3. Components of xylem and phloem with their functions.
4. Concept of primary and secondary growth; Secondary growth in stem and root of dicots.
5. Anomalous secondary growth in *Bignonia* and *Dracaena*.
6. Root-stem transition.

Unit - IV: Practical

1. Study of vegetative and reproductive structures of all prescribed gymnosperms by preparing temporary stained slides (dissection, sectioning, drawing, description, and identification up to genus).
2. Study of fossils through slides or specimens.
3. Sectioning and observation of placentation types, ovule structure, and anther through temporary preparations.
4. Study of permanent slide preparation by double staining techniques (Safranin and Haematoxylin or Safranin and fast green).
5. Anatomical studies of anomalous secondary structures of *Bignonia* and *Dracaena* by temporary double staining techniques (Safranin and Haematoxylin or Safranin and fast green).
6. Spotting: Includes those groups and sections not covered in the preparations.

Suggested Readings:
1. Beck, B. (1988). Origin and Evolution of Gymnosperms. Columbia University Press.
2. Bhatnagar, A. K. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi.
3. Bhattacharya, K., Hait, G. and Ghosh, A.K. (2015). A Textbook of Botany. Volume II. New Central Book Agency (P) Ltd., New Delhi.

4. Bhojwani, S.S. and Bhatnagar, S.P. (2000). The Embryology of Angiosperms. Vikas Publishing House.
5. Crang, R., Lyons-Sobaski, S., and Wise, R. (2018). Plant anatomy: A concept-based approach to the structure of seed plants. Springer.
6. Dickison, W.C. (2000). Integrative Plant Anatomy. Harcourt Academic Press, USA.
7. Evert, R.F. (2006). Esau's Plant Anatomy: Meristems, Cells, and Tissues of the Plant Body: Their Structure, Function, and Development. John Wiley and Sons, Inc.
8. Fahn, A. (1990). Plant Anatomy. Pergamon Press.
9. Mauseth, J.D. (1988). Plant Anatomy. The Benjamin/Cummings Publisher, USA.
10. Mishra, S. R. (2010). Textbook of Palaeobotany. Discovery Publishing House Pvt Ltd.
11. Mitra, J.N., Mitra, D. and Chaudhuri, S.K. (2023). Studies in Botany. Volume I. 10th Revised Edition. Moulik Library, Kolkata.
12. Pandey, B.P. (2017) A Texbook of Botany: Angiosperms. S. Chand& Company Pvt Ltd.

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7. CHEMESTRY

Preface

The FYUG syllabus for Chemistry has been framed as per NEP-2020 guidelines. This undergraduate course in Chemistry has been addressed to the students enrolled for 3-year UG Major and Multidisciplinary program, 4-year UG Honours, and Honours with the Research program of the University at the beginning of their careers. This course aims to disseminate knowledge in the field of academic, research, and professional development of students. The course in Chemistry has been divided into three sections, one each in Inorganic, Organic, and Physical Chemistry. The course on Inorganic Chemistry covers the basic understanding of atomic models, periodic properties of elements, and chemical bonding. A unit has been devoted to elementary knowledge of the nucleus and nuclear reactions. The course also covers theoretical and practical aspects of qualitative and quantitative analysis. A large part of Organic Chemistry is concerned with reactions leading to the formation and breaking of carbon-carbon bonds and the synthesis of various organic compounds including natural products. It also aims to impart knowledge to the students on the various oxidation and reduction methods for the modification of functional groups. Emphasis has been given to learning the scope and limitations of the reactions and the effect of structure on reactivity and selectivity. The course on Physical Chemistry includes the determination of structure and the geometrical arrangement of atoms in solids, the liquefaction of gases, and a quantitative relation between the heat capacities of a substance at constant pressure and constant volume. It aims to introduce the students to thermodynamic parameters and state functions and develop the basic concepts of thermodynamics and the direction of spontaneous change. The course also covers some elementary ideas on the kinetics of the reaction and the feasibility of a given reaction.

Programme Outcomes

At the end of the programme, the students are expected to have sound knowledge of fundamental concepts of inorganic, organic, and physical chemistry. The acquired hands-on training will enable the students to analyze and identify various ions and functional groups.

CHE-100: INTRODUCTORY CHEMISTRY – I

(Contact Hours: 75, Credits: 4)

Objective: *The main objective of this course is to demonstrate scientific understanding of the structure of matter and its physical and chemical transformations so that students will be able to apply appropriate theories to predict chemical structure, reactivity, and physical properties. It would also provide students with hands-on training in qualitative analysis of various inorganic ions.*

Learning outcomes: *The contents assignments and assessments of this course are aligned to understand the fundamental concepts of chemistry in all three branches viz. inorganic, organic, and physical chemistry. Also, they will learn inorganic qualitative analysis to identify the acidic and basic radicals present in inorganic salts.*

PART-A (Theory)

Unit I: Inorganic Chemistry-I   **Marks: 7 (Internal); 18 (End Sem.)**   **15 hours**

(a) Structure of Atom: Bohr's Atomic model and its limitations, De- Broglie's matter waves, Heisenberg's Uncertainty principle, Schrodinger's wave equation and its importance, Physical concepts of Ψ and Ψ^2, Quantum numbers, Shapes of s, p and d orbitals, Principles of electronic configuration: Hund's Rule, Pauli's exclusion Principle, and Aufbau principle, Screening effect and effective nuclear charge.

(6 marks, 5 hours)

(b) Chemical periodicity: Long form of periodic table, Modern periodic law, Types of elements on the basis of electronic configuration, Periodic variation in properties: atomic and ionic radii, ionization enthalpy, electron gain enthalpy and electronegativity, Diagonal relationships.

(5 marks, 4 hours)

(c) Chemical Bonding : Valence shell electron pair repulsion (VSEPR) theory and shapes of molecules and ions:- BeF_2, CO_2, BF_3, BO_3^{3-}, O_3, H_3O^+, NH_3, H_2O, PCl_3, PCl_5, SF_4, SF_6, Basic idea of valence bond theory and its limitations, Concept of hybridization of orbitals and its implications on bond length, bond energy, bond angles and shapes of molecules with following examples: BeF_2, BF_3, $AlCl_3$, H_3O^+, NH_3, H_2O, PCl_3, PCl_5, SF_4, SF_6, ClF_3, I_3^-, LCAO-MO theory and its application to homonuclear diatomic molecules (H_2, Be_2, N_2, N_2^+, N_2^{2+}, N_2^- N_2^{2-}, O_2, O_2^-, O_2^{2-}, O_2^+ O_2^{2+}), Polarity of covalent bonds and dipole moment, Polarizing power, Polarizability

of ions and Fajan's rule, Concept of lattice energy and Born-Haber cycle (NaCl).

(8 marks, 6 hours)

Unit II: Organic Chemistry-I   Marks: 6 (Internal); 19 (End Sem.)   15 hours

(a) Nomenclature, Structure, Bonding, and Properties: Nomenclature of organic molecules (hydrocarbons, halogen compounds, aldehydes, ketones, alcohols, ethers, amines, carboxylic acids, esters, amides and nitro compounds). Hybridisation and its implications on the bond length, bond energy, bond angles, shape of the molecules with following examples: (i) CH_4, CH_3^-, RNH_2 (ii) C_2H_4, CH_3^+, carbonyl compounds (C=O) and (iii) C_2H_2, R-C≡N, ketene. Nature of covalent bond and its orbital representation in molecules listed above, Electronegativity, Inductive effect, Effect of H-bonding on boiling point and solubility of organic compounds, Conjugation, Resonance, Hyperconjugation (propene and toluene), Heterolytic and homolytic bond cleavage, Electrophiles and nucleophiles, Reactive intermediates: carbocations, carbanions and free radicals.

(8 marks, 6 hours)

(b) Alkanes and Cycloalkanes: Methods of preparation of alkanes (with special reference to mechanism of Kolbe, Würtz, Würtz-Fittig and Corey-House reactions), Chemical reactivity (oxidation and cracking). Mechanism of chlorination, Relative reactivity of halogens towards different types of alkanes. General methods of preparation of cycloalkanes (up to cyclohexane) and their reactions with halogens and HX, Baeyer's strain theory – modifications and its limitations.

(5 marks, 4 hours)

(c) Alkenes and Alkynes: Synthesis and reactivity of alkenes, Markownikoff's rule and anti-Markownikoff's rule, Mechanism of hydrogenation, bromination, hydration, halohydration, hydroboration, oxidation, epoxidation, ozonolysis, hydroxylation and polymerization, Comparative acidity of ethane, ethane and ethyne, Synthesis and reactivity of alkynes: electrophilic addition reactions (halogenation, hydration, HX and HOX), ozonolysis; alkynides (Na, Cu and Ag) and polymerization.

(6 marks, 5 hours)

Unit III: Physical Chemistry-I   Marks: 6 (Internal); 19 (End Sem.)   15 hours

(a) States of Matter
(i) Gaseous State-I: Postulates of kinetic theory of gases, Collisions and gas pressure, Average kinetic energy, Root mean square velocity and absolute temperature of gas, Boltzmann constant, Gas laws and kinetic theory, Liquification of CO_2 gas, Real gases - deviation from ideality,

Compressibility factor and its variation with pressure and temperature for different gases, and van der Waals equation of state.

(7 marks, 6 hours)

(ii) Liquid State-I: Qualitative description of the structure of liquids, Physical properties of liquids: vapour pressure, Surface tension, Viscosity, Refractive index (definitions and descriptions). Effect of additive (sodium chloride and ethanol) on surface tension and viscosity of liquid.

(4 marks, 3 hours)

(iii) Solid State-1: Elementary discussion on the types of unit cells, Crystal systems, Crystal defects, Bragg's law.

(3 marks, 2 hours)

(b) *Chemical Kinetics-I:* Rate of reaction and rate constant, Molecularity and order of a reaction, Zero order reaction, Differential and integrated forms of rate equations of first and second order reactions, Pseudo-first order reactions, Determination of order of reactions, Effect of temperature on reaction rates and energy of activation, Effect of catalyst.

(5 marks, 4 hours)

PART-B (Practical)

Unit IV: Inorganic Laboratory-I **Marks: 6 (Internal); 19 (End Sem.)** **30 hours**

Experiment: Qualitative analysis of inorganic mixtures containing at least five radicals/ions (from the list given below) to be completed - one of the radicals/ions must be interfering (borate, chromate or phosphate).

List of ions/radicals:

Cations: Pb^{2+}, Cu^{2+}, Bi^{3+}, As^{3+}, Sb^{3+}, Sn^{2+}, Sn^{4+}, Fe^{2+}, Fe^{3+}, Al^{3+}, Ba^{2+}, Cr^{3+}, Zn^{2+}, Mn^{2+}, Co^{2+}, Ni^{2+}, Ca^{2+}, Sr^{2+}, Mg^{2+}, K^{+}, NH_4^{+}.

Anions: Cl^-, Br^-, I^-, SO_4^{2-}, NO_3^-, BO_3^{3-}, PO_4^{3-}, CrO_4^{2-}.

Interfering radicals/ions: borate, chromate, phosphate.

End-semester External Evaluation Distribution (Duration: 6 hours)		
1	Qualitative Analysis	12 Marks
2	Viva voce	5 Marks
3	Laboratory record	2 Marks
In-semester Internal Evaluation Distribution		
1	Laboratory attendance and performance	2 Marks
2	Test and Viva voce	4 Marks

Suggested books:

1.   Concise Inorganic Chemistry, J. D. Lee, 5th Ed., Wiley India, New Delhi (2014).
2.   General and Inorganic Chemistry (Part-I), R. Sarkar, 3rd Revised Ed., New Central Book Agency, India (2011).
3.   Vogel's Qualitative Inorganic Analysis, G. Svehla, 6th Revised Ed., Orient Longman, London (1987).
4.   Modern Organic Chemistry, M. K. Jain and S. P. Sharma, Vishal Publishing Co., Jalandhar (2020).
5.   Organic Chemistry, J. Clayden, N. Greeves, S. Warren and P. Wothers, Oxford University Press, London (2012).
6.   Principles of Physical Chemistry, B. R. Puri, L. R. Sharma and M. S. Pathania, Vishal Publication Co., Jalandhar (2020).
7.   Physical Chemistry, P. W. Atkins and De-Paula Atkins, 7th Ed, Oxford University Press, London (2006).
8.   University Chemistry Practical, P. C. Kamboj, Vishal Publishing Co., Jalandhar (2009-2010).

Notes:

(i) A candidate must obtain minimum pass marks (which will include both the internal and end-semester marks) stipulated by the University **separately** both in the theory (Part A) and practical components (Part B) to clear the course.

(ii) The marks allotted to each component of different units should be strictly adhered to in making the question paper.

CHE-150: INTRODUCTORY CHEMISTRY – II

(Contact Hours: 75, Credits: 4)

Objective: *The primary objective of this course is to provide a broad foundation in chemistry that stresses scientific understanding and reasoning along with problem solving aptitude. It would also provide the students with the skills required to analyze and comprehend the chemical composition of organic compounds.*

Learning outcomes: *Upon successful completion of this course, the students will have an understanding in the principles and applications of various theories in inorganic, organic, and physical chemistries. Also, they will learn the techniques to identify the functional groups and analyze the organic samples to know their properties.*

PART-A (Theory)

Unit I: Inorganic Chemistry-II   Marks: 6 (Internal); 19 (End Sem.)   15 hours
(a) Nucleus and Radioactivity-I: Nuclear particles (neutrons and protons) and concept of mesons and pions, Mass defect and nuclear binding energy (including numerical), Packing fraction, Natural and artificial radioactivity, Radioactive disintegration series, First order rate equation of radioactive disintegration, Half-life and average life period, Group displacement law, Neutron-proton ratio and its implications, Elementary concepts of fusion and fission.
          (5 marks, 4 hours)

(b) Redox reactions: Electronic concepts of oxidation and reduction, Oxidation number, Common oxidants and reductants, Calculation of equivalent weights of oxidants and reductants, Balancing of redox reactions by ion electron method.   *(4 marks, 3 hours)*

(c) Principles of qualitative and quantitative analysis: Solubility product and its application in group separation of cations, Standard solutions: primary and secondary solutions, Concentrations of standard solutions: molarity, molality and normality, Volumetric analysis: redox titrations

(permanganometry, dichromometry and sodium thiosulphate with iodide), iodometric and iodimetric titrations. *(5 marks, 4 hours)*

(d) Acid-base Concept: Arrhenius and Bronsted-Lowry concept, Lewis concept, Solvent system (Franklin) concept and its limitation, Effect of solvent in relative strengths of acids and bases, Levelling and differentiating effect, Relative strengths of acids and bases (pKa and pH concept), HSAB principle.

(5 marks, 4 hours)

Unit II: Organic Chemistry-II   Marks: 7 (Internal); 18 (End Sem.)   15 hours

(a) Organic Stereochemistry–I: Concept of isomerism, Types of isomerism, Configurational and conformational isomerism (ethane and butane), Fischer, Newman and Sawhorse projections with suitable examples, Geometrical isomerism, Configuration of geometrical isomers, E and Z nomenclature (including oximes), Optical isomerism: optical activity, chiral carbon atom, enantiomers, diastereomers, R/S nomenclature (with one chiral carbon atom only)
(6 marks, 5 hours)

(b) Aromatic Hydrocarbons and Aromaticity: Molecular orbital picture of benzene, Resonance energy, Aromaticity, Hückel's (4n+2) rule and its application to simple molecules and ions, Electrophilic substitution reactions in aromatic hydrocarbons and general pattern of the mechanism, Effect of substituent groups (activating and deactivating groups, directive influence): mechanism of nitration, sulphonation, halogenation (nuclear and side-chain), formylation (Gattermann and Gattermann – Koch), Friedel – Craft's alkylation and acylation.
(5 marks, 4 hours)

(c) Nucleophilic Substitution Reactions: Nucleophile, Ambident nucleophile (KCN, AgCN, KNO_2, $AgNO_2$), Difference between nucleophiles and bases, S_N^1, S_N^2, NGP, S_N^i, Factors affecting substitution reactions (structure of substrate, nature of nucleophile, solvent and role of leaving group), Mechanism and stereochemistry of substitution reactions.
(5 marks, 4 hours)

(d) Elimination reactions: E^1, E^2, E^1cB mechanism, Orientation in elimination reactions (Saytzeff's and Hoffmann rules). *(3 marks, 2 hours)*

Unit III: Physical Chemistry-II   Marks: 6 (Internal); 19 (End Sem.)   15 hours

(a) Thermodynamics-I: Concept of system and surrounding, types of systems, Intensive and extensive properties, Types of processes: isothermal, adiabatic, isobaric, reversible, irreversible and cyclic processes; Thermodynamic functions: state variables and exact differentials, Path functions and inexact differentials, Zeroth law of thermodynamics, Reversibility and maximum work in ideal gas expansion. First law of thermodynamics: Statement, internal energy, enthalpy,

Heat capacity at constant pressure (Cp) and volume (Cv), Concept of heat, Relation between Cp and Cv, Spontaneous processes, Entropy, Second law of thermodynamics, Joule-Thomson coefficient and inversion temperature.   (*10 marks, 8 hours*)

(b) Thermochemistry: Exothermic and endothermic reactions, Hess's law of constant heat summation, Enthalpy of formation, Standard state, Enthalpy of combustion, Enthalpy of neutralization, Enthalpy of solution, Enthalpy of dilution, Kirchhoff's equations: influence of temperature on ΔH and ΔU of a reaction.   *(5 marks, 4 hours)*

(c) Adsorption and Surface Phenomena: Physisorption and chemisorption, Adsorption isotherms: derivation and application of Gibbs and Langmuir adsorption isotherm. *(4 marks, 3 hours)*

PART-B (Practical)

Unit IV: Organic Laboratory-I   Marks: 6 (Internal); 19 (End Sem.)   30 hours
Experiment: Systematic qualitative analysis of organic compounds containing one functional group.

(a) Detection of elements (N, Cl, Br and I)
(b) Determination of one of the following functional groups present in a single organic compound (with systematic reporting)

   -COOH, -OH (phenolic), -CHO, >C=O, $-NH_2$ and $-NO_2$
(c) Preparation of the derivative.

End-semester External Evaluation Distribution (Duration: 6 hours)		
1	Qualitative Analysis	12 Marks
2	Viva voce	5 Marks
3	Laboratory record	2 Marks
In-semester Internal Evaluation Distribution		
1	Laboratory attendance and performance	2 Marks
2	Test and Viva voce	4 Marks

Suggested Books:

1.   Inorganic Chemistry, R. L. Dutta, 3rd Ed., The New Book Stall, India (1973).

2. Principles of Inorganic Chemistry, B. R. Puri, L.R. Sharma and K.C. Kalia, 33rd Ed., Vishal Publishing Co. (2019-20).

3. Organic Chemistry, S. N. Mukherjee, S. P. Singh and R. P. Kapoor, Vol I (2017), II (2018) & III (2018), New Age Publishers, India.

4. Basic Stereochemistry of organic molecules, S. Sengupta, 2nd Ed., Oxford University Press, London (2018).

5. Physical Chemistry, P. C. Rakshit (revised by S. C. Rakshit), 6th Ed., Sarat Book House, Kolkata (2014).

6. A Textbook of Physical Chemistry, Vol 1 & 2, K. L Kapoor, 4th Ed. Macmillan Publishers India Ltd. (2011).

7. Vogels Textbook of Practical Organic Chemistry, B. S. Furniss, A. J. Hanaford, P. W. G. Smith and A. R. Tatchell, 5th Ed., John Wiely, New York (1989).

Notes:

(i) A candidate must obtain minimum pass marks (which will include both the internal and end-semester marks) stipulated by the University **<u>separately</u>** both in the theory (Part A) and practical components (Part B) to clear the course.

(ii) The marks allotted to each component of different units should be strictly adhered to in making the question paper.

8. CLINICAL NUTRITION AND DIETETICS

Programme in Clinical Nutrition and Dietetics: The under graduate programme in Clinical Nutrition and Dietetics aims to inculcate knowledge in the field of nutrition and dietetics. A student will learn in-depth about the physiological changes and nutrition during each stage of the life cycle, therapeutic nutrition, community nutrition, the science of food, food service management and recent advances and developments in the field of nutrition.

Programme Outcome

On completion of the BSc Clinical Nutrition & Dietetics Programme the graduate will be able to:

PO1: Acquire knowledge in nutrition and health.
PO2: Understand the nutritional problems and how to combat malnutrition.
PO3: To develop understanding in various physiological changes during the life cycle.
PO4: To apply the knowledge of nutrition and dietetics for prevention and management of diet related diseases.
PO5: To understand the concept of community nutrition and how various national and international agencies contribute to the upliftment of women and children.
PO6: Understand the role of macro and micro nutrients in human nutrition.
PO7: To understand commercial and non-commercial food service management and its application.
PO8: To acquire knowledge of human metabolism and biochemistry with special reference to energy and nutrients requirement.
PO9: To gain expertise in diet planning in health and disease.
PO10: To understand the science and microbial spoilage of different food groups.

CND-100: BASIC NUTRITION

(Contact Hours: 60, Credits: 4)

Course Objective (COs): To learn, gain knowledge and understanding of foods, nutrients, their recommended allowances, health and the relationship between health and nutrition as well as the cooking methods adopted and its impact on health.

Learning Outcome (LOs):

1. Students will understand the different functions of food and sources of nutrients

2. Students will learn the cooking method and effect of different methods on food and nutrients.

3. Students will understand the recommended dietary allowances (RDA) of nutrients,
4. Students will gain understanding on health and the relationship between health and nutrition.

UNIT –I: Introduction to Nutrition

Definition and types of Nutrition (adequate, optimum and malnutrition) functions of foods. Food as a source of nutrients, food as a source of energy, unit of energy, energy value of food.

UNIT- II: Health

Definition (physical, mental, social and reproductive). Inter-relationship between nutrition and health; visible symptoms of good health. Food guide: Basic food groups, how to use food guide, Balanced diet: Basic principles of meal planning- objectives – steps in meal planning.

UNIT- III: Macro-nutrients

Carbohydrates: Classification, composition, functions, sources, recommended Daily Allowances (RDA) and deficiencies. Protein: Classification, composition, functions, sources, RecommendedDaily Allowances (RDA) and deficiencies. Fats: Classification, composition, functions, sources, Recommended Daily Allowances (RDA) and deficiencies.

UNIT- IV: Methods of Food preparation and its Impact on Nutrients

Principle of cooking, cooking methods (dry heat method, moist heat method, conventional method); Nutrient enhancing methods, advantages and disadvantages of cooking methods, effect of cooking methods on nutrients

Suggested Readings:

1. Agarwal. Anjana, Udipi. A. Shobha. (2014). Textbook of Human Nutrition,1st edition.
2. Chadha, R. (2015). Nutrition: A Life Cycle Approach, Orient Black swan Publication.
3. Katz. L. David, Friedman. S. C. Racheal, Lucan. C. Sean. Nutrition in clinical Practice, 3rdEdition. Walters Kluwer Publication.
4. Mahan, L. K. & Raymond J.L. (2003), Krause's Food & the Nutrition Case Process, 9thedition, and 12th edition, Elsevier.
5. Medeiros. M. Denis and Wildman. E. C. Robert. (2000). Advance Human Nutrition, 4thEdition, Jones and Bartlett Publishers, Inc.
6. Sharma, A. (2020). Principles of Therapeutics Nutrition & Dietetics, 1st Edition, CBS Publishers and distributor.
7. Shrilakshmi. B. (2021). B. Dietetics, 8th Edition, New Age International Reprint
8. Srilakshmi. B. (2010). Nutrition Science, 8th Edition, New Age International reprint.
9. William, S. R. (2017). Basic Nutrition and Diet Therapy, Staci Nix,15th Edition, Elsevier Publication.

CND-150: HUMAN PHYSIOLOGY

(Contact Hours: 60, Credits: 4)

Course Objective (COs): To learn and gain knowledge and understanding of the structure, function and role of different organs and secretions of the human body.

Learning Outcome (LOs)

1. Students will understand the structure and functions of different organs of the human body.

2. Students will learn the role and mechanism of different secretions in various organ system, Example (Lymphatic system, digestive system, menstruation, urine formation, Blood etc.)

3. Students will gain knowledge on different enzymes and hormones along with their mode of action.

Unit I: Circulatory and Respiratory Systems:

Blood and blood circulation: blood composition, function, clotting; blood groups. Blood vessels: artery, vein, capillary, structure of the heart, cardiac cycle; Lymphatic: Lymph nodes and lymph, pulse.

Respiratory System: Organs of respiration- Structure and functions. Mechanism of respiration.

Unit II: Digestive, Excretory and Cutaneous System:

Digestive System: Organs, Structure and functions, role of digestive juice. Mechanism of digestion.

Excretory System: Organs, structure and function of the Kidney, Formation of urine.

Skin: Structure and functions.

Unit III: Nervous System, Muscle Contraction and Vision:

Nervous system: structure of the nerve cell, nerve fiber, classification of nervous system. Brief account of nerve impulse. Transmission of nerve impulse- reflex action, voluntary action. Meninges and Cerebral spinal fluid.

Muscle contraction; Eye: Structure and function.

UNIT IV: Endocrine and Reproductive Systems:

Endocrine system: structure and functions, hormones-modes of action. Disorder of over and under secretions. Role of hypothalamus; pituitary, thyroid, pancreas and adrenal glands, prostaglandins.

Reproductive system: structure and function of reproductive organs, brief idea of menstruation, puberty and menopause.

Suggested Readings:

1. Agarwal, R.A. 1997. Animal Physiology and Biochemistry, Revised Edition, New Delhi Cambridge University Press.
2. Arora, Mohan P. 2003. Animal Physiology, Himalaya Publishers, Mumbai.
3. Bhaskar, Harsh Vardhan. 2008. Animal Physiology, New Delhi Campus books. ISBN8180300854 Books.
4. Craton Grey and Adams Neil (2012). The Human Body (A family reference guide), Paragon queen street house 1st Publish by Paragon.
5. Goel, K.A.1999. Animal Physiology, Meerut Rastogi Publications: ISBN:8171334539Books.
6. Moyes Christopher D. 2006. Principles of Animal Physiology, New Delhi Dorling Kindersley.
7. SK, S Prema, 2010. Essential of Medical Physiology, 5th edition, J P Publisher.
8. Waugh, A. & Grant, A. (2012) Ross & Wilson: Anatomy and Physiology, 14th Edition, Elsevier.

9. COMMERCE

COM-100: ACCOUNTING FOR BUSINESS

(Contact Hours: 60, Credits: 4)

Course Objective: To provide general exposure to the students of the various components of business environment in Indian context.

Learning Outcome: Students will be able to:
a. Understand the basic concepts of Accountancy.
b. Understand the system of preparing financial statements of sole traders, partnership firms, Hire Purchase, Royalty and consignment accounts.

UNIT -I
Introduction to Financial Accounting: Meaning, Definition and scope of Accounting – Objectives of Accounting – Functions of Accounting – Branches of Accounting – Accounting Principles ,Accounting Standards: Meaning and Objectives, IND AS and IFRS
Final accounts of Sole Trading Concern: Financial statements – Preparation of Trading and Profit and loss account and Balance sheet with adjustments.

UNIT- II
Single Entry: Meaning, Features, Merits and Demerits. Types of Single Entry System. Difference between Single Entry System and Double Entry System. Ascertainment of profit/loss under single entry.
Consignment Accounts: Meaning, Consignor, Consignee, Goods consigned at Cost price and Invoice price, Account Sales. Commission: Types of Commission. Normal and Abnormal loss. Valuation of Stock, Creation of Stock Reserve Account. Problems on Consignment both Cost Price and Invoice Price.

UNIT -III
Partnership Accounts –Nature and types of Partnership including salient feature of Partnership Act 2008. Admission of Partner, Retirement and Death of Partner.
Dissolution of Partnership firm (Garner Versus Murray)

UNIT -IV
Accounting for Hire Purchase System: Meaning – Features of Hire purchase system. Differences between hire purchase and installment system. Calculation of interest. Ascertainment of cash price of an asset. Problems on hire purchase system (excluding repossession of assets)
Royalty Accounts: Meaning and Definition. Terms used: Royalty, Minimum rent, Short workings, surplus royalty, recoupment of short workings.
Stoppage of work due to abnormal causes. Problems on royalty including minimum rent account.

Suggested Readings (Latest Edition)
- S.P. Jain and K.L. Narang, Advanced Accountancy Vol 1 Kalyani publication
- M. Hanif and A.Mukherjee, Financial Accounting, McGraw Hill Publications
- M.C. Sukhla, T.S. Grewal and S.C. Gupta, Advanced accountancy, Sultan Chand and Co.
- S. Kr. Paul, Advanced Accountancy Vol I, World Press, Kolkata
- R.N. Anthony and J.S. Reece, Accounting Principles, Richard Irwin Inc
- Compendium of Statement and Standards of Accounting: The Institute of Chartered Accountants of India, New Delhi

COM-150: PRINCIPLES OF MANAGEMENT

(Contact Hours: 60, Credits: 4)

Course Objective: To acquaint the students with the basic process and principles of management and to make them aware of the important management functions and practices.

Learning outcome: Students will:
  a. Be familiarize with extant management concepts, theories and practices
  b. Develop a theoretical and applied understanding of managing organizations.

Unit – I: Introduction
Meaning, characteristics and significance of Management
Functions of Management
Theory base of Management – Classical (Taylor and Fayol); Neo Classical (Mayo and Barnard); Modern (Systems and Contingency theory); Contemporary (Drucker and Porter)

Unit – II: Planning and Organizing
Planning – Meaning and characteristics; Planning premises and planning process; Need for planning; Barriers to effective planning; Decision making in planning
Organizing – Meaning, characteristics and significance; Principles of organising; Formal and Informal organization; Organizational structure and types (Departmentation, Project, Matrix and Network); Delegation v/s Decentralization

Unit – III: Staffing and Directing
Staffing – Meaning, characteristics and significance; Factors affecting staffing decisions
Directing – Meaning, characteristics and significance; Motivation concept and theories (Maslow, Herzberg and McGregor); Leadership concept and styles (Likert and Blake & Mouton); Communication concept, types, process, barriers and remedies

Unit – IV: Controlling

Controlling – Meaning, characteristics and significance; Process of Controlling; Traditional techniques (Financial statements, Budgetary control and Break even analysis) and Modern techniques (Management Audit, PERT& CPM and MIS); Planning and Controlling linkage

Suggested Readings (latest editions)

- Bose, Chandra, Principles of Management and Administration, PHI, New Delhi.
- Chandan, JS, Management Concepts and Strategies, Vikas, New Delhi.
- Drucker, Peter, The Practice of Management, Allied Publishers, New Delhi.
- Koontz & O'Donnell, Principles of Management, Tata McGraw Hill, New Delhi.
- Prasad & Gulshan, Principles & Practice of Management, Sultan Chand & Sons, New Delhi
- Robbins, Organizational Behavior, PHI, New Delhi.
- Mahajan & Mahajan, Management Principles and applications. Vikas Publications
- Gupta & Sharma, Principles and Practice of Management, Kalyani Publications

10. COMPUTER APPLICATION

Preface

Bachelor of Computer Application (BCA) is an undergraduate degree program that focuses on computer applications and information technology. The BCA curriculum is designed to provide students with a strong foundation in computer science and its applications. The programme covers different courses such as programming languages, database management, algorithms, data structures, computer networks, software engineering, web development, mathematics/statistics etc.The programme includes practical training in the form of internships or projects. This practical exposure helps students gain hands-on experience and apply the theoretical knowledge they have acquired.

After completing the BCA course, graduates can explore various career opportunities. They can work as software developers, web developers, database administrators, system analysts, IT consultants, network administrators, and more. BCA graduates are in demand in industries such as IT companies, software development firms, e-commerce companies, banking and finance, healthcare, and government organizations.

Program Outcome (POs):

The expected outcome of the programmeare-

1. Students will be able to understand the fundamental concepts of Computer Science (applications) and programming.

2. Students will be able to create and implement effective algorithms and data structures.

3. Students will be able to develop software applications using different programming languages like C, java, C++, and Python.

4. Students will be able to write code that is easily maintainable, reusable, and extensible.

5. Students will be able to understand and apply various software development methodologies.

6. Students will be able to identify and apply appropriate software testing techniques and tools to improve performance and reliability.

7. Students will be able to develop mobile applications, web applications using HTML, CSS, JavaScript, and databases.

8. Students will be able to understand and utilize various software development tools and technologies like Integrated Development Environments (IDEs) and version control systems (VCS) like Git etc.

9. Students will be able to stay updated with the latest trends and advancements in the IT industry and continuously improve skills and knowledge through self-learning.

BCA-100: PROBLEM SOLVING AND PROGRAMMING IN C

(Contact Hours: 75, Credits: 4)

Course Objectives (COs):

The objective of the course is to introduce the fundamentals of C programming language and develop the skills for solving problems using this language.

Learning Outcome (LOs):

After completion of this course, a student will be able to

- Understand Problem solvingtechniques through flowcharts and algorithm along with IDE and Compilers for C.
- Step-by-stepanalyses and develop a program to solve real world problems. Understand and Apply Variable, Conditional Statements, Loops, Functions, pointers, structures in C.

OutlineofthePaper

UNIT	Topic	Hours	External Marks	Internal Marks
I	CBasic Concepts	15	18	
II	Functions, Arrays	15	19	19
III	Pointers, Structure and Union	15	19	
IV	Practical	30	19	6
Total		**75**	**75**	**25**

UNIT-I: C Basic Concepts (Theory)   **15 Hours**

C Fundamentals: Algorithms, Flow charts, Development of algorithms, The C character set, identifiers and keywords, Data types, constants, variables and arrays, declarations, symbolic constants, Operators (Arithmetic, unary, relational, logical, bitwise, assignment, conditional operator)

I/O functions: Header files (Stdio.h, Conio.h) getch(), getche(), getchar(), putch(), putchar(), scanf(), printf(), gets(), puts(), clrscr()

Control statements: Decision making and branching (if..else, switch); looping (while, do .. while, for), Jumping (break, continue, goto), Nested loops.

UNIT-II: Functions, Arrays (Theory)   **15 Hours**

Functions: Overview (definition, declaration), defining and accessing a function, function prototypes, call by value, call by reference, recursion, Advantages and disadvantages of recursion over iteration, Storage classes (Automatic, Register, External, Static), String functions (strcmp (), strlen (), strrev (), strcat (), strcpy(), toupper (), tolower ()), Math functions (sqrt (), abs (), sin (), cos (), Standard function- exit ().

Arrays (1D and 2D): Declaration of array, accessing elements of the array, Array for inter function communication (1D and 2D), passing elements to (function, data values, address, array), processing an array, passing array to a function, arrays and strings, searching for a value in an array (Linear search, Binary search).

UNIT-III: Pointers, Structure and Union (Theory)   **15 Hours**

Pointers: Pointer declarations, passing pointer to a function, arrays of pointers, pointer and 1D and 2D arrays, function pointers (calling a function using a function pointer, passing functions to other functions, pointer to function, functions returning pointers), Memory allocation in C, dynamic memory allocation.

Structure and Unions: Defining a structure, processing a structure, users defined data types, structure and arrays, structures and pointers, passing structures to a function, self-referential structures, bit fields in structures, union, Union of structures, Enumerations, typedef.

UNIT-IV: Practical involved the concepts from UNIT-I to UNIT-III.   30 Hours

Suggested Practical Assignments (Questions may not be restricted to this list)

BASICPracticals:

   1. Write a program to display a text message on the Display Screen.
   2. Write a program to find out the sum of two integer values and display the result on the screen. Input the two values from the keyboard.

3. Write a program to find out the greatest of three numbers.
4. Write a program for swapping the two numbers with / without using another variable.
5. Write a program to find whether the given year is a leap year or not (use % modulus operator)
6. Write a program to find out the real roots of quadratic equation, $Ax^2+Bx+C=0$.
7. Write a program to convert the given temperature in Fahrenheit to Celsius using the following conversion formula, C=(F-32)/1.8.
8. Write a program to find out the average of any ten numbers. (Use (a) while loop, and (b) forloop).
9. Write a program to generate Fibonacci sequence. (1,1,2,3,5,8,13, …)
10. An employee is paid 1.5 times the normal rate for every hour beyond 40 hours worked in a week. Write a program to calculate the weekly wage of an employee.
11. Write a program to check whether the given string is palindrome or not.
12. Write a program to read the text and convert the case of the text.
13. Admission to a professional course is subject to the following conditions:
    (a) Marks in mathematics >=60
    (b) Marks in physics >=50
    (c) Marks in chemistry >=40
    (d) Total in all three subjects >=200

    Write a program to search of admission of students. The user has to enter the marks from the keyboard of the corresponding subjects.

14. Write a program to sum the following series:
    a) The first n natural numbers
    b) The first n odd natural numbers
    c) The first n even natural numbers
15. Write a program to sum the series : 2 * 3 – 3 * 5 + 4 * 7 + to n terms

Advance Practicals:

1. Write a program to read the following numbers, round them off to the nearest integers and print out the results in integer form:
    35.7 50.21 -23.73 -46.45
2. Given the string "WORDPROCESSING ", write a program to read the string from the terminal and display the same in the following formats:
    (a) WORD PROCESSING (b) WORD (c) W. P. PROCESSING

3. Write a program that will read the value of **x** and evaluate the following function

    1 for x>0
    Y= 0 for x=0
    -1 for x<0
    Using
    (a) nested **if** statements,

(b) **else if** statements, and

(c) Conditional operator

4. Write a program to calculate the monthly telephone bill according to the following rules:

    (a) Rural subscribers:

    Upto 250 calls Free
    251 calls to 450 calls 0.60
    451 calls to 500 calls 0.80
    501 calls to 1000 calls 1.00
    above 1000 calls 1.20

    (b) Urban subscribers:

    Upto 150 calls Free
    151 calls to 400 calls 0.80
    401 calls to 1000 calls 1.00
    Above 1000 calls 1.20

(c) The rental for urban subscribers depends on the number of calls upto 400 calls the rental will be 200/- and above 400 calls the rental will be 240/-. For rural subscribers the rental is always 200/-.

5. Write a C program to input the Name, City Type (whether Metro or Non-Metro) and Basic Pay of an employee and calculate the salary according to the following rules:

(a) Dearness allowance (DA)

    (i) Upto Rs. 3500 110% of basic pay

    (ii) Above Rs.3500 90% of the basic pay subject to a maximum of Rs. 3850

        (i.e. DA should be at least Rs. 3850.

(b) House Rent Allowance (HRA) is 15% of the basic pay subject to a maximum of Rs. 800 (i.e. never more than Rs. 800)

(c) If City is Metro, City Compensatory Allowance (CCA)=800 else if it is Non-Metro, CCA=600.

(d) Provident Fund (PF) is 12% of the basic pay.

    (**Total Salary**=Basic Pay +DA+HRA+CCA-PF)

    The **output** should be in the following format (Example only)

    Example Name ABCDEF

    Basic Salary 5000

    Dearness Allowance 4500

    HRA 750

    CCA: Non-Metro 600

    PF 600

    Total Salary 10250

6. Write a program to display the multiplication table of a given number from 1 to 20.

7. Write a program to find the biggest and smallest number and its position in the given array.

8. Write a program to find addition, subtraction and multiplication of matrices using function.
9. The factorial of an integer m is the product of consecutive integers from 1 to m. That is,
    Factorial m = m! =m*(m-1)*(m-2)*…*1.

10. Write a program to find the sum of row, column, and diagonals of the given matrix.
11. Write a program to input a string and perform the following tasks without using library functions: (a) to find its length, (b) to change it to upper case / lower case (c) to extract the left most n characters, (d) to extract the right most n characters (e) to extract n characters from it starting from position p, (f) to insert another string in it at position p (g) to replace n characters in it starting at position p with a given string
12. Write a program to search a pattern in a given text.
13. Write a program to read and display the information of all the students in the class.
14. Write a program that passes a pointer to a structure to a function.
15. Write a program to illustrate the use of arrays within a structure.

Instructions to Paper Setter

● Questions should be set according to the following scheme.

UNIT	Questions	
	To be Set	To be Answered
I	2	1
II	2	1
III	2	1

For Practical a total of 10 questions, each carrying 19 marks, shall be set. For each question, there shall be two sub-questions, one carrying 9 marks and the other carrying 10 marks. A student shall be allotted any one of the questions on a LOTTERY basis.

Exam Duration:

Theory	Practical
2 Hours	2 Hours

Distributionofmarksforpractical

10%   :Syntaxandinput/outputscreens
30%   :Logicandefficiency(sourcecode,pseudocode,andalgorithm)
20%   :Errortrapping(illegalorinvalidinput,stackoverflow,underflow,insufficientphysicalmemoryetc.)
20%   :Completion
20%   : Result

Suggested Readings:

Text Books:

1. TharejaReema, ProgramminginC, OxfordUniversityPress,NewDelhi, 2nd Edition,2016.
2. Byron   Gottfried,ProgrammingwithC,Schaum'sOutlineSeries,McGraw   Hill Education,4^{th}Edition,2018.
3. Brian W. Kernighan, Dennis Ritchie, ANSI C: The C Programming Language, Pearson Education India, 2nd Edition, 2015.
4. Jery R Hanly, Elliot B Koffman,ProblemSolvingandProgramDesignInC,Pearson, 2nd Edition, 2016.

ReferenceBooks:

1. YeshawanKanetkar,   LetUs   C: Authentic   Guide   To   C   Programming Language,BPBPublications,NewDelhi, 18th Edition, 2021.
2. E.   Balagurusamy,ProgramminginANSIC,McGraw   Hill   Education,NewDelhi, 8th Edition,2019.

BCA-150: Internet Technology with PHP and MySQL

(Contact Hours: 75, Credits: 4)

Course Objectives (COs):

This course is designed to equip students with the basic skills and knowledge to start building dynamic and interactive websites using HTML, CSS, JavaScript, PHP and MySQL.

Learning Outcomes (LOs):

Students shall be able to list the various HTML tags and use them to develop user-friendly web pages. Define the Javascript functions, CSS with its types and use them to provide the styles to the web pages at various levels. The course also lays a good foundation for students to acquire full-stack development skills which are much in demand in today's marketplace.

UNIT	Topic	Hours	External Marks	Internal Marks
I	HTML, JavaScript and CSS	15	18	
II	Server Side Programming Using PHP	15	19	15
III	MySql and PHP	15	19	
IV	Practical	30	19	6
Total		75	75	25

CONTENTS

UNIT-I : HTML, JavaScript and CSS   (Theory)   15 Hours

HTTP and Web Servers: HTTP; System Architecture of a Web server; Client-side Scripting versus Server-side Scripting; Apache Web Server

HTML: Elements of HTML (Headers, Linking, Images, Special Characters, Lists, Tables, Forms, Frames, Dropdowns, Divs)

JavaScript: JavaScript syntax and basic data types, Variables, constants, and data manipulation. Working with operators and control structures. Arrays, String Manipulation

JavaScript Fundamentals: DOM (Document Object Model) manipulation, Handling events and event-driven programming, Working with arrays and objects, Conditional statements and loops, Error handling and debugging techniques.

JavaScript Functions and Scope: Creating and invoking functions, Function parameters and return values, Function scope and closures, Higher-order functions and callback functions.

Working with the DOM: Manipulating HTML elements with JavaScript, Accessing and modifying element attributes, Creating, appending, and removing elements dynamically, Traversing and manipulating the DOM tree, Handling form input and form validation.

Cascading Style Sheets: CSS syntax and structure, Inline, internal, and external CSS, CSS rule precedence, CSS Class and Id selectors, Attribute selectors and pseudo classes.

CSS Box Model (Introduction, Border properties, Padding-Properties, Margin properties). CSS Positioning, Changing font families, sizes and weights. Text color, background, shadows, text formatting- alignment, decoration, spacing. CSS Color- RGB, HEX, HSL. Applying colors to text, backgrounds, and borders, Working with gradients and background images, Creating transparent elements and overlays, CSS background properties: size, position, and repeat.Creating page Layout and Site Designs.

UNIT-II : Server Side Programming with PHP   **15 Hours**

Introduction to PHP: Introducing PHP, Conditions and Branches, Loops, Functions, Working with types,User-defined Functions Arrays, Strings and Advanced Data Manipulation in PHP: Arrays, Strings, Regular Expressions, Dates and Times, Integers and Floats.

Validation with PHP: Validation and Error Reporting Principles, Server-Side Validation with PHP
Sessions: Introducing Session Management, PHP Session Management, Using Sessions in Validation

UNIT-III: MySql and PHP   **15 Hours**

Introduction to MySQL with PHP: Database Basics, MySQL Command Interpreter, Managing Databases and Tables.Inserting, Updating and Deleting Data, Querying with SQL SELECT, Join QueriesQuerying Web Databases: Querying a MySQL Database using PHP, Processing User InputWriting to Web Databases: Database Inserts, Updates and Deletes, Issues in Writing Data to Database.

UNIT-IV: PRACTICAL   **30 Hours**

Practical involving HTML,CSS, JavaScript, PHP and MySQL

Suggested Practical Assignments (Questions need not be restricted to this list)

Basic Practicals

1. Create an HTML document that defines a table with columns for state, state bird/animal, state flower and state food. There must be at least five states as rows in the table.
2. Create a HTML document showing all the headings in a page.
3. Create a simple table with three rows and four columns.
4. Create a HTML document to display all the different form of lists.

5. Using HTML, CSS create a paragraph.
6. Using HTML, CSS create a list of fruits and vegetables.
7. Using HTML, CSS create a striped table.

8. Write Javascript code to display a table of the numbers from 1 to n through an HTML document. Use for loop or do loop.
9. Write Javascript code to display the first 50 Fibonacci Numbers through an HTML document. [Hint: Use document.write to display output in a tabular form, using the assistance of table HTML tags]. Use for loop or do loop.
10. Write Javascript code to check for Armstrong numbers
11. Write Javascript code to find the sum of n numbers.
12. Write a PHP function to add two numbers
13. Write a PHP program to swap 2 numbers using a third variable.
14. Write a PHP program to swap 2 numbers without using a third variable.
15. Write a PHP program to solve the following equation

$s = u*t + ½ a*t^2$ where s = distance, u= initial velocity, t = time, a= acceleration

$A = ½*b*h$ where A = Area, b = base, h = height

Advanced Practicals

1. Create an HTML document for yourself, including your name, address, e-mail address, phone number, date of birth and age. If you are a student, you must include the course you have undertaken and give a little description about the course. If you are employed, you must include your employer, your employer's address and your job title. This document must use several headings and <em>, <strong>,<hr/>,<p> and <br/> tags.
2. Create an HTML document that defines a table with columns for state, state bird/animal, state flower and state food. There must be at least five states as rows in the table.
3. Create an HTML document that has a form with the following controls:

    A text box to collect users' names.

    Four checkboxes, one each for the following items:

    Four 100-watt light bulbs for Rs70.

    Eight 100-watt light bulbs for Rs140.

    Four 100-watt long-life light bulbs for Rs90.

    Eight 100-watt long-life light bulbs for rs210

4.   A collection of three radio buttons that are labeled as follows:
    i.   Visa
    ii.   Mastercard
    iii.   Maestro.

5. Using HTML, CSS create a styled checkbox with animation on state change.
6. Using HTML, CSS create a list with floating headings for each section
7. Create a Navigation bar (with dropdown) and grid with CSS

8. Write Javascript code to display a table of the numbers from 5 to 15 and their squares and cubes through an HTML document. [Hint: Use document.write to display output in a tabular form, using the assistance of table HTML tags]. Use for loop or do loop.
9. Write Javascript code to display the first 50 Fibonacci Numbers through an HTML document. [Hint: Use document.write to display output in a tabular form, using the assistance of table HTML tags]. Use for loop or do loop.
10. Write Javascript code to display a list of Armstrong numbers between 100 and 1000 through an HTML document. [Hint: Use document.write to display output in a tabular form, using the assistance of table HTML   tags]. Use for loop or do loop.
11. Write Javascript code to display a table of Palindrome numbers between 100 and 500 through an HTML document. [Hint: Use document.write to display output in a tabular form, using the assistance of table HTML   tags]. Use for loop or do loop.
12. Write Javascript code to generate a list of numbers between 100 and 1000 where the result of the current number is the sum of the previous four numbers in the series. Example initial four numbers are 0,1,1,2. The next number in the series should be 4.
18. Write a PHP script to display the contents of a database table containing information about books. The table has three fields specifying the book ID, book name and the number of pages in the book. Display the results in an HTML table.
19. Using the previous question's database table, create HTML forms for inserting, editing and deleting records. Use regular expressions to check the correct format for bookID which is given as, first three characters have to be digits followed by an underscore and then a five character string.
20. Create a PHP program that validates whether an inputted email address is in the correct format using regular expressions. The program should check for the presence of an "@" symbol, a domain name, and a valid top-level domain.

Instructions to Paper Setter

- Questions should be set according to the following scheme.

UNIT	Questions	
	To be set	To be Answered
I	2	1
II	2	1

III	2	1

For Practical a total of 10 questions, each carrying 19 marks, shall be set. There shall be two sub-questions in each question, one carrying 9 marks and the other carrying 10 marks. A student shall be allotted any one of the questions on a LOTTERY basis.

Exam Duration:

Theory	Practical
2 Hours	2 Hours

Evaluationofmarksforpractical Exam:

10%   :Syntaxandinput/outputscreens
30%   :Logicandefficiency(sourcecode,pseudocode,andalgorithm)
20%   :Errortrapping(illegalorinvalidinput,stackoverflow,underflow,insufficientphysicalmemoryetc.)
20%   :Completion
20%   : Result

Suggested Readings:

Text Books:

1. Hugh E Williams and David Lane, *Web Database Applications with PHP and MySQL,* O'Rielly, 2nd Edition, 2004.
2. Luke Welling and Laura Thomson, *PHP and MySQL Web development,* SAMS Publishing, 2nd Edition.
3. Marijn Haverbeke, *Eloquent JavaScript: A Modern Introduction to Programming.* Available online: https://eloquentjavascript.net
4. James H. (Jim) Pence, Thomas A. Powell, HTML &CSS:The Complete Reference, McGraw-Hill Education, 5th Edition, 2010.
5. Eric Meyer, Estelle Weyl, CSS: The Definitive Guide, Shroff/O'Reilly, 4th Edition, 2017.

Reference Books:

1. Rasmus Lerdorf, Peter MacIntyre, Kevin Tatroe, *Programming PHP*, 2nd Edition, O'Reilly Publishing.
2. W. Jason Gilmore, *Beginning PHP 5 and MySQL 5: From Novice to Professional*, 2nd Edition, APress.

11. COMPUTER SCIENCE

Preface

The 4-year BSc program in Computer Science is a comprehensive course of study that provides students with a solid foundation in the principles and practices of computer science. This program is typically designed to equip students with the knowledge and skills necessary to pursue careers in various computing fields or to continue their education at the graduate level.

The course consists of the following components:

Foundational Courses: The program usually starts with foundational courses that cover essential concepts such as programming, algorithms, data structures, computer organization, and discrete mathematics. These courses establish the fundamental building blocks of computer science.

Core Computer Science Courses and Specializations: As students progress through the program, they delve deeper into core computer science areas. These courses include topics such as software engineering, databases, operating systems, computer networks, theory of computation, and artificial intelligence. Students gain a comprehensive understanding of these areas and develop proficiency in problem-solving, programming languages, and software development methodologies.Specializations allow students to gain in-depth knowledge and expertise in their chosen fields.

Project Work and Practical Experience: Many programs incorporate project-based learning or capstone projects, where students work on real-world problems or create software applications under the guidance of faculty members. This hands-on experience helps students apply their knowledge, develop problem-solving skills, and gain practical exposure to the field of computer science.

Internships Programs: The students are provided with the opportunity to acquire valuable industry experience by working in tech companies, research labs, or other relevant organizations through internship programs. This help students apply theoretical knowledge in real-world settings, develop professional skills, and make industry connections.

Professional Development: Alongside technical skills, the program also focuses on developing professional skills such as communication, teamwork, critical thinking, and ethical considerations in computing. These skills are essential for successful collaboration, effective problem-solving, and ethical decision-making in the field of computer science.

Overall, the 4-year BSc program in Computer Science provides students with a comprehensive education in computer science principles, theories, and practical skills. It prepares them for a wide range of career opportunities in software development, data analysis, system administration, cyber security, research, and more.

Programme Outcomes (POs):

The expected outcome of the programme are-
1. Students will be able to design, develop, and implement software solutions using appropriate algorithms, programming languages, and software engineering principles.
2. Students will have a strong foundation in computer science theory, including data structures, algorithms, automata theory, and computer organization.
3. Students will be able to analyze and evaluate complex computer systems, identifying strengths, weaknesses, and potential improvements.
4. Students will have experience working in teams on software projects, including collaboration, project planning, and communication.
5. Students will be able to apply ethical principles to their work in computer science, including issues related to privacy, security, and intellectual property.
6. Students will be able to effectively communicate technical information to both technical and non-technical audiences, including through technical reports and presentations.
7. Students will be able to adapt to new technologies and programming languages as they emerge, and continue to learn and develop professionally throughout their careers.

CSC-100: PROGRAMMING IN C AND INTRODUCTION TO DATA STRUCTURES

(Contact Hours: 75, Credits: 4)

Course Objectives

The course is designed to introduce programming concepts using C language to students and to introduce basic data structures and their uses. The aim of this course is to prepare the students to be able to write C programs using suitable data structures to solve real-world problems.

Learning Outcome

On successful completion of the course, students will be able to:

- Solve real-life problems of reasonable complexity using suitable and efficient programming constructs in C
- Understand and apply the concepts of arrays, pointers, structures to implement efficient algorithms
- Understand the fundamentals of data structures such as linked lists, stacks, and queues, and be able to implement them in C.
- Use pointers in C to manipulate memory and pass parameters to functions.
- Implement sorting and searching algorithms in C

Outline of the Course

Unit	Topic	Hours	Ext. Marks	Int. Marks
I	C: Basic Concepts	15	18	19
II	Functions, Arrays, Pointers, Structures and Union	15	19	
III	Introductory Data Structures	15	19	
IV	Practical	30	19	6
Total		**75**	**75**	**25**

UNIT – I: C Basic Concepts (Theory)   15 Hours

C Fundamentals: Algorithms, Flow charts, Development of algorithms, The C character set, identifiers and keywords, Data types, constants, variables and arrays, declarations, symbolic constants, Operators (Arithmetic, unary, relational, logical, bitwise, assignment, conditional operator)

I/O functions: Header files (stdio.h, conio.h) getch(), getche(), getchar(), putch(), putchar(), scanf(), printf(), gets(), puts(), clrscr()

Control statements: Decision making and branching (if..else, switch); looping (while, do .. while, for), Jumping (break, continue, goto), Nested loops.

UNIT – II: Functions, Arrays, Pointers, Structures and Union(Theory)   15 Hours

Functions: Overview (definition, declaration), defining and accessing a function, function prototypes, call by value, call by reference, recursion, Advantages and disadvantages of recursion over iteration, Storage classes (Automatic, Register, External, Static), , String functions (strcmp (), strlen (), strrev (), strcat (), strcpy(), toupper (), tolower ()), Math functions (sqrt (), abs (), sin (), cos (), Standard function- exit ().

Arrays and Pointers: Defining an array, array initialization, processing an array, passing array to a function, multidimensional arrays, pointer declarations, passing pointer to a function, pointer and one dimensional arrays, Operation on pointers, Memory allocation functions (malloc(), calloc(), free()).

Structures and Unions: Defining a structure, processing a structure, user defined data types, array of structures, structures and pointers, passing structures to a function, self-referential structures, Union, Union of structures, Enumeration, typedef

UNIT – III: Introductory Data Structures (Theory) 15 Hours

Data structure fundamentals: Data Type, Abstract Data Type, Data Structure. Linked List as a data structure (characteristics, advantages, disadvantages); operations on lists (creation, insertion, deletion, traversal); types of linked list - singly linked list, doubly linked list, circular list.

Stacks and Queues: Introduction to stacks and queues, Operations on stacks and queues, Implementation of stacks and queues using static arrays and linked lists; Definitions of Circular Queue, Priority Queue (definition only) , D-Queue (definition only) ; Application of stacks: Conversion of infix(containing arithmetic operators including exponential operator, and parenthesis) to postfix, evaluation of postfix expression.

Searching and Sorting: Linear search and Binary search algorithms, Bubble sort and Insertion sort algorithms

UNIT – IV: Practical 30 Hours

Practical Assignments (Questions may not be restricted to this list)

BASIC Practical:

1. Write a program to display the message "Welcome to the C programming world" on the screen.
2. Write a program to find out the sum of two integer values and display the result on the screen. Input the two values from the keyboard.
3. Write a program to find out the greatest of three numbers.
4. Write a program for swapping the two numbers with / without using another variable.
5. Write a program to find whether the given year is a leap year or not (use % modulus operator)
6. Write a program to find out the real roots of quadratic equation, Ax+Bx+C=0.
7. Write a program to convert the given temperature in Fahrenheit to Celsius using the following conversion formula, C=(F-32)/1.8.
8. An employee is paid 1.5 times the normal rate for every hour beyond 40 hours worked in a week. Write a program to calculate the weekly wage of an employee.
9. Write a program to check whether the given string is palindrome or not.
10. The total distance traveled by a vehicle in t seconds is given by
11. Distance = ut + (at2)/2

12. Where u is the initial velocity (meters per second), a is the acceleration (meters per second2). Write a program to evaluate the distance traveled at regular intervals of time, given the values of u and a. The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of u and a.

13. Write a program to read the following numbers, round them off to the nearest integers and print out the results in integer form:
    35.7 50.21 -23.73 -46.45

3. Admission to a professional course is subject to the following conditions:
   (a) Marks in mathematics >=60
   (b) Marks in physics >=50
   (c) Marks in chemistry >=40
   (d) Total in all three subjects >=200

   Or
   Total in mathematics and physics >=150
   Write a program to search of admission of students. The user has to enter the marks from the keyboard of the corresponding subjects.

4. Write a program that will read the value of **x** and evaluate the following function

$$Y = \begin{cases} 1 & \text{for } x>0 \\ 0 & \text{for } x=0 \\ -1 & \text{for } x<0 \end{cases}$$

   Using
   (a) nested **if** statements,
   (b) **else if** statements, and
   (c) Conditional operator?:

5. Write a program to calculate the monthly telephone bill according to the following rules:
   (a) Rural subscribers:

   Upto 250 calls Free
   251 calls to 450 calls 0.60
   451 calls to 500 calls 0.80
   501 calls to 1000 calls 1.00
   above 1000 calls 1.20

   (b) Urban subscribers:

   Upto 150 calls Free
   151 calls to 400 calls 0.80
   401 calls to 1000 calls 1.00
   Above 1000 calls 1.20

(c) The rental for urban subscribers depends on the number of calls upto 400 calls the rental will be 200/- and above 400 calls the rental will be 240/-. For rural subscribers the rental is always 200/-.

6. Write a C program to input the Name, City Type (whether Metro or Non-Metro) and Basic Pay of an employee and calculate the salary according to the following rules:

   (a) Dearness allowance (DA)

           (i) Upto Rs. 3500 110% of basic pay

           (ii) Above Rs.3500 90% of the basic pay subject to a maximum of Rs. 3850

               (i.e. DA should be at least Rs. 3850.

   (b) House Rent Allowance (HRA) is 15% of the basic pay subject to a maximum of Rs. 800 (i.e. never more than Rs. 800)

   (c) If City is Metro, City Compensatory Allowance (CCA)=800 else if it is Non-Metro, CCA=600.

   (d) Provident Fund (PF) is 12% of the basic pay.

   (**Total Salary**=Basic Pay +DA+HRA+CCA-PF)

   The **output** should be in the following format (Example only)

   Example Name ABCDEF

   Basic Salary 5000

   Dearness Allowance 4500

   HRA 750

   CCA: Non-Metro 600

   PF 600

   Total Salary 10250

ADVANCED Practical:

1. Given the string "WORDPROCESSING ", write a program to read the string from the terminal and display the same in the following formats:

    (a) WORD PROCESSING (b) WORD (c) W. P. PROCESSING

2. Write a program to sum the following series:

   a) The first n natural numbers

   b) The first n odd natural numbers

   c) The first n even natural numbers

3. Write a program to find out the average of any ten numbers. (Use (a) **while** loop, and (b) **for** loop).

4. Write a program to generate Fibonacci sequence. (1,1,2,3,5,8,13, …)

5. Write a program to sum the series : 2 * 3 – 3 * 5 + 4 * 7 + to n terms

6. Given a number, write a program using while loop to reverse the digits of the number. For example, the number 12345 should be written as 54321. (**Hint:** Use modulus operator to extract the last digit and the integer division by 10 to get the n-1 digit number from the n digit number.)

7. Write a program to generate positive prime numbers.

8. Write a program to display the multiplication table of a given number from 1 to 20.
9. Write a program to display the multiplication table of a given number for a given range.
10. Write a program to display the multiplication table of a given group of numbers (maximum five numbers) for a given range.
11. Write a program to find the biggest and smallest number and its position in the given array.
12. Write a program to find addition, subtraction and multiplication of matrices using function.
13. The factorial of an integer m is the product of consecutive integers from 1 to m. That is,
    Factorial m = m! =m*(m-1)*(m-2)*…*1.
14. Write a program to find the sum of row, column, and diagonals of the given matrix.
15. Write a program to find the largest number of the given matrix using function.
16. Write a program to sort all the elements of a matrix using function.
17. Write a program to input a string and perform the following tasks without using library functions: (a) to find its length, (b) to change it to upper case / lower case (c) to extract the left most n characters, (d) to extract the right most n characters (e) to extract n characters from it starting from position p, (f) to insert another string in it at position p (g) to replace n characters in it starting at position p with a given string
18. Write a program to search a pattern in a given text.
19. Write a program to search a pattern in a given text and replace every occurrence of it with another given string.
20. Write a program to write a given number in words using function.

21. Write a program to implement a Linked List, and create functions for the following operations on lists - creation, insertion, deletion, traversal

22. Write a program to implement a stack *using arrays*.

23. Write a program to implement a stack *using linked lists*.

24. Write a program to implement a queue *using arrays*.

25. Write a program to implement a queue *using linked lists*.
26. Write a program for sorting the elements of an array by using Bubble sort, Insertion sort.
27. Write a program to implement linear search and binary search.

Instructions to Paper Setter

Questions should be set according to the following scheme.

Unit	Questions	
	To be set	To be answered
I	2	1

II	2	1
III	2	1
IV (Practical)	5	3

Exam Duration :

Theory	Practical
2 Hours	3 Hours

Suggested Readings

Text :

1. **E. Balaguruswamy**, *Programming in ANSI C*, Tata McGraw Hill publication
2. **YashavantKanetkar**, *Let us C* , 17th Edition, BPB Publication
3. **S. Chattopadhyay, D. Ghosh Dastidar, M Chattopdhyay**, *Data Structures Through C Language,* BPB Publications, 2001

References :

1. **Byron S. Gottfried**, *Theory and Problems of Programming with C*, Tata McGraw Hill Publication
2. **Brian Kernighan and Dennis M. Ritchie**, *C Programming Language*, 2nd Edition, PHI
3. **Y. Langsam, M.J. Augenstein, A.M. Tenenbaum,** *Data Structures Using C and C++,* Second Edition, Prentice Hall of India, 2000
4. **Reema Thareja**, *Data Structures Using C*, 2nd Edition, Oxford University Press, India

CSC-150: DATABASE MANAGEMENT SYSTEM

(Contact Hours: 75 Hours, Credits: 4)

Course objectives

The objective of this paper is to introduce to the students the fundamental concepts necessary for designing, using and implementing database systems. The paper stresses on database modeling and design, physical file storage techniques and language facilities provided by database management systems.

Learning Outcome

1. The student will be able to understand the requirement for a database management system.
2. The student will be able to design a relational database for an organization.
3. The student will be able to implement a database using any RDBMS software.
4. The student will be able to normalize databases and understand how files are physically stored on disk.
5. The student will be able to understand the concept of transactions and schedules.

Outline of the Course

Unit	Topic	Hours	External Marks	Internal Marks
I	Introduction and Conceptual Data Modeling	15	18	19
II	Relational Model and Database Normalization	15	19	
III	File Organization and Transaction Processing	15	19	
IV	Structured Query Language (Practical Only)	30	19	6
Total		**75**	**75**	**25**

Unit I: **Introduction and Conceptual Data modeling**
      15 hours

Introduction: Introduction to databases, characteristics of the database approach, database users and designers, role of a DBA, advantages of using a DBMS, data models, schemas, instances, DBMS architecture (Three-Schema Architecture), Data Independence.

Conceptual Data Modeling: Phases of database design, entity type, entity set, attributes, keys, value sets, relationships, relationship types, relationship sets, relationship instances, relationship degree, role names, recursive relationships, constraints on relationship types, attributes of relationship types, weak entity types, ER Diagram, naming conventions and design issues.

Unit II: **Relational Model and Database Normalization**   **15 hours**

Relational model concepts: Domain, attribute, tuple, relation, characteristics of relations, relational databases, relational database schemas, relational constraints (Domain constraint, constraints on null), entity integrity, referential integrity, foreign keys.

Functional Dependencies, First Normal Form, Second Normal Form, Third Normal Form,

Boyce-Codd Normal Form.

Unit III: **File Organizationand TransactionProcessing**   **15 hours**

File Organization: Introduction to storage hierarchies, hardware descriptions of disk devices, Organization of file records on disk (record and record types, Fixed- length records, variable-length records, record blocking, spanned and unspanned records, allocating file blocks on disk, file headers), Primary methods of file organization -Heap Files, Sorted Files, Hashed Files. Types of Single-level Ordered Indexes (Primary Indexes, Clustering Indexes, Secondary Indexes).

Transaction Processing: Transaction, ACID properties of transaction, transaction states, schedules, serializability, tests for serializability, recoverability.

Unit IV: **Structured Query Language (Practical Only)**   **30 hours**

SQL: Characteristics of SQL, Data types in SQL, Types of SQL commands

Data Definition Commands: CREATE SCHEMA, CREATE TABLE, DROP TABLE, ALTER TABLE

Single table query commands: SELECT, SELECT with WHERE, SELECT with ORDER BY, SELECT with GROUP BY, SELECT with GROUP BY and HAVING, SQL built-in functions - SUM, MIN, MAX, COUNT, AVG

Multi-table query commands: Retrieval using sub-query, JOIN, EXIST and NOT EXIST

Special operators: IS NULL, IS NOT NULL, BETWEEN..AND, IN, LIKE, ANY, ALL

Data changing commands: INSERT, DELETE, UPDATE

List of possible problems for Practical (May not be restricted to this list)

1. Create a table named DEPARTMENT with the following columns.

Column name	Datatype	Size
Department_No	Number	2
Department_name	Varchar2	20
Location	Varchar2	10

2. Create a table named EMPLOYEE with the following columns.

Column name	Datatype	Size
Employee_No	Number	4
First_Name	Varchar2	30
Last_Name	Varchar2	50
DOJ	Date	
Gender	Char	1
Salary	Number	10,2
Commission	Number	10,2
Dno	Number	2

3. Add the following records in Department

Department_No	Department_name	Location
10	Finance	Shillong
20	Accounts	Jowai
30	Manufacturing	Guwahati
40	Engineering	Kohima

4. Add the following records in Employee

Employee_No	First_Name	Last_Name	DOJ	Gender	Salary	Commission	Dno
1111	Jane	Doe	19-dec-	F	20000	1000	10

			2008				
2222	Homer	Simpson	01-jan-2015	M	10000		20
3333	Jack	Reacher	05-jun-2012	M	12000		10
4444	Sponge	Bob	16-apr-2012	M	8000	400	10

5. List details of all departments
6. Display employee_no as "Staff no", employee first and last name as "Name", dno as "Department No"
7. Display the name of employee along with their total salary i.e. salary + commission
8. If each employee were to get a raise, display their no, name, old salary and new salary, where new_salary is 10% raise from their old salary
9. Display employees who did not earn a commission
10. Display all female employees
11. Display employees information in ascending order of their date of joining
12. Display employees information in descending order of their salary.
13. Display employees whose name starts with the letter J
14. Display employees whose first name or last name have the letter O

EMPLOYEE

Fname	Minit	Lname	Ssn	Bdate	Address	Sex	Salary	Super_ssn	Dno
John	B	Smith	123456789	1965-01-09	731 Fondren, Houston, TX	M	30000	333445555	5
Franklin	T	Wong	333445555	1955-12-08	638 Voss, Houston, TX	M	40000	888665555	5
Alicia	J	Zelaya	999887777	1968-01-19	3321 Castle, Spring, TX	F	25000	987654321	4
Jennifer	S	Wallace	987654321	1941-06-20	291 Berry, Bellaire, TX	F	43000	888665555	4
Ramesh	K	Narayan	666884444	1962-09-15	975 Fire Oak, Humble, TX	M	38000	333445555	5
Joyce	A	English	453453453	1972-07-31	5631 Rice, Houston, TX	F	25000	333445555	5
Ahmad	V	Jabbar	987987987	1969-03-29	980 Dallas, Houston, TX	M	25000	987654321	4
James	E	Borg	888665555	1937-11-10	450 Stone, Houston, TX	M	55000	NULL	1

DEPARTMENT

Dname	Dnumber	Mgr_ssn	Mgr_start_date
Research	5	333445555	1988-05-22
Administration	4	987654321	1995-01-01
Headquarters	1	888665555	1981-06-19

DEPT_LOCATIONS

Dnumber	Dlocation
1	Houston
4	Stafford
5	Bellaire
5	Sugarland
5	Houston

WORKS_ON

Essn	Pno	Hours
123456789	1	32.5
123456789	2	7.5
666884444	3	40.0
453453453	1	20.0
453453453	2	20.0
333445555	2	10.0
333445555	3	10.0
333445555	10	10.0
333445555	20	10.0
999887777	30	30.0
999887777	10	10.0
987987987	10	35.0
987987987	30	5.0
987654321	30	20.0
987654321	20	15.0
888665555	20	NULL

PROJECT

Pname	Pnumber	Plocation	Dnum
ProductX	1	Bellaire	5
ProductY	2	Sugarland	5
ProductZ	3	Houston	5
Computerization	10	Stafford	4
Reorganization	20	Houston	1
Newbenefits	30	Stafford	4

DEPENDENT

Essn	Dependent_name	Sex	Bdate	Relationship
333445555	Alice	F	1986-04-05	Daughter
333445555	Theodore	M	1983-10-25	Son
333445555	Joy	F	1958-05-03	Spouse
987654321	Abner	M	1942-02-28	Spouse
123456789	Michael	M	1988-01-04	Son
123456789	Alice	F	1988-12-30	Daughter
123456789	Elizabeth	F	1967-05-05	Spouse

15. Create tables for the above-mentioned tables and fill in the data as shown above in the tables created by you earlier.

Write SQL queries for the following:

16. List the names and addresses of all Male employees.
17. Retrieve the full name of the employee, full name of the direct supervisor and the name of the department where the employee works.
18. Find the name of the Manager of the 'Administration' department.
19. Find the names of all employees and the projects they work in.
20. Find the names of all employees who has daughters.
21. Find the names of all departments that are in "Houston".

22. Retrieve the names of all employees in department 5 who work more than 10 hours per week on the ProductX project.
23. List the names of all employees who have a dependent with the same first name as themselves.
24. Find the names of all employees who are directly supervised by 'Franklin Wong'.
25. Find the names of all employees who works in Project "ProductX" and earns more than 28000 as salary.

Instructions to Paper Setter

Questions should be set according to the following scheme.

Unit	Questions	
	To be set	**To be answered**
I	2	1
II	2	1
III	2	1
IV (Practical)	4	2

Exam Duration :

Theory	Practical
2 Hours	3 Hours

Suggested Readings

Text:

1. **R.Elmasri, S.B Navathe**, *Fundamentals of Database Systems*, Pearson Eductaion, 7th Edition, 2017
2. **Thomas Nield,** *Getting Started with SQL: A Hands-On Approach for Beginners,* O'Reilly Publication, 2016

Reference:

1. **C. J. Date**, An Introduction to Database Systems, Eighth Edition, Pearson, 2003
2. **A. Silberschatz, H.F Korth, S Sudarshan**, *Database System Concepts, Tata-* McGraw Hill, 7th Edition, 2019.
3. **Bipin Desai**, *An Introduction to Database Systems*, Galgotia Publications (West Publishing), 2010.
4. **D.M Kroenke**, *Database Processing: Fundamentals, Design and Implementation*, Pearson Education, 15th Edition, 2018.
5. **G.W Hansen, J.V Hansen**, *Database Management and Design,* Pearson Education, (2nd Edition) 2001.
6. **Thomas M Connolly, Carolyn E Begg,** *Database Systems, A Practical Approach to Design, Implementation and Management*, Pearson Education, 6th Edition 2019.

12. ECONOMICS

Preface

Economics has emerged as one of the most 'sought-after' subjects of study in Social Sciences as it immediately communicates with the changing societal priorities and needs. The curriculum under the NEP, 2020 has been structured so as to make it practically more useful and job-oriented in the multifaceted environment ranging from trade, industry, infrastructure, etc. to information technology. At the same time, the syllabus gives sufficient impetus for academic inputs to prepare students for a research/teaching career in Economics. The programme emphasises both on theory and applied nature of the subject that has registered rapid changes during the recent times.

There are a total of fifteen compulsory core courses that students are required to take across six semesters in the first three years of the programme. The question paper shall be prepared as per University guidelines. Out of 100 marks in each course, 75 marks will be assessed in the end semester examination and 25 marks will be carried from the sessional assessments. In the end semester examination, there will be two questions from each unit and the students have to answer at least one question from each unit.

Programme Outcomes

The Undergraduate programme in Economics aims to develop a comprehensive understanding and critical thinking among students. It seeks to impart knowledge of key economic theories and policies and to develop an ability to utilise this knowledge to examine and analyse past and present economic situations and issues. The syllabus facilitates development of a deeper insight in each individual so as to enable him/her to opt for challenges of selfemployment in the face of broadening gap between the demographic needs and the number of jobs becoming available. Overall, the programme provides necessary training to the students of economics and equips them to deal with contemporary public policy issues.

ECO-100: MICROECONOMICS I

(Contact Hours: 60, Credits:4)

Course Objectives:
This course is designed to expose the students to the basic principles of microeconomic theory. The emphasis will be on thinking like an economist and the course will illustrate how microeconomic concepts can be applied to analyze real life situations.

Learning Outcomes:
As a foundation course, in this Paper, the student will understand the behaviour of an economic agent, namely, a consumer, a producer, a factor owner and the price fluctuations in a market. In addition, the student will learn principles of factor pricing and welfare economics.

Unit – I
Consumer Behaviour: nature and scope of Economics. Concepts of demand and supply, price mechanism and market equilibrium. Individual and market demand curve; shifts in demand curve; elasticity of demand: types, determinants and methods of measurement (point, arc and total outlay methods); relationship between the price elasticity of demand and the slope of the demand curve. Indifference curve analysis of demand: basic assumptions, properties, consumer's equilibrium.

Unit – II
Production, Cost and Supply: Concepts of production function, isoquants and their properties; returns to a factor, returns to scale, law of variable proportions; cost curves – short run and long run; total, average and marginal revenue curves, relationship between AR, MR and price elasticity. Concept of supply, derivation and shifts of supply curve, elasticity of supply.

Unit – III
Market Structure: perfect and imperfect competition; equilibrium of the firm and industry under perfect competition in the short run and long run; equilibrium of the firm under monopoly and monopolistic competition in the short run and long run; Chamberlin's group equilibrium; meaning and features of oligopoly.

Unit - IV
Factor Pricing and Welfare Economics: marginal productivity theory of distribution; Ricardian and modern theories of rent; Subsistence and wage fund theories of wages; liquidity preference theory of interest; Knight's theory of profit. Concepts of welfare; value judgements; problems in measuring welfare; Classical welfare economics; Pareto optimality; social welfare function.

Suggested Readings:
Koutsoyiannis, A. *Modern Microeconomics*. Macmillan, London (latest edition).
Mankiw, N. G., *Principles of Economics*, Cengage Learning, New Delhi (latest edition).
Samuelson, P.A. and W.D. Nordhaus (1998), *Economics*, Tata McGraw Hill, New Delhi.
Stonier, A.W. and D.C. Hague (1999), *A Textbook of Economic Theory*, Pearson Education, New Delhi.
Ahuja, H. L. *Advanced Economic Theory,* S. Chand Publishing, New Delhi, (latest edition).

ECO-150: MACROECONOMICS I

(Contact Hours: 60, Credits:4)

Course Objectives:
Macroeconomics deals with the functioning of the economy as a whole, including how the economy's total output of goods and services and employment of resources is determined and what causes these totals to fluctuate. This paper has an extensive, substantive as well as methodological content.

Learning Outcomes:
This course discusses the preliminary concepts associated with the determination and measurement of aggregate macroeconomic variables like saving, investment, GDP, money, inflation and the balance of payments. The student will learn about the basic theoretical framework underlying the field of macroeconomics. He/ she will be able to undertake economic analyses in terms of theoretical, empirical as well as policy issues.

Unit – I
National Income: meaning, concepts and their inter-relationship; methods of measuring national income and their limitations; national income identity in a closed economy; circular flow of income – two, three and four sector models; green accounting.

Unit – II
Output and Employment: Classical theory of employment; Keynesian theory of income and employment; the principle of effective demand; consumption and saving function; investment multiplier; marginal efficiency of capital; saving and investment: ex post and ex ante (concepts only); concept of accelerator.

Unit – III
Money, Banking, Inflation and Unemployment: Functions of money; Fisher's quantity theory of money; determination of money supply and demand; credit creation and credit control. Inflation: meaning, types, causes, effects and control. Unemployment: meaning and types; Phillip's curve.

Unit – IV
Trade Cycles and Balance of Payments: Concept, nature and characteristics of trade cycles; Hawtrey's monetary theory, Hayek's over-investment theory, Schumpeter's innovation theory; control of trade cycles. Balance of Trade and Balance of Payments: concepts and components; equilibrium and disequilibrium in the BoP; consequences of disequilibrium and measures to correct the deficit in the BoP.

Suggested Readings:

Ackley, G. (1976), *Macroeconomics: Theory and Policy*, Macmillan Publishing Co., New York.

Mankiw, N.G. (2007), *Principles of Macroeconomics*, Thomson Learning Inc., New Delhi.

Shapiro, E. (1996), *Macroeconomic Analysis*, Galgoti Publications, New Delhi.

Branson, W.H. (2005), *Macroeconomic Theory and Policy*, East West Press.

Ahuja, H. L. *Advanced Economic Theory,* S. Chand Publishing, New Delhi, (latest edition).

13. EDUCATION

Preface

The Under graduate Course in Education as per the NEP-2020 guidelines is meant for the 3-year UG Major, Multidisciplinary and Skill Enhancement course program, 4-year UG Honours, and Honours with the Research program of the University at the beginning of their careers .

The course in Education consists of:-

Three papers in the 1st semester

EDN-100:   Introduction to Education (Major)
MDC- 116: Introduction to Psychology
SEC- 131:   Motivation

Three papers in 2nd semester

EDN-150:   Foundation of Education (Major)
MDC- 166: Introduction to Educational Psychology
SEC-182:   Confidence Building

These papers will enable the learners to demonstrate their understanding of the subject and deliver meaningful learning experiences by integrating their knowledge of content, pedagogy, the learner and the learning environment; engaging in the reflective instructional cycle of planning, instructing, assessing, and adjusting based on data; and applying a variety of communication, instructional, and assessment strategies.

It will facilitate learning through joint productive activity among teachers and students, developing students' competence in communication throughout all instructional activities, connecting curriculum to experience and skills of students' home and community, challenging students toward cognitive complexity, and engaging students through dialogue, especially instructional conversation.

Programme Outcomes

At the end of the programme, the students are expected to have sound knowledge of fundamental concepts of Education. The acquired knowledge will enrich the skills for professional collaboration, and interactions with peer mates, teachers, parents, and the community.

EDN-100: INTRODUCTION TO EDUCATION

(Contact Hours: 60, Credits: 4)

Objectives: This course will help the learners to develop a positive attitude towards Education. It will sensitize the students on the importance of Education as a discipline. It will also help learners to identify future job opportunities relating to Education as a discipline.

Learning Outcomes

At the end of the course students are able to:

1. demonstrate comprehensive knowledge and understanding in the academic field of study
2. assess learning experiences that will help instil deep interest in learning about the effects of mass media in Education
3. discover and contextualise knowledge and can engage themselves in developing a curriculum
4. adapt skills that are necessary for planning, organising and present a report on an activity

UNIT I   **Concept of Education**
- Meaning; Aims; Functions; Importance
- Principles of Education
- Types of Education
- Scope of Education

UNIT II   **Mass Media in Education**
- Meaning; Functions of Mass Media
- Structure of Mass Media
- Multi Media in Education
- Effects of Mass Media in Education

UNIT III   **Concept of Curriculum**
- Meaning; Characteristics; Need and Importance
- Principles of Curriculum Construction
- Types of Curriculum
- Factors Influencing Curriculum

UNIT IV   **Co-curricular Activities**
- Meaning and Importance of Co-Curricular
- Scope of Co-curricular Activities
- Types of Co-curricular Activities
- Benefits of Co-curricular Activities

Assignments   (Choose any one)

1. Prepare a plan for any one non-academic activity: Examples: Science quizzes; poetry competition; story writing competition; mathematics Olympiads; extempore; project exhibition, Essay competitions or Debate competition; poster drawing; folk art work; etc.

2. Prepare any one plan from the following, for organising: a Cultural event; scouting and guiding; celebrating cleanliness day; taking part in college councils; volunteering for social work; etc

3. Prepare, organise and report on any one recreational activity that you have performed: Example: Picnic; Mountain Hike; workshops; group games; industrial or factory visits; field visits; etc

.

References

Aggarwal, J.C.(2018). *Curriculum Development Planning & Instruction*. Doaba House: India

Aggarwal, J.C.(2020). *Philosophical Foundations of Education*. Shri Vinod Pustak Mandir: India

Chawla,A.(2021). *Introduction to Mass Communication* | First Edition | By Pearson Education: India

Dutta, K. B. *Mass Media in India*. (2005). Akansha Publishing: India.

Ferguson. (2001). *Co-curricular Activities: A Pathway to Careers*. Facts On File Inc.

Egyankosh. (n.d.). *Co-Curricular Activities*. https://egyankosh.ac.in/bitstream/123456789/47006/1/Unit-13.pdf

KKHSOU. (n.d.). *Co-Curricular Activities*. https://kkhsou.ac.in/eslm/E-SLM_Main/5th%20Sem/Bachelor%20Degree/Education/Education%20Major/English%20medium/Educational%20Management%20English%20Medium/Block%202/Unit%20-12.pdf

Pandey, Jyoti. (2015). *Principles Of Education and Curriculum Development*. KSK: India.

Ravi, V. (2015). *Curriculum Development*. Lulu.com: India.

Sudhakara Reddy, T. J. & Bhaskara, Digumarti Rao. (2016). *Co-Curricular Activities*. APH Publishing Corporation: India.

Talla, Mrunalini. (2012).*Curriculum Development: Perspectives, Principles and Issues*. Pearson Education India.

Venkateshwara Rao, N. (2020).*Introduction to Media and Mass Communication*. Kanishka Publishers: India.

EDN-150: FOUNDATION OF EDUCATION

(Contact Hours: 60, Credits: 4)

Objectives: This course will enable the students to deep knowledge and understanding of the philosophical, sociological, political and economic foundations of education. It will also develop in them the ability and commitment to engage in a critical analysis of educational issues and to apply the results of that analysis to educational reconstruction.

Learning Outcomes

At the end of the course, students are able to:

1. explain the concept and the need of Education
2. summarize the types of democracy related to education
3. examine the aims of education.

Unit I Concept of Education

- Meaning, Nature and Scope of Education
- Forms of Education:-Formal, Informal and Non-formal
- Distinction between Education and Literacy
- Role of Education in National Development

Unit II Aims of Education

- Need and Significance of Aims of Education
- Determinants of Educational Aims
- Type of Aims of Education
  i) Ultimate Proximate Aims of Education

  ii) Liberal and Vocational Aims of Education

- Democratic Citizenship as an Aims of Education

Unit III Freedom and Discipline in Education

- Meaning, Need and Importance of Freedom
- Meaning, Need and Importance of Discipline
- Relationship between Freedom and Discipline
- Role of Teachers in maintaining Discipline

Unit IV Democracy and Education

- Meaning, Types and Characteristics of Democracy
- Principles of Democracy

- Democracy in Education
- Role of Teachers in a Ddemocracy

Assignments   (Choose any one)

1. Challenges of the NEP-2020 in Higher Education
2. Rights and duties of a democratic citizen(Give a detailed report by consulting primary or secondary sources)
3. Multi Cultural Education: Issues and Challenges(Give a detailed report by consulting primary or secondary sources)

References

Dewey, J. (2009). *Democracy and Education.* Merchant Books Publication.

Gingell, J. & Winch, C. . (1999). *Key Concepts in the Philosophy of Education.* Taylor & Francis Ltd.

Latchanna, G. et al. (2016). *Foundations of Education.* Hyderabad: Neelkamal Publication.

Mishra, S. (2022). *Philosophy of Education.* Notion Press.

Mrunalini, T. et al. (2016). *Philosophical Perspectives of Education.* Hyderabad: Neelkamal Publication.

Pathak, R.P. (2019). *Philosophical and Sociological Foundations of Education.* Kanishka Publishers.

Ravi, S.S. (2015). *Philosophical and Sociological Bases of Education.* PHI Learning.

Saikia, P. (2019). *Sociological Foundations of Education.* DVS Publishers.

Singh, M. & Singh, U. (2011). *Sociological Foundations of Education.* Laxmi Publications.

Whitehead, A.N. (2022). *The Aims of Education.* Nation Press.

14. ELECTRONICS

About the Programme:

The 4-year BSc program in Electronics is a comprehensive course which starts frombasicsand goesuptoadvance level electronics. The curriculum has been designed to provide students with strong foundation in Electronics and its application. The programme covers different courses like Network analysis, Semiconductor devices, Applied Physics, Electronic Circuits, Operational Amplifier, Digital Electronics, Signal and systems, Microprocessor and Microcontroller, Electronics Instrumentation, Electrodynamics, Control System , Antenna etc. The syllabus also includes programming in C and also hardware description languages (verilog). The programme also includes practicals , project and internship to help the students gain hands-on experience and apply the theoretical knowledge along with exposure in applications of the subject.

After completing the Degree with Electronics Major, the students will have the expertise to explore various career opportunities. They can work in the field of Hardware and software Electronics as a designer, fabrication and testing. Students interested can also opt for further studies and enter different Universities offering Mastersin Electronics/Applied Physics/Instrumentation, MCA, Post graduate degree diploma in Biomedical Instruments etcand also continue further as a Research Scientist.

PROGRAM OUTCOME (POS):

1. Students will be able to develop broad knowledge and understanding of key concepts about electronic science.

2. Students will be equipped with advanced scientific and technological capabilities for analyzing and tackling the issues and problems in the field of electronics

3. Students will develop an ability to apply knowledge and skills toacquiresolutions of specific theoretical and applied problems in electronics.

4. Students will develop abilities to design and develop innovative solutions for benefits of society, by diligence, leadership, teamwork and lifelong learning.

5. Students will be provided with the knowledge of programming which will help them to design microcontroller circuit and advance to the field of Robotics,etc.

6. Students will be trained to use simulator for circuit designing and fault detection so as to work in any environment without the availability of a fully equipped lab.

ELE-100: BASIC NETWORK ANALYSIS

(Contact Hours: 75, Credits: 4)

COURSE OBJECTIVES :

The objective of the course is to impart knowledge of various basic circuit components and to understand the basic circuit laws which form the base of understanding electronic circuits. Problems solving using these basic laws and theorems will help students to understand the response of such circuits to DC and AC supplies. Practical will help them to gain the skills necessary to see the importance of these laws/theorems circuits in various applications.

LEARNING OUTCOME (LOS):

After completion of this course.

1. Students will be able to understand the passive components (resistance, inductor and capacitor) and will be able to use these components in designing and analyzing the circuits under DC and AC conditions.

2. Students will be able to use different theorems in solving complex circuit problems while designing circuits.

3. Students will gain Practical skills in various experiments to further enhance their understanding about circuits.

OUTLINE OF THE PAPER

UNIT	Topic	Hours	External Marks	Internal Marks
I	Basic Circuit Concept and DC Circuit analysis:	15	18	
II	AC Circuit Analysis:	15	19	19
III	Network Theorems:	15	19	
IV	Practical	30	19	6
Total		75	75	25

UNIT-I: BASIC CIRCUIT CONCEPT AND DC CIRCUIT ANALYSIS (THEORY)   (15 hours)

Resistors: Fixed and variable resistors, Construction and characteristics, Color coding of resistors, resistors in series and parallel.

Inductors: Fixed and variable inductors, Self and mutual inductance, Faraday 's law and Lenz 's law of electromagnetic induction, Energy stored in an inductor, Inductance in series and parallel, Testing of resistance and inductance using multimeter.

Capacitors: Principles of capacitance, Parallel plate capacitor, Permittivity, Definition of dielectric constant, Dielectric strength, Energy stored in a capacitor, Air, Paper, Mica, Teflon, Ceramic, Plastic and Electrolytic capacitor, Construction and application, capacitors in series and parallel, factors governing the value of capacitors, testing of capacitors using multimeter.

DC Circuit Analysis: Kirchhoff 's current law (KCL), Kirchhoff 's voltage law (KVL), Node analysis, Mesh analysis, Star-delta conversion. RC circuit- charging and discharging with initial charge, RL circuit with initial current, Time constant, RL and RC circuits with DC source, DC response of series RLC circuits.

UNIT-II: AC CIRCUIT ANALYSIS (THEORY)   (15 hours)

Sinusoidal voltage and current, Definition of instantaneous, Peak,   Peak to Peak, root-mean square and average values. Voltage-current relationship in resistor, Inductor and capacitor, Phasor, Complex impedance, Power in AC circuits: Instantaneous power, Average power, Reactive power, Power factor. Sinusoidal circuit analysis for RL, RC and RLC circuits. Resonance in series and parallel RLC circuits, Frequency response of series and parallel RLC circuits, Quality (Q)factor and bandwidth. Passive filters: Low pass, High pass, Band pass and Band Stop.

UNIT-III: NETWORK THEOREMS (THEORY)   (15 hours)

Principal of duality, Superposition Theorem, Thevenin 's Theorem, Norton 's Theorem, Reciprocity Theorem, Millman 's Theorem, Maximum power transfer Theorem. AC circuit analysis using Network Theorems.

Two port networks: Impedance (Z) parameters, Admittance (Y) parameters, Transmission (ABCD) parameters.

UNITIV: PRACTICAL   (30 hours)

1. (a) Resistance in series, parallel and series–parallel combination
   (b) Capacitors and Inductors in series and parallel.
   (c) Multimeter– Checking of components.

2. Measurement of Amplitude, Frequency and Phase difference using CRO.

3. Verification of Norton 's Theorem.

4. Verification of Thevenin 's Theorem.

5. Verification of the Maximum Power Transfer Theorem.

6. Study of RC Charging and Discharging.

7. Study of RC Circuits: Time-constant, Differentiator, and Integrator.

8. Study of the frequency of a Low Pass Passive

9. Study of the frequency response of High pass passive filter

10. Study of the frequency response of a series LCR circuit and determination of its

(a)Resonant-frequency (b)Impedance at resonance (c)Quality factor Q (d)Bandwidth.

SUGGESTED READINGS:

1. Electric Circuits, S.A.Nasar, Schaum 's out line series, Tata McGraw Hill(2004).
2. Electrical Circuits, M.Nahviand, J.Edminister, Schaum 's Outline Series, Tata- McGraw Hill (2005).
3. Essentials of Circuit Analysis, Robert L.Boylestad, Pearson Education (2004).
4. Engineering Circuit Analysis, W.H.Hayt, J.E.Kemmerly, S.M.Durbin, Tata McGraw Hill(2005).
5. Fundamentals of Electric Circuits, Alexander and M.Sadiku, McGraw-Hill (2013).
6. Handbook of Electronics, S. L. Gupta and V. Kumar, Pragati Prakashan (2019).
    7. Fundamentals of Electrical and Electronics Engineering, S. Ghosh, PHI, (2003).
8. Network analysis, D. Roy Choudhury, Wiley Eastern Ltd, (2013).
9. Network Analysis, G.K Mittal, Khanna Publishers, (2007).
10. Basic Electronics (Solid State), B.L. Theraja, S. Chand and Co. Ltd., (2006).
11. Electronics Practical, S. Gupta and S. Gupta, Narosa Publishing House, (2006)
12. Experiments on Electronics, S.V. Subrahmanyam, Laxmi Publications, (2011).

INSTRUCTIONS TO PAPER SETTER

Theory	Practical
3 Hours	3 Hours

THEORY:

Questions should be set according to the following scheme.

UNIT	Questions	
	To be Set	To be Answered
I	2	1
II	2	1
III	2	1

PRACTICALS:

Evaluation of Marks for Practicals:

a.	Laboratory Note Book	3
b.	Theory	3
c.	Circuit diagram and Tabulation	4
d.	Result and Precaution	3
e.	Viva Voce	6
	Total	**19**
f.	Internal	6
	Total	**25**

ELE-150: SEMICONDUCTOR DEVICES

(Contact Hours: 75, Credits: 4)

COURSE OBJECTIVES :

Study of semiconductor material will impart knowledge on the fundamentals of electronics devices. The students will have a sound understanding about the different properties of semiconductor materials and devices. Students will also be able to understand the constructional details, working and applications of various active electronic components used in low and high power applications. Practical knowledge will help them to analyze the characteristics of these devices.

LEARNING OUTCOME (LOS):

After completion of this course.

1. the students will be able to identify semiconductors and differentiate them from conductors and insulators.

2. They will also gain skills to understand how properties of semiconductors can be utilize to make different semiconductor devices.

3. They will be able to draw the characteristics and interpret the results of various electronic devices.

Outline of the Paper

UNIT	Topic	Hours	External Marks	Internal Marks
I	Semiconductor Basics:	15	18	
II	P-N Junction Diode and Bipolar Junction Transistors (BJT)	15	19	19
III	Field Effect Transistors and Power Devices:	15	19	
IV	Practical	30	19	6
Total		75	75	25

UNIT-I:

SEMICONDUCTOR BASICS: (15 hours)

Introduction to semiconductor materials, Crystal structure, Planes and Miller indices, Chemical bond in semiconductors like Germanium and Silicon, Band gap--- forbidden energy gap, valence band and conduction band. Drift and diffusion current, Concept of Fermi level, Intrinsic and Extrinsic semiconductor, Mobility, Drift velocity and conductivity of intrinsic semiconductor, Calculation of density of electron in conduction band and density of holes in valence band, Law of mass action, Extrinsic semiconductors –donor and acceptor impurities, Energy band diagram and Fermi level of p-type and n-type.

UNIT-II: P-N JUNCTION DIODE AND BIPOLAR JUNCTION TRANSISTORS (BJT) (15hours)

Formation of depletion layer, Space charge at a junction, Band structure in open circuited p-n junction diode and its modification with biasing, Calculation of barrier potential and barrier width across p-n junction, Dependence of barrier width with doping, Rectifier equation of p-n junction diode, V-I characteristic of a diode; Dynamic resistance of diode; Temperature effect, Reverse breakdown in a diode, Junction capacitance: Transition and diffusion capacitance, Concept of linearly graded junction, Derivation of diode equation and I-V characteristics.

Zener and avalanche junction breakdown mechanism. Tunnel diode, Varactor diode, Photodiode, Light-emitting diode, Solar cell: circuit symbol, characteristics, applications.

Transistor (p-n-p and n-p-n), transistor current components, leakage current, Temperature effects, Ebers- Moll model of BJT, Transistor connection in common base, common emitter and common collector.

CB and CE static characteristics, Active region, Saturation and cut off, Load line, Operating point. Emitter efficiency, Base transport factor, Current gain, Energy band diagram of transistor in thermal equilibrium, Quantitative analysis of static characteristics (Minority carrier distribution and terminal currents), Base-width modulation, Modes of operation, Metal semiconductor junctions: Ohmic and Rectifying contacts.

UNIT-III: FIELD EFFECT TRANSISTORS AND POWER DEVICES: (15hours)

JFET: Construction, Idea of channel formation, Pinch-Off and saturation voltage, Current-voltage output characteristics.

MOSFET: Types of MOSFETs, Circuit symbols, Working and characteristic curves of depletion type MOSFET (both N channel and P channel) and enhancement type MOSFET (both N channel and P channel). Complimentary MOS (CMOS).

UJT: Basic construction and working ,Equivalent circuit, intrinsic Standoff ratio, characteristics.

SCR: Construction, Working and Characteristics, Triac, Diac, IGBT, MESFET, Circuit symbols, Basic constructional features, Operation and applications.

UNIT-IV:

Practical   **(Marks 30)**

1. Study of the I-V characteristics of a semiconductor junction diode under forward bias and reverse bias condition.

2. Study of the I-V characteristics of a Zener diode under forward bias and reverse bias condition.

3. Study of the I-V characteristics of the common emitter configurationof BJT and obtain ri, ro,β.

4. Study of the I-V characteristics of the common base configuration of BJT and obtain ri,ro, α.

5. Study of the I-V characteristics of the UJT.

6. Study of the I-V characteristics of the SCR.

7. Study of the I-V characteristics of JFET.

8. Determination of energy gap (band gap) of a semiconductor using a P-N junction diode.

SUGGESTED READINGS:
1. Handbook of Electronics, S. L. Gupta and V. Kumar, Pragati Prakashan (2019).

2. Elements of Electronics, M.K. Bagde and S.P. Singh, S. Chand & Co. Ltd., (2002).

3.Principles of Electronics, V.K. Mehta and R. Mehta, S. Chand and Co. Ltd., (2014).

4. Basic Electronics (Solid State), B.L. Theraja, S. Chand and Co. Ltd. (2006).

5.Foundation of Electronics, D. Chattopadhay, P.C. Rakshit, B. Saha, N. N. Purkait, New Age International (2015).

6. Semiconductor Devices: Physics and Technology, S.M.Sze, Wiley India edition (2002).

7. Solid State Electronic Devices, B.G. Streetman and S. Banerjee, Pearson Education (2006).

8. Semiconductor Devices: Basic Principles, J. Singh, John Wiley and Sons (2001).

9. Electronics Practical, S. Gupta and S. Gupta, Narosa Publishing House, (2006).

10. Experiments on Electronics, S.V. Subrahmanyam, Laxmi Publications, (2011).

INSTRUCTIONS TO PAPER SETTER

Theory	Practical
3 Hours	3 Hours

THEORY:

Questions should be set according to the following scheme.

UNIT	Questions	
	To be Set	To be Answered
I	2	1
II	2	1
III	2	1

PRACTICALS:

Evaluation of Marks for Practicals:

a.	Laboratory Note Book	3
b.	Theory	3
c.	Circuit diagram and Tabulation	4
d.	Result and Precaution	3
e.	Viva Voce	6
	Total	**19**
f.	Internal	6
	Total	**25**

15. ENGLISH

Preface

The FYUG programme in English, up to the second semester, comprises two Major/ Minor Courses, two Ability Enhancement Courses (AEC) and one Multi-Disciplinary Course (MDC). There are five papers and 17 credits with a total of 425 grade points over two semesters. The Major/ Minor Courses, being subjects in a core discipline and comprising Introduction to English Literature and British Poetry: Milton to the Present, are taught in both semesters. So are the Ability Enhancement Courses, comprising Alternative English in the first semester and Communicative English in the second. The Multi-Disciplinary Course, comprising Introduction to Theatre and Performance, is taken up in the second semester.

The two Major/ Minor Courses are designed to introduce students to the origin and development of English literature and provide a comprehensive guide to English poetry, its development, forms and movements over the ages. So is the Alternative English paper under AEC. Communicative English is designed to train students to develop their communication skills in dealing with modern-day situations. The Introduction to Theatre and Performance will introduce students to the basic concepts of Theatre and Performance.

Programme Outcome

Through Major/ Minor Courses and the Alternative English paper, the students will gain the aptitude to read and understand various literary texts and genres, thus enabling them to think critically and demonstrate a coherent and systematic knowledge of the different aspects of the English language and literature. In addition, Communicative English will help them develop effective communication skills, while Introduction to Theatre and Performance will help them gain the ability to translate dramatic theory into practice.

ENG-100: INTRODUCTION TO ENGLISH LITERATURE

(Contact Hours: 60, Credits: 4)

The course is designed to introduce students to the origin and development of English literature. It will offer a broad overview of the major literary movements from the old English period to postmodernism and the present era with brief descriptions of key works. By introducing students to the broad categories of poetry, drama and fiction, the course will help them develop an understanding of major genres, literary tendencies and important socio-political movements of the various ages.

Course Objectives:

1. To equip students with the ability to understand and engage with various literary and critical concepts and categories.
2. To enable students to read texts with close attention to themes, conventions, contexts and value systems.
3. To train students to situate their reading and their positions in terms of community, class, caste, religion, gender and politics and to develop their understanding of the global and local.
4. To inculcate in students the ability to communicate ideas, opinions and values and to expand their knowledge of the subject as it moves from the classroom to life and life-worlds.
5. To develop critical thinking and ethical awareness in students.

Learning Outcomes

The students will gain the aptitude to read and understand various literary texts and genres, thus enabling them to think critically and demonstrate a coherent and systematic knowledge of the different aspects of English language and literature. They will also develop a keener literary judgement and a clearer understanding of literary and ethical values.

UNIT I: Introduction to the Literary Periods
(This unit will focus only on the major movements, providing a brief outline—about 400 words—of each.) *

Literary Periods:
1. Old English (450-1066)
2. Middle English (1066-1500)
3. The Renaissance (1500-1660)
4. The Elizabethan Age (1558-1603)
5. The Jacobean Age (1603-1625)
6. The Restoration Period (1660-1700
7. The Romantic Period (1785-1832)

8. The Victorian Period (1832-1901)
9. Modernism (1914-1945)
10. Postmodernism (1945 to the Present)

* Sample outlines are available. See "Christian, et al." in Suggested Reading.

UNIT II: Introduction to English Poetry

(This unit will focus on prominent genres—providing a brief outline of each—relevant literary terms and select texts.)

Brief Outlines of Poetry Genres:
1. Lyric (Elegy, Dirge, Sonnet, Ode)
2. Narrative Poetry (Ballad, Epic, Mock Epic, Allegory)
3. Didactic Poetry (Satire)
4. Epistolary Poetry
5. Pastoral Poetry
6. Dramatic Poetry (Dramatic Monologue)

Representative Poets and Texts (14th to 17th Century)
a. Geoffrey Chaucer: "The Tale of the Wyf of Bathe"
b. William Shakespeare: "Sonnet 18"
c. John Donne: "The Sunne Rising"
d. Abraham Cowley: "Platonic Love"

UNIT III: Introduction to English Drama

(This unit will focus on prominent genres—providing a brief outline of each—relevant literary terms and a select text.)

Brief Outlines of Drama Genres:
1. Mime Theatre
2. Morality Play
3. Tragedy
4. Comedy
5. Tragi-comedy
6. Historical Play
7. Melodrama
8. Mystery Play
9. Theatre of the Absurd
10. Street Theatre

Representative Playwright and Text (16th Century)
William Shakespeare – *The Merchant of Venice*

UNIT IV: Introduction to English Fiction

(This unit will focus on prominent genres—providing a brief outline of each—relevant literary terms and a select text.)

Brief Outlines of Fiction Genres:
1. Realistic Fiction
2. Romance
3. Picaresque Novel
4. Epistolary Novel
5. Historical Fiction
6. Science Fiction
7. Speculative Fiction
8. Crime/ Mystery
9. Magic Realism
10. Young Adult Fiction

Representative Author and Text (18th Century)
Daniel Defoe: *Robinson Crusoe*

Suggested Reading

Alexander, Michael. *History of English Literature*. Macmillan Press Ltd., 2000.

Allison, Alexander, et al., ed. *The Norton Anthology of Poetry*. W. W. Norton and Company, 1983.

Christian, et al., ed. "Literary Movements". 13 May 2023, StudySmarter, www.studysmarter.co.uk/explanations/english-literature/literary-movements/

Defoe, Daniel. *Robinson Crusoe*. Fingerprint Publications. 2017.

Mangan, Michael. *A Preface to Shakespeare's Comedies.* Routledge, 1996.

Prasad, B. *A Background to the Study of English Literature*. Macmillan Ltd., 2010.

Robert Scholes, et al., ed. *Elements of Literature*. Oxford University Press, 2004.

Sampson, George. *The Concise Cambridge History of English Literature*. Cambridge University Press, 1946.

Sanders, Andrew. *Oxford History of English Literature*. Oxford University Press, 2005.

Shakespeare, William. *The Merchant of Venice*. Dover Publications Inc., 1995.

Stephen Greenblatt, et al., ed. *The Norton Anthology of English Literature. Vol. A, The Middle Ages.* W.W. Norton & Co. Ltd., 2006.

ENG-150: BRITISH POETRY: MILTON TO THE PRESENT

(Contact Hours: 60, Credits: 4)

This course is a continuation of *Introduction to Poetry* dealt with in the first Semester. It is intended to provide a comprehensive guide to English poetry, its development, forms and movements over the ages. Beginning with Milton, it moves on to the Metaphysical Poets, represented by John Donne, and the Augustan period, represented by Alexander Pope. The Romantics are represented by Gray, Blake and Keats, the Victorians by Browning and Hardy, offering students the scope to view their poetry against the background of a clash between faith and scepticism, hope and despair.

The course is also designed to familiarise students with the "new" poetry which came into being at the beginning of the twentieth century in the UK, which embodies the crisis, disillusionment, and radical scepticism of the times. Beginning with Yeats and Eliot, the course includes English, Welsh and Irish poets, who add a "regional" flavour to the complexity and exciting diversity of Modern English Poetry.

Course Objectives

1. To provide a comprehensive guide to English poetry, its development, forms and movements over the ages.
2. To familiarise students with the "new" poetry, which came into being at the beginning of the 20th Century in the UK.
3. To equip them with the ability to understand and appreciate the various elements and aspects of poetry.
4. To encourage reading and discussion of poetry as a means to explore issues of identity, culture, human relationships, nature and topics relating to life and customs.

Learning Outcomes

This course will help students gain expertise in the study of poetry, its various elements, genres, techniques and devices. By engaging in close reading and analysis of literary texts, students will develop their critical thinking skills, thus inculcating the spirit of enquiry and questioning in them. Further, students will be provided with the relevant materials in their endeavour to explore culture, history, and human values.

UNIT I

1. John Milton: "Paradise Lost" (Book I, lines 1-125)
2. Alexander Pope: "Ode on Solitude"
3. Thomas Gray: "Elegy Written in a Country Churchyard"

UNIT II

1. William Blake: "The Lamb" and "The Tyger"

2. John Keats: "Ode to Autumn"
3. Robert Browning: "My Last Duchess"

UNIT III

1. Thomas Hardy: "Let Me Enjoy"
2. William Butler Yeats: "The Second Coming"
3. T. S. Eliot: "Whisper of Immortality"

UNIT   IV

1. Ted Hughes: "A Woman Unconscious"
2. Seamus Heaney: "Digging"
3. Lynne Rees: "Never"

Suggested Reading

Bloom, H. *The Best Poems of the English Language*. Harper Collins, 2004.

Bowra, C. M. *The Romantic Imagination*. OUP, 1999.

Bromwich, David. *Skeptical Music: Essays on Modern Poetry*. University of Chicago Press, 2001.

Corcoran, Neil. *English Poetry since 1940*. Longmans, 1993

Corns, T. N., ed. *The Cambridge Companion to English Poetry*. Cambridge University Press, 1973.

Draper, R. P. *An Introduction to Twentieth-Century Poetry in English.* St Martin's Press, 1999.

Duran, Angelica: *Concise Companion of Milton*, Blackwell, 2006.

Frye, N. *Fearful Symmetry: A Study of William Blake*. University of Toronto Press, 2004.

Neill, E. *Trial by Ordeal: Thomas Hardy and the Critics*. Columbia Camden House, 1999.

Keats, John. *Complete Poems and Selected Letters of John Keats* (with an Introduction by Edward Hirsch). Modern Library, 2001.

Howarth, Peter. *British Poetry in the Age of Modernism*. Cambridge University Press, 2005.

Keating, P. J. *Robert Browning: A Reader's Guide*. Writers & Their Background Series, 1974.

Manning, Peter. *Reading Romantics: Texts and Contexts*, Viking, 1990.

Perkins, David. *A History of Modern Poetry (2 Volumes).* Harvard University Press, 1987.

16. ENVIRONMENTAL SCIENCE

Preface

The objective of the programme is to expose students to the wide knowledge base of the environment, its components and the principles operating therein. The students will also gain specialized knowledge on contemporary environmental issues and problems so as to attempt in solving them, and also will disseminate the same to the society. The programme will enable the students to develop analytical skills, investigation capabilities and hone their decision-making skills in the areas of environmental Science.

Students will also take part in practical sessions which are focused on laboratory techniques that allow them to acquire lab skills. The practical skills are critical and indispensable to effective holistic learning and will enable them to engage effectively with advanced laboratory modules and prepare them for future employment.

Programme Outcome (POS):

Upon completion of this programme the student will be able to
PSO1 Academic competence: Understand fundamental concepts, principles and processes underlying the field of Environmental Science, its interdisciplinary nature and create and disseminate knowledge to the students about environmental problems at local, regional and global scale and demonstrate an understanding of a wide range of Environmental techniques

Students will acquire knowledge, competent professionals with a strong foundation of Environmental Science and application to be suitable for vital positions in the academia, industry, government and non-government institutions as skilled manpower.

PSO2 Personal and Professional Competence: They will become effective scientific communications /collaborators in multidisciplinary teams providing technical leadership to engage with the challenging environmental problems of local, national and global nature. Employ skills in specific areas related to Environmental Science such as industrial pollution, Green technology development, Ecological, health, agriculture and ensure multilevel commitment to health and wellbeing of the society at large.

PSO3 Research Competence: Apply environmental data analysis methodology in order to conduct research and demonstrate appropriate skill to seek innovative solutions to problems that emerge in various fields of Environmental Science.

EVS-100: CONCEPTS AND COMPONENTS OF ENVIRONMENT

(Contact Hours: 75, Credits: 4)

Course Objective: To introduce the concepts and components of environment, composition and structure of atmosphere, lithosphere.

Learning Outcomes: Student should be able to gain the knowledge about the environment, its components and functions.

Unit I: Environment:Definition, conceptand importance; Scope of Environmental Science; Multidisciplinary nature of Environmental Science; Man - Environment Relationship; Need for environmental awareness; Applications of and Career in Environmental Science.**(Contact hours: 15 hrs.)**

Unit II: Atmosphere: Composition and structure; Heat budget; Lapse Rate; Inversion of Temperature. Weather and climate:Wind and pressure systems; Major climatic zones of the world; Tropical cyclones; Ocean currents; Western disturbances; El Nino and La Nina. Clouds: Formation and classification.**(Contact hours: 15 hrs.)**

Unit III: Lithosphere: Internal Structure of the earth; Earth's Crust and its composition; Plate tectonics: evidences and boundaries; Continental drift. Minerals and Rocks: Definition, types and usages; Rock Cycle.Hydrosphere:Types of water; Properties of water;Distribution of water; Hydrological cycle; Aquifer and water table. Zonation of Hydrosphere: lentic, lotic and marine.**(Contact hours: 15 hrs.)**

Unit IV: Identification of minerals and rocks; Plotting of Climograph (line & bar diagram method) and Hythergraph (G. Taylor's 12sided polygon method); Measurement of rainfall and wind speed; Estimation of moisture, temperature and conductivity of soil; Determination of transparency, temperature, pH and conductivity of water; Visits to institutions/centers of environmental significance.**(Contact hours: 30 hrs.)**

Suggested readings:(All latest edition)

Anjaneyulu, Y. Introduction to Environmental Science. BSP Books Pvt. Ltd., Hyderabad.
Botkin, D.B. and Keller, E.A. Environmental Science: Earth as a Living Planet. John Wiley and Sons, New Delhi.
Cunningham, W.P. and Saigo, B.W. Environmental Science – A Global Concern. WCB/McGraw Hill, NewYork.
Lal, D.S. Climatology.ShardaPustakBhawan,Allahabad.
Lal, D.S. Physical Geography.ShardaPustakBhawan,Allahabad.
McKinney, M.L., Schoch, R. and Yonavjak, R.M.Environmental Science Systems and Solutions.Jones & Bartlett Publishing Inc.,Delhi.

Purohit, S.S., Shammi, Q.J. and Agarwal, A.K.A Textbook of Environmental Science. Students Edition,Jodhpur.

Sharma, P.D. Ecology and Environment.Rastogi Publication, Meerut.

Singh, S.Environmental Geography.PrayagPustakBhawan,Allahabad.

Maiti, S.K. Hand Book of Methods in Environmental Studies. Vol.I &II.ABD Publishers, Jaipur.

Michael, P. Ecological Methods for Field and Laboratory Investigation.Tata McGraw Hill, New Delhi.

Misra, R.Ecology Workbook. Oxford & IBH Publications Co., New Delhi.

EVS-150: POPULATION AND COMMUNITY ECOLOGY

(Contact Hours: 75, Credits: 4)

Course Objective: To give students an understanding regarding the various pollution sources in environment and their effect on environment and life.

Learning Outcomes: Students should get a clear idea regarding pollution, pollutants and their various effects on humans as well as ecosystem which will make them careful in future.

Unit I: Ecology: Definition of ecology; Division of ecology;Ecological factors: biotic and abiotic (light, temperature, precipitation, fire) factors; Shelford's law of Tolerance; Leibig's Law of minimum; Ecological amplitudes, ecotypes, ecoclines, ecological niche.**(Contact hours: 15 hrs.)**

Unit II: Population Ecology: Concept and characteristics of population:natality, mortality, age structure, population pyramids, population density, population dispersion, population growth, life table and survivorship curves; Carrying Capacity of the Earth. Population interactions: competition, predation, parasitism, symbiosis, commensalism, mutualism, and ammensalism.**(Contact hours: 15 hrs.)**

Unit III: Community Ecology: Concept of community, classification; Community structure:horizontal and vertical stratification. Community Characteristics; Analytical Characters of community: qualitative and quantitative; Methods of studyof community. Ecological Succession:Concept,processes, stages and typesof successions; Examples of succession; Concept of Climax; Climax communities; Climax Theories: Monoclimax and Polyclimax.**(Contact hours: 15 hrs.)**

Unit IV: Determination of requisite size and number of quadrats for vegetation analyses; Determination of frequency, density and abundance of species in a grassland community;Calculation of IVI of plant species in a grassland community;Qualitative and quantitative analyses of planktons; Determination of chlorophyll content.**(Contact hours: 30 hrs.)**

Suggested Readings:(All latest edition)

Ambhast, R.S. A Textbook of Plant Ecology.Students, Friends and Co., Varanasi.

Arora, M.P..Ecology. Himalaya Publishing House, New Delhi.

Chapman, J.L. and Reiss, M.J.Ecology - Principles and Applications. Cambridge University Press, Cambridge.

Dakshini, K.M.M. and Foy, C.L. Principle and Practices in Plant Ecology. CRC, Boston. Misra, Dash, M.C. and Dash, S.P. Fundamentals of Ecology. Tata McGraw Hill Publishing Company Ltd., New Delhi.

Miller, G.T. and Spoolman, S. Essentials of Ecology.Brooks/Cole Learning, USA.

Odum, E.P.Fundamentals of Ecology.Nataraj Publisher, DehraDun.

Kormondy, E.J.Concepts of Ecology.Fourth Edition.Prentice Hall of India, NewDelhi.

Rana, S.V.S.Essentials of Ecology and Environmental Science.Prentice Hall of India, NewDelhi.

Michael, P. Ecological Methods for Field and Laboratory Investigation. Tata McGraw Hill, New Delhi.

Misra, R.Ecology Workbook. Oxford & IBH Publications Co., New Delhi.

Sharma, P.D. Ecology and Environment.Rastogi Publications, Meerut.

Tripathi, B.D. and Govil, S.R. Water Pollution (An Experimental Approach).CBS Publishers and Distributors, New Delhi.

17. FISHERY SCIENCE

About the programme:

Four-year undergraduate program in Fishery Science is a multidisciplinary course that teaches about the discipline of managing and understanding fisheries. The course is just not limited to the conservation of fishes but also imparts knowledge about catching, managing, breeding, and marketing of the fishes. Some of the subjects, which will be taught in this course include navigation and seamanship, gear and craft engineering, marine engines, fisheries economics and management and fisheries science extension along with fish taxonomy, fish anatomy, fish physiology and biochemistry, fish breeding, genetics, biotechnology, nutrition, and shellfish fisheries.

Programme Outcomes (POs):

Programme Outcomes include:

- To provide students with a broad understanding on the principles of fisheries science.
- To provide students with the knowledge and skills necessary to manage fisheries resources.
- To provide students with the knowledge and skills necessary to conduct research in fisheries science.
- To provide students with the knowledge and skills necessary to communicate effectively about fisheries science.

- Students, after completing this 4 years UG course, will have opportunities to engage in various jobs like Assistant Director, Research Assistant and Fisheries Inspector, Assistant Fisheries Development Officer, Fisheries Extension Officer, and District Fisheries Development Officer, Fish Exporter, Marine Biologist & Marine Scientist, Fish Trader, Fish Breeder, Hatchery/Farm Operator, Bio Scientists, Fisheries Researchers, Aqua Culturists, Educators, Environmental Consultants and Planners, Conservation Officers, and many others.

FSC-100: INTRODUCTION TO FISH AND FISHERIES

(Contact Hours: 60, Credits: 4)

Course Objectives:

- To impart the knowledge of fishery science and to make use of the knowledge in the daily life of students.
- To make the students aware of natural resources and environment.
- Application of knowledge in fisheries for nutrition, agriculture and livestock.

Learning Outcomes (LOs):

On completion of the course, students will be able to:

- Understand about different characteristics of fishes, biochemical composition of fish with relative and medicinal value of both freshwater and marine fish.
- Classification of different fish groups with evolution of fish.
- Diversity of fish population, anatomy, types of scales and fins that are present in fish and their functional differences, colourations of fish etc.
- Dependence on fish culture, livelihood, global fisheries and fish culture, and the scope of fish and fishery industry in India.
- Enhancement of collaborative learning and communication skills through practical sessions,

Unit I: **Fish as food commodity:** Concept of fish**:** Characteristics of fishes; Biochemical composition of fish; Types of macro and micro components of fish flesh (Proteins, carbohydrates, fats, vitamins, minerals and water). Importance of fish to mankind: Nutritive and medicinal value of fish.

Unit II: **Major groups of fishes:** Affinities and evolution of fishes; Agnatha: Ostracoderms, lamprey and hagfishes; Gnathostomata: Placoderms, Chondrichthyes and Osteichthyes.

Unit III: **Fish morphology:** General external morphology: Diversity of body forms and compensation factors; Fins: Fin types and function; Types of scales, colouration and its significance.

Unit IV: **Fisheries sector:** Livelihood security and employment generation; Global fisheries and aquaculture; Fisheries in India: Present status and future trend.

Suggested Readings:

1. Francis D. (2007). The fishes of India, Vol 1 & 2. Jagmander Book Agency, New Delhi.
2. Jayram K.C. (2002). The fresh water fishes of India, A hand book. Zoological Survey of India.
3. Kar D. (2012). Taxonomy, APH Publishing Corporation, Ansari Road, Darya Ganj, New Delhi-110002.
4. Kar D. (2013). Essentials of Fish Biology. Dominant Publishers and Distributors(p) Ltd, Delhi-110053
5. Khanna. S.S. and Singh H.R. (2005). A Textbook of Fish Biology and Fisheries. Narendra Publishing House, Delhi-6.
6. Kumar S. and Tembhre M. (2010). Fish and Fisheries. New Central Book Agency.
7. Lagler K.F. (1981). Fresh Water Fishery Biology. 2nd edition. W. M. C. Brown Company Publishers, Dubugur, IOWA.
8. Moyle P.B. & Cech J.J. Jr. (2011). Fishes: An Introduction to Ichthyology. 5th edition. Prentice Hall India Learning Private Limited;
9. Norman, J.R. (2002). A history of fishes: a complete known account of fishes. Asiatic publishing House, Delhi.
10. Parihar R.P. (2004). A Text book of Fish Biology and Indian Fisheries. Central Publishing House, Allahabad
11. Sandhu G.S. (2005). A Text book of Fish and Fisheries. Daya Publishing House, New Delhi-35.
12. Sharma J. (2006). Fishes: Aid to collection and identification. Daya Publishing House, New Delhi-35.
13. Shukla A.N. (2009). Physiology of Fishes. Discovery Publishing Pvt. Ltd.
14. Srivastava C.B.L. (2006). A Text Book of Fishery Science and Indian Fisheries. Kitab Mahal; Classic Edition.
15. Tonapi G.T. (1980). Freshwater Animals of India. Oxford and IBH Publishing Company.
16. Yadav B.N. (2002). Fish and Fisheries, 2nd revised and enlarged ed^{n}. Daya Publishing House, Delhi – 35.

FSC-150: FUNDAMENTALS OF AQUATIC ECOLOGY

(Contact Hours: 60, Credits: 4)

Course Objectives:

- To know the brief amount of component of aquatic system.
- To know the animal association and their environment.
- To know Disaster management in Fisheries-Basic concept.

Learning Outcomes (LOs):

Upon completion of the course, students will be able to:

- Understand better about components of different ecosystem that are favourable to fish culture of different fish species, and also the diversity of aquatic ecosystem.
- Will be able to understand better on basic concepts of primary and secondary productivity, food chain and energy flow.
- Should be able to classify lakes depending upon the circulation, thermal stratification and on different biogeochemical cycles.
- Will understand better about eutrophication, their causative factors and their control.
- Physicochemical and biological differences between oligotrophic and eutrophic water bodies.

Unit I: **Introduction:** Basic concept of aquatic ecology; Components of the aquatic eco-system: Fresh water (lotic and lentic), Estuarine (tidal marine, tidal brackish and tidal fresh-brackish) and Marine (epipelagic, mesopelagic, bathypelagic, abyssopelagic and the hadal zone). Diversity of the aquatic eco-system.

Unit II: **Trophic dynamics I:** Biological Productivity**:** Basic concepts, primary productivity and secondary productivity; Food chains, energy flow and trophic relationships in lentic and lotic biotopes.

Unit III: **Trophic dynamics II**: Classification of lakes, types of lakes based on circulation; Thermal stratification and overturn; Biogeochemical cycle: Nitrogen cycle, Carbon cycle and Phosphorous cycle of lentic system.

Unit IV: Ecological succession: Eutrophication: Causative factors, consequences and control; Physico-chemical and biological differences between oligotrophic and eutrophic water bodies; Macrophytic succession.

Suggested Readings:

1. Moyle P.B. and Cech J.J. Jr. (2011). Fishes: An Introduction to Ichthyology. 5th edition. Prentice Hall India Learning Private Limited.

2. Francis D. (2007). The fishes of India, Vol 1 & 2. Jagmander Book Agency, New Delhi.

3. Jayram K.C. (2002). The Fresh Water Fishes of India, A hand book. Zoological Survey of India.

4. Sharma J. (2006). Fishes: Aid to Collection and Identification. Daya Publishing House, New Delhi-35.

5. Kar D. (2013). Essentials of Fish Biology. Dominant Publishers and Distributors Pvt Ltd, Delhi-110053

6. Kar D. (2012). Taxonomy, APH Publishing Corporation, Ansari Road, Darya Ganj, New Delhi-110002.

7. Khanna S.S. and Singh H.R. (2005). A Textbook of Fish Biology and Fisheries, Narendra Publishing House, Delhi-6.

8. Kumar S. and Tembhre M. (2010). Fish and Fisheries. New Central Book Agency.

9. Lagler K.F. (1981). Fresh Water Fishery Biology. 2nd edition. W. M. C. Brown Company Publishers, Dubugur, IOWA.

10. Norman J.R. (2002). A History of Fishes: A Complete Known Account of Fishes. Asiatic publishing House, Delhi.

11. Parihar R.P. (2004). A Text book of Fish Biology and Indian Fisheries. Central Publishing House, Allahabad

12. Sandhu G.S. (2005). A Text book of Fish and Fisheries. Daya Publishing House, New Delhi-35.

13. Shukla A.N. (2009). Physiology of Fishes. Discovery Publishing Pvt Ltd.

14. Srivastava C.B.L. (2006). A Text Book of Fishery Science and Indian Fisheries. Kitab Mahal; Classic Edition.

15. Tonapi G.T. (1980). Freshwater Animals of India. Oxford and IBH Publishing Company.

16. Yadav B.N. (2002). Fish and Fisheries, 2nd revised and enlarged ed[n]. Daya Publishing House, Delhi – 35.

18. GARO

Preface

Ia programmeo poraigiparangna A·chikkuchi sea jotani dingtang dingtang rokomrang, jekai ku·akma, poedo, dakmesokani,songsarni golporangaro folkloreko mesoke on·na miksonga. A·chikkuona Bengali, Hindi, English aro gipin ku·sikrangoniko pe·skae A·chik sea jotanio bariataniko u·iatna miksonga. Sea jotanio nama namgijaniko skie ra·na man·gen. Iana agreba A·chik ku·sikni bidingo poraiani, jatni dakbewal, tangbewal, A·chik Grammar aro Compositionko skie ra·aniko man·chapa. Changa sapani aro dakna man·ani bilko bariatna skianikoba on·gen.

(The programme is designed to introduce to the students various genres of Garo Literature, like Garo prose, poetry, drama, fiction and folklore. It also aims to familiarize students with the development of Garo literature through translation from Bengali, Hindi, English and other language into Garo; and mostly through English as a filter language. The course will also introduce and expose students with an understanding of literary theory and criticism. It also includes courses on Garo language study, culture, Garo Grammar and Composition. Courses on skill enhancement and ability enhancement of students also included.)

PoraieMan·ani:

- A·chiku Sea-jotani dingtang dingtang rokomrangni namroroani bidingo ma·siani barigen.
- A·chikku segipa jotgiparangni seani rokom bewal aro katta jakkalanirangko ma·sie ra·gen.
- Pe·skae seanichi A·chikkuni ma·ambi, sea-jotani tangdoaniko poraigiparangna ma·siatna aro pe·skae seaniko dakani bidingo u·iatgen.
- A·chikkuchi name agangrikna man·ani aro A·chik Grammarni bidingo poraigiparang ma·sigen.
- Poraigiparango namgipa dakbewal, jatna a·songna ka·saani aro a·songko rikaniko gisiko ong·katatgen.

(Programme Outcomes:

- Enable students to develop the understanding of different gernres of Garo literature.
- To equip students to understand the themes and styles of Garo authors and poets.
- Enable students to have an overview of the history and development of Garo literature through translations along with the knowledge of aspects of translation.
- Students will be equipped with the knowledge of Garo grammar as well as the communicative competence.

➢ Inculcate in the minds of students the spirit of human values, patriotism and nation building.)

GAR-100: INTRODUCTION TO GARO PROSE AND POETRY

(Contact Hours: 60, Credits: 4)

Ia course poraigiparangna ku·ritingchi aganrikrikgipa ku·akma aro poedo segiminrangko poraina tarigipa ong·a. Poraigiparangna chasong gitalni adita mongsonggipa A·chik poedo ki·taprangko poraina on·gen.

Courseni Miksonganirang:
➢ Poraigiparangna A·chik ku·akma, chasong gitchamni poedorangni namroroani aro uni gunrangko u·iatgen.

➢ Poraigiparangko A·chik poedo segiparangni katta bichong aro seani bewalrangko u·iatna tariani

➢ Poraigiparang textko ning·tubate u·ina gita rhetoric aro prosodyko jakkalna tarigen.

Poraie Man·ani:
Ia paper poraigiparangna A·chik ku·akma aro poedoko nigope ma·ambi aro namroroaniko u·ina dakchakgen. Poraigiparang rhetoric aro prosodyni adita mongsonggiparangko jakkaleA·chik ki·taprangko maikai sandirikkite poraina (critical interpretation) man·a uko skie ra·gen.

Unit-1: Ku·akma (Prose)
Kroshnil D. Sangma: Katta Wal·tim

1. Katchini Kni Tom·gija
2. Salgra Gitok Chika
3. Abet Rangge
4. Tobeng
5. Rel Aragondi
6. Mijanggi Gnang
7. Mini Rasong Kata,
8. Jumango Paraka
9. Chram Anti Wari Chidit
10. Saman Rakgipa

Unit-II : Chasong Gitchamni Poedorang (Traditional Poetry)
Harendra W. Marak: A·chik Aganbewalrang

Dani
Dimrimbri Pal·wang A·dingko Katchini Anti Kaa
Jumang Matpu Nika
Gongani Kilbolma Supea
Churugala aro Sasat So·a

Unit-III: Chasong Gitalni Poedorang (Modern Poetry)

Lindrid D. Shira: A·chik Poedorang - I

Mikjumang A·gilsak   Jonmoni D. Shira
Angni Gisik   Couplane G. Momin
Matgrik Mil·am Sepi Gitcham   Johindra Ch. Marak
Ketket Rim·bo   K. D. Shira
Chengoni Manderang   Monensing R. Sangma

Unit- IV:
Viola Sonachi B. Sangma: Rhetoric & Prosody

Bak – I Janapchengani
Bak- II Apsan Ong·ao Pangchakgipa Bimangrang
Bak-IV Dingtanggrikao Pangchakgipa Bimangrang
Bak-V Gisikni Bimang Dakao Pangchakgipa Bimangrang
Bak- VI Tongtong Ong·gijanio Pangchakgipa Bimangrang
Bak-VII Gam·anio Pangchakgipa Bimangrang
Bak-VIII Banaiani/ Rikanio Pangchakgipa Bimangrang
Bak- IX. Namgipa Compositionko Sena Sapani

Suggested Reading:

Chandra, N. D. R. & A. J. Sebastian *:Literary Terms in Poetry.*Authorpress, New Delhi,2001
Hudson, William Henry *An Introduction to the Study of Literature*, Kalyani, New Delhi, (Reprint 1996)
Marak, Caroline R. *Influence of English on Garo Poetry,* Scholar Publishing House (P) Ltd., New Delhi, 1985.
Marak, Gilberth K. *Ang' Gisik Ku·aning Bidol*-I.Author, Tura, 2002
Marak, Harendra W. *A·chik Aganbewalrang* (Original Tales of the Garos). NEHU Publications, Shillong, 1983 (2nd Ed)
Marak, Julius L. R. *Atchu Ambini Ku·bisring.* Author, Rongjeng, 2004
Sangma, Brucellish K. *Sea Jotani Bidingo Seanirang*, Author, Tura, 2005
Sangma, Brucellish K. *Sea Jotani Bidingo Seanirang*, Author, Tura, 2005
Sangma,Kroshnil D. *Katta Wal·tim.* Tura Book Room, Tura, 1982 (8th Ed.)

Shira, Lindrid D. *A·chik Poedorang* -1, *L. D. Shira (Compiler),* Garo Hills Book Emporium, Tura, 1994 (3rd Ed.)

Shira, Lindrid D. *Gisik Matgrikrang.* Author, Tura, 1993

Sangma, Viola Sonachi B. *Rhetoric & Prosody,* Author, Panthi Offset Printer, Tura, 2015

GAR -150: ORAL NARRATIVES & FOLKLORE

(Contact Hours: 60, Credits: 4)

Ia paper oral aro folkloreni bakrangko talataniko on·a, jean A·chikku sea-jotanio mongsonggipa ong·a. Ia paper jatni dakbewal-tangbewalrangko segipa ki·taprangchi A·chikrangni ku·ritingo agananirang aro folkloreko talataniko on·gen. Ia paper kinggittam mongsonggipa chimonggimin A·chikkuchi aganritinganirango D.S.Rongmuthu, Dhoronsing K.Sangma aro Aldrich Ch. Mominni segimin ki·taprangko man·chapa.

Course-ni Miksonganirang:

Ia course poraigiparangko A·chikrangni ku·ritingchi ripingbagipa aro folkloreni gimin u·iatna tariaha. Ia papero poraigiparang ku·ritingchi aganrikrike ripingbagiminni gunrangko, folklore aro uni bakrang, mongsongbate jatni golpo aro mythrangko u·ie ra·gen. Ia paper poraigiparangko jatni dakbewal-rikbewal, golpo, toe skiani, ku·ritingchi aganrikrikbaanirang aro legendrangni gimin u·ina dakchakgen.

Poraie Man·ani:

Ia paper poraigiparangko A·chikrangni ku·ritingchi agane ripingbaaniko skie ra·na dakchakgen. Poraigiparang A·chik mythology, bebera·ani aro nika niani bidingo mongsonggipa u·ianiko man·gen. Poraigiparang maikaijatni sea jotani aro ku·ritingchi agananiko sea-jotani, A·chik sea-jotani aro ku·ritingchi aganrikrikani bewalko taria aro bil man·a uko skie ra·gen.

Unit - 1 :
D. S. Rongmuthu: Apasong Agana –Bakdilmong -I

> A·ko Doka Chiko Gina
> Misini Dedrang A·ningni dedrangko Gro Dinga
> Susimemani Siani Salo
> Banggria
> Wa·alko Ba·a

Unit - II:

D. S. Rongmuthu   : Apasong Agana - Bakdilmong -II

           Miko Man·chengani
           A·ba o·e Game Cha·chengani
           Muniko Man·chenga
           Marangni Atchia
           Silchiko Man·chenga

Unit - III

Dhoronsing K. Sangma   : A·chik Golporang Bak – I

           Do·uang
           Do·kuaming Mese
           Peru Am·pak Kika
           Nokmana Bisi Tikja
           Mat An·chi Pila

Unit -IV

Aldrich Ch. Momin   : A·chikni Ku·andik

           Man·e Cha·gipa Manderangni Manianirang
           Gipin Manianirang aro Dakbewalrang.

Suggested Reading:

Handoo,Jawaharlal *Folklore- an Introduction.* Mysore, Central Institute of Indian Languages,1989.

Momin. Aldrich Ch. *A·chikni Ku·andik*. Author, 1985

Thomas,Iris Watre *Music & Musical Instruments of the Garo Tribe of North East India.* Akansha House, New Delhi, 2007

Rongmuthu, D.S. *Apasong Agana*. Sharona N. Marak, Tura,1997 (Reprinted)

Rongmuthu, Dewansing S. *The Folktales of the Garos.* Gauhati University, Gauhati, 1960.

Rongmuthu, Dewansing S. *The Epic lore of The Garos*. Gauhati University, Gauhati, 1967.

Sangma, Smeri Alva B. *Rites of Passage in the Garo Oral Literature*. Akansha, New Delhi, 2012

Sangma, Dhoronsing K.*: A·chik Golporang Bak*-I*.* Author, Tura, Tura Book Room, 1988

Shira, J.D. *Atchu Ambini Golporang.Toe Skiani Golporangchi Gisikko Matrsrame Wil·e Ra·bo*. Garo Hills Book Emporium, Tura, 1993

19. GEOGRAPHY

Preface

The syllabus for Geography at undergraduate level using the Choice Based Credit system has been framed in compliance with model syllabus given by UGC. The broad objective of this syllabus is to enable the students acquire a holistic understanding of the subject matter with emphasis on diverse approaches adopted by geographical sciences in dealing with spatial phenomena concerning both physical and human dimension in their interactive interface. Care has been taken to provide the students with a judicious mix of courses dealing with theories, techniques, and modern technologies in dealing with spatial interaction and research preparedness with an overall aim of inculcating spirit of critical thinking and improving employability through skill development in emerging areas of digital cartography, GIS and quantitative techniques in tune with the changing nature of the subject. Attempts have been made to equip the students with the ability to comprehend both analytical (spatial) as well as synthetic (regional) dimension of geographical knowledge through courses designed to focus on practical applicability of the acquired knowledge in diverse fields of the subject.

Programme outcome (PO)

As an outcome of the syllabus it is expected that the students will be able to advance their level of understanding of geography as a holistic subject with acquired competence and expertise dealing with space and spatial issues and find solutions to the problems that concern global inequality, climate change, environmental degradation, pollution, hazards and disasters, bio-diversity loss, urbanisation, crowding, social and ethnic conflicts etc. at different levels of spatial hierarchy- from global to local.

GEO-100: INTRODUCTION TO HUMAN GEOGRAPHY

(Contact Hours: 60, Credits: 4)

Objective: To enable the students to understand the major themes in human geography

Learning Outcome: Students will acquire an understanding and appreciation on the relationship between geography and society

Unit I - Introduction

Geography and its branches; geography as a study of relationship between human and physical environment (determinism and possibilism); relationship of geography with other disciplines; nature and scope of human geography

Unit II - Economic Geography

Approaches to the study of economic geography; classification of economic activities; types of agricultural practices

Unit III - Population Geography

Growth, distribution, density of human population in the world; concepts of optimum, over and under population; migration - definition, types

Unit IV – Political Geography and Social Geography

History and development of political geography; attributes of states - frontiers and boundaries; concept of geopolitics
Human races and its distribution; languages - classification and distribution; religion - origin and distribution

Suggested Readings

Bergman. E.F.(1995): **Human Geography-Culture, Connections and Landscape,** Prentice Hall, New Jersey.

Dikshit R.D. (1994): **The Art and Science of Geography**, Prentice Hall of India, New Delhi.

Dikshit R.D. (2000): **Geographical Thought-A Contextual History of Ideas,** Prentice Hall of India, New Delhi.

Dikshit, R.D. (2000): **Political Geography: The Spatiality of Politics**, Tata McGraw Hill, New Delhi.

Hartshorne, R. (1959): **Perspective on the Nature of Geography**, McNally and Co., Chicago.

Harvey, D. (1972): **Explanations in Geography,** Edward-Arnold, London.

Holt, J.A. (2001): **Geography; Its History and Concept**, Longman, London.

Husain, M. (1984): **Evolution of Geographical Thoughts**, Rawat Publications, Jaipur.

James, R. (2010**): The Cultural Landscape-An Introduction to Human Geography,** Prentice Hall of India, New Delhi.

Knox, P.L. and Marston Sallie (2001): **Places and Regions in Global Context: Human Geography (2nd Edn.),** Prentice Hall, New Jersey.

Singh, L.R. (2002): **Fundamentals of Human Geography**, Sharda Pustak Bhawan, Allahabad.

GEO-150: INTRODUCTION TO PHYSICAL GEOGRAPHY

(Contact Hours: 60, Credits: 4)

Objective: To enable students in understanding the linkages between landscape form and processes, the factors that influence the earth's climate and the relationship between biotic and abiotic components.

Learning Outcome: Students will be able to explain the basic principles of the development of landforms through time. It also explains how the physical system plays a role in supporting lifeforms on the earth.

Unit I - Geo-tectonics
Interior of the earth; geological timescale; continental drift, sea floor spreading and plate tectonics; folds and faults

Unit II - Geomorphology
Development of geomorphology; basic geomorphological concept; geomorphic processes - weathering, erosion and mass wasting; geomorphic forms - fluvial and glacial

Unit III - Climatology
Heat budget; classification of air masses, fronts, cyclones and anti-cyclones; Koppen's scheme of classification of world climates.

Unit IV – Oceanography and Biogeography
Ocean floor configuration (Pacific, Atlantic & Indian); Ocean currents (Pacific, Atlantic & Indian); Coral reefs: classification and distribution

Phyto-geographical and zoo-geographical regions; concept of biome - tropical forest and grassland biomes; ecosystem - food chain, food web and ecological pyramids

Suggested Readings

Ahmad, E.(2001):**Physical Geography,** Kalyani Publishers, New Delhi.

Barry, R.G. and R.J. Chorley (2010): **Atmosphere, Weather and Climate**, Routledge, London and New York.

Critchfield, H. (1975**): General Climatology,** Prentice Hall, New York.

Dayal, P. (1996): **A Textbook of Geomorphology**, Shukla Book Depot, Patna.

Hagget, R. J. (2003): **Fundamentals of Geomorphology**, Routledge, London.

Kale, V.S. and Gupta Abhijit (2001): **Introduction to Geomorphology**, Orient Longman, Calcutta.

Lal, D.S. (2005): **Climatology,** Sharda Pustak Bhawan, Allahabad.

Negi, B.S. (2002): **Climatology and Oceanography**, Kedar Nath Ram Nath, Meerut.

Sarkar, Ashis (2015): **Systematic Geography: A Systematic Approach**, Orient Blackswan Private Limited, New Delhi

Sharma, Y.K. (2007): **Physical Geography**, Lakshmi Narain Agarwal, Agra.

Sharma, R.C. and M. Vatal (2018): **Oceanography for Geographers**, Surjeet Publications, New Delhi.

Thornbury, W.D. (1960): **Principles of Geomorphology**, John Willey & Sons, New York.

20. GEOLOGY

PREFACE

About the Programme:

The Department of Geology offers a three/ four years Bachelor of Sciences (B.Sc.) in Geology. The course content of B.Sc. in Geology has been designed to impart knowledge in pure and applied aspects of Geology. The programme will help studentsto extract valuable information stored in rocks, minerals, and fossils.

Programme Outcomes (POs):

1. Students will understand the fundamental geological theories, principles, and ideas, including the structure of the Earth, its processes, and the interactions of its systems.

2.Develop fieldwork skills including geological mapping, sample collecting, data acquisition, observation, interpretation and analysis of geological features and phenomena.

3. Gain proficiency in mineral and rock identification, and characterization of geological materials.Usequantitative and qualitative methodologies to analyse and interpret geological data, including field observations, lab tests, and geographical data.

4. Students will be able to think critically and solve problems in order to recognise, evaluate, and handle a variety of geological issues, including identifying geological risks, evaluating geological resources, and analysing environmental effects. Use written reports, oral presentations, and graphic representations to convey geological ideas, observations, and findings;work cooperatively with teamwork abilities during fieldwork and project-based tasks.

5. Understand and uphold professional ethics and standards in geology, such as the prudent use of geological resources, the preservation of the environment, and the encouragement of safety during geological studies.

6. Students will gain the ability to adapt to cutting-edge technological developments in order to pursue employment in geology-related industries, such as mineral exploration, environmental consultancy, geological surveys, academia, and research institutes.

This programmewill ensure a strong foundation in geology and the fundamental abilities students need to succeed professionally and make contributions to the geosciences industry.

GEL-100: INTRODUCTION TO GEOLOGY

(Contact Hours: 60, Credits:4)

Course Objectives (COs): To understand the Solar System, the Earth and various features of Earth's surface.

Learning Outcomes (LOs): Students will gain knowledge about the Solar System and position of Earth in the solar system along with the concept behind movements of the tectonic plates.

UNIT I	Introduction and scope of geology. The solar system – Planets, asteroids and meteorites. Earth – its position in the solar system. Internal structure and constitution of the Earth. Hydrosphere, atmosphere and biosphere. Interacting Earth systems.
UNIT II	Rock cycle. Weathering and erosion and resultant products. Mass wasting. Erosional and depositional landforms associated with water, wind, glacial and coastal processes.
UNIT III	Continental drift. Plates and Plate tectonics - plate motions, plate boundaries, sea-floor spreading. Rock deformation: folds, faults, joints, and unconformities. Landforms related to active folding and faulting. Earthquakes –mechanism and distribution. Volcanoes – types, products and distribution.
UNIT IV	Understanding the past from geologic records; Nature of geologic records. Standard Geological time scale and introduction to the concept of time in geological studies; Introduction to geochronological methods and their application in geological studies. History of development in concepts of Uniformitarianism and Catastrophism. Fossils and the process of fossilization.

Suggested readings:

Duff, P. M. D., & Duff, D. (Eds.). 1993. Holmes' Principles of Physical Geology. Taylor & Francis.
Emiliano, C. 1992. Planet earth: Cosmology, Geology, and the Evolution of Life and Environment. Cambridge University Press.
Flint, Richard Foster and Skinner Brian J., Physical Geology 2nd Edition.
Holmes, A., 1959. Principles of Physical Geology, 4th edition.
Mukerjee, P.K., A Textbook of Geology.
Plummer, Carlson & Hammersley, Physical Geology 14th Ed. McGraw Hill.
Prasad CVRK., Elementary Exercises in Geology, University Press.
Read, H.H. & Watson, J. Introduction to Geology Volume 1: Principles.
Tarbuck, E. J. & Lutgens, F. K., 1998. Earth: An Introduction to Physical Geology. Pearson.

GEL-150: ROCKS AND MINERALS

(Contact Hours: 75, Credits:4)

Course Objectives (COs): To study the geomorphic processes as well as the basic knowledge about rocks and minerals.

Learning Outcomes (LOs): Students will gain knowledge about various geomorphic processes as well as common rock forming minerals and origin of Igneous, Sedimentary and Metamorphic rocks.

UNIT I	Minerals - Definition, perspective, scope and significance. Physical properties of minerals: Properties based on interaction with light (colour, lustre, streak, play of colours, Chatoyancy and Asterism, Luminescence), Mechanical Properties (cleavage, parting, fracture, hardness, tenacity) and Mass related properties (density and specific gravity).
UNIT II	Rocks- Definitions and types and process of rock formation. Textures and structures. Igneous rock - magma generation and differentiation. Sedimentary rock s- surface processes and sedimentary environments. Metamorphic rocks - factors and types of metamorphism.
UNIT III	Geomorphology: Energy Flow in Geomorphic System; Volcanic and Karst - processes and landforms. Structurally controlled landforms -Landforms related to active folding and faulting. Drainage: types and patterns.
UNIT IV Practical* (30 hours)	1. Identification of common rock forming minerals in hand specimens: Quartz, plagioclase, microcline, calcite, garnet, hornblende, biotite, augite, sillimanite. 2. Identification of some common Igneous, Sedimentary and Metamorphic rocks under hand specimen: granite, basalt, sandstone, limestone, marble, gneiss. 3.Reading topographical maps of the Survey of India; Identification of some common landforms on topographic maps.

Suggested Readings:
Berry, L.G., Mason, B. and Deitrich, 1976. Mineralogy.
Bloom A.L., 1998. Geomorphology. Prentice-Hall India.
Datta A. K., An introduction to Physical Geology –Dastane Ram chandra and Co. Pune.
Deer, W. A., Howie, R. A., & Zussman, J., 1992. An introduction to the rock-forming minerals (Vol. 696). London: Longman.
Dexter Perkins., 2015. Mineralogy, 3rd edition.
Gribble, C.D., 2005. Rutley's elements of Mineralogy, Springer.
Homes A.,1993. Principle of Physical Geology 4th Ed., Chapman and Hall, London.
Hurlbut, C. S., 1944.Manual of Mineralogy. 15thEd., John Wiley & Sons, inc.

Klien C.K., Mineral Science John Wiley & Sons.

Mukherjee P. K., 1991. A Text Book of Geology CBS Publisher and Dist., New Delhi.

Plummer, Carlson & Hammersley, Physical Geology 14th Ed. McGraw Hill.

Rathore, B. S., Crystallography, Mineralogy & Geochemistry.

Raymond, L. A., 2002. Petrology: The study of Igneous, Sedimentary, and Metamorphic Rocks, McGraw-Hill Science Engineering.

Read, H.H. & Watson, J., Introduction to Geology Volume 1 Principles.

Rutley's Elements of Mineralogy 27th Ed. – revised by CD Gribbek.

Thornbury W. D., 1958. Principles of Geomorphology John Wiley and Son.

Tyrell GW., The Principles of Petrology, Asia Publishing House.

Verma, V. K., 2002. Lectures on Geomorphology, Pilgrims Book House.

21. HINDI

प्रस्तावना

प्रस्तुत पाठ्यक्रम राष्ट्रीय शिक्षा नीति -2020 के अनुरूप स्नातक स्तर पर समस्त विद्यार्थियों के सर्वांगीण विकास के लिए नियोजित है। प्रस्तुत पाठ्यक्रम के अध्ययन से विद्यार्थी जहां एक ओर उच्च शिक्षा हेतु आवश्यक अर्हता प्राप्त करेंगे वहीं दूसरी ओर उच्च मानवीय गुणों और मूल्यों के अनुशीलन करने में भी सक्षम होंगे। साथ ही राष्ट्रीय हित को सर्वोच्च प्राथमिकता देते हुए एक सर्वसमावेशी समाज के निर्माण में अपनी महत्त्वपूर्ण भूमिका सुनिश्चित करेंगे।

HIN-100: हिन्दी भाषा एवं लिपि

(Contact Hours: 60, Credits:4)

उद्देश्य : प्रस्तुत पाठ्यक्रम के माध्यम से हिन्दी भाषा के विविध रूपों एवं मानक देवनागरी लिपि का ज्ञान कराया जाएगा और साथ ही हिन्दी भाषा के विकास के विभिन्न चरणों एवं हिन्दी की प्रमुख बोलियां एवं लिपि के मानकीकरण से संबन्धित पाठों का अध्ययन होगा।

उपलब्धि: इस पाठ्यक्रम के अध्ययन से विद्यार्थी भाषा के महत्त्व, राष्ट्रीय एकता में भाषा की भूमिका एवं हिन्दी तथा पूर्वोत्तर की भाषाओं के अंतर्संबंधों को समझने में सक्षम हो सकेंगे।

इकाई 1   भाषा: परिभाषा एवं विशेषताएँ, भाषा के विविध रूप, भाषा के विविध पक्ष, राष्ट्रीय एकता में भाषा की भूमिका।

इकाई 2   हिन्दी भाषा का विकास: प्राचीन भारतीय आर्यभाषाएँ, मध्यकालीन भारतीय आर्य भाषाएँ।

इकाई 3   आधुनिक भारतीय आर्य भाषाएँ; हिन्दी की प्रमुख बोलियाँ; पूर्वोत्तर की भाषाओं से अंतर्संबंध।

इकाई 4   नागरी लिपि: उद्भव एवं विकास, मानकीकरण, गुण-दोष एवं सुधार के उपाय।

अभिस्तावित पुस्तकें:

1. नागरी लिपि और हिन्दी वर्तनी- अन्तलाल चौधरी, बिहार ग्रन्थ अकादमी, पटना, 1992 ई.
2. भारतीय आर्य भाषा और हिन्दी- सुनीति कुमार चटर्जी, राजकमल प्रकाशन, दिल्ली, 1954 ई.
3. हिन्दी भाषा और देवनागरी लिपि- धीरेन्द्र वर्मा, हिन्दुस्तानी एकेडमी, इलाहाबाद, 1939 ई.
4. हिन्दी भाषा का उद्भव और विकास- उदय नारायण तिवारी, लोक भारती प्रकाशन, इलाहाबाद, 1995 ई.
5. भाषाविवेचन-भागीरथ मिश्र, साहित्य भवन, इलाहाबाद, 1990 ई.
6. भाषाशास्त्र की रूपरेखा- उदय नारायण तिवारी, भारती भण्डार, इलाहाबाद, 1963 ई.
7. सामान्य भाषा विज्ञान- बाबूराम सक्सेना, हिन्दी साहित्य सम्मेलन, इलाहाबाद, 1984 ई.
8. हिन्दी लिपि की कहानी- डॉ. गुणाकर मुले, राजकमल प्रकाशन, नई दिल्ली, 1974 ई.

HIN-150: हिन्दी व्याकरण

(Contact Hours: 60, Credits:4)

उद्देश्य: इस पाठ्यक्रम का उद्देश्य विद्यार्थियों को हिन्दी व्याकरण की आधारभूत संरचना के मुख्य घटकों यथा- संज्ञा, सर्वनाम, लिंग, वचन, प्रत्यय, उपसर्ग, समास आदि के साथ भाषा के विविध रूपों का परिचय प्रदान करना है।

उपलब्धि: इस पाठ्यक्रम के अध्ययन से विद्यार्थी हिन्दी भाषा के लेखन एवं संवाद में विशेष योग्यता प्राप्त कर सकेंगे, साथ ही हिन्दी भाषा की विविध भूमिकाओं का परिचय भी उन्हें प्राप्त होगा।

इकाई 1   हिन्दी रूपरचना : हिन्दी संज्ञा और उसके विविध भेद; सर्वनाम और उसके विविध भेद; क्रिया और उसके विविध भेद ।

इकाई 2   लिंग की परिभाषा और उसके विविध भेद; वचन की परिभाषा और उसके विविध भेद;प्रत्यय एवंउपसर्ग की परिभाषा और उसका स्वरूप;हिन्दीकारक; हिन्दी समास।

इकाई 3   विशेषणऔर उसके भेद; भाषा के विविध अवयव-वर्ण, शब्द, पद, वाक्य, अर्थ ।

इकाई 4   भाषा के विविध रूप: सामान्य हिन्दी, परिनिष्ठित हिन्दी, प्रयोजनमूलक हिन्दी, राष्ट्रभाषा हिन्दी, राजभाषा हिन्दी ।

अभिस्तावित पुस्तकें-

1. हिन्दी व्याकरण-कामता प्रसाद गुरु, नागरी प्रचारिणी सभा, काशी,1997 **ई.**
2. हिन्दी व्याकरण मीमांसा- काशीराम शर्मा, राधाकृष्ण प्रकाशन, नई दिल्ली, 1996ई.
3. प्रयोजनमूलक हिन्दी- डॉ. विनोद गोदरे, वाणी प्रकाशन, दिल्ली, 2004 **ई.**
4. प्रयोजनमूलक हिन्दी-डॉ. विजयपाल सिंह, संजय बुक सेंटर, वाराणसी, 1993**ई.**
5. प्रयोजनमूलक हिन्दी- रवीन्द्र कुमार श्रीवास्तव, केन्द्रीय हिन्दी संस्थान, आगरा, 1975ई.
6. प्रयोजनमूलक हिन्दी: सिद्धांत एवं प्रयोग- डॉ. दंगल झाल्टे, वाणी प्रकाशन, दिल्ली, 2002 **ई.**
7. प्रयोजनमूलक हिन्दी की नई भूमिका- डॉ. कैलाश नाथ पाण्डेय, लोकभारती प्रकाशन, इलाहाबाद, 2007 **ई.**
8. राजभाषा हिन्दी- कैलाश चंद भाटिया,प्रभात प्रकाशन, दिल्ली, 1994 ई.

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22. HISTORY

The FYUG programme in History has been framed in line with the NEP framework, focusing on discipline specific courses intended to inform students about socio-economic, political and cultural developments in the Indian subcontinent from the prehistoric to post-colonial times. Also offered, are courses with a global perspective with special reference to Europe, The USA, China and Japan, to familiarize students with the major political, economic and social forces that have shaped the world in general and the history of India in particular. Further, the courses emphasise the foundational character of the discipline, highlighting the continuous dialogue that exists between the past and the present that can inform the future.

Programme Outcomes (POs):

I. Students will be familiar with the diverse sources, landscapes and approaches to the study of the history of ancient, medieval and modern India.
II. Will understand the major political, economic and social forces that have shaped the world in general and the history of India in particular.
III. Students will be acquainted with the historical trajectory of India's composite cultural heritage.
IV. Will be familiar with regional history with special reference to Northeast India.
V. Will be equipped to undertake research on the subject and to pursue a career in academics.
VI. Will help students sitting for competitive examinations, a career in tourism and other allied fields.
VII. Will create informed and responsible citizens.

HIS-100: HISTORY OF INDIA: EARLIEST TIMES TO THE POST VEDIC PERIOD

(Contact Hours: 60, Credits: 4)

Objective

To introduce stages of development in the Indian Sub Continent from the Prehistoric period to the rise of Iron Age urbanization during the 5th century BCE. The focus will be on key developments in Prehistory, Proto-history and early historical India, highlighting the elements of change and continuity in socio-economic, political and religious developments.

Learning Outcome

Students will be familiar with the diverse sources, landscapes and approaches to the study of the history of ancient India as well as the major developments spanning the period under study.

Unit I   Reconstructing Ancient Indian History

Geographical Background of the Indian Subcontinent: landscapes and environment;   sources for the historical reconstruction of the period under study; approaches to the understanding of ancient Indian History

Unit II   Pre and Proto Historic India

Palaeolithic cultures: Sequence and distribution; tool typology and technology; subsistence patterns; Mesolithic cultures: Regional and chronological distribution; new developments in technology and economy; Neolithic and the advent of food production; regional and chronological distribution; patterns of exchange; Chalcolithic cultures in India with special reference to Ahar, Kayatha, Malwa and Jorwe cultures; distribution pattern and subsistence economy.

Unit III   Harappan Civilization

Origin; settlement pattern and town planning; agrarian base; art and craft, trade; socio-political organization and religious beliefs; the problem of urban decline.

Unit IV   Vedic to Post-Vedic Period

Vedic culture: Early to Later-Vedic period (society, economy, polity and religion); post-Vedic period (Iron technology, trade, money economy and urbanization); the rise of heterodox sects; Buddhism and Jainism (origin and teachings); the rise of *Mahajanapadas*; emergence of Magadha as a paramount power.

Suggested Readings

Agarwal D.P.,	*The Copper Bronze Age*, MunshiramManoharlal, New Delhi, 1969.
------------	*The Archaeology of India*, Select book Service Syndicate, New Delhi, 1985

Allchin , F.R. & Bridget,	*The Rise of Civilization in India and Pakistan*, Cambridge University Press, London, 1988.
Allchin , F.R.,	*The Archaeology of Early Historic South Asia: The Emergence of Cities and States*, Cambridge University Press, London, 1995
Chakravarty, Ranabir,	*Exploring Early India: Upto c.AD.1300*, Ratnasagar, Delhi, 2016.
----------------	*Trade in Early India*, Oxford University Press, New Delhi, 2004
	Trade and Traders in Early Indian Society, Manohar, New Delhi, 2002.
Dhavilkar, M.K., (ed.)	*A Comprehensive History of India Prehistory of India*, Vol.1, Part-1, Manohar, New Delhi, 2013.
Ghosh, A.,	*The City in Early Historical India,* IIAS, Simla, 1973.
Jayaswal, Vidula,	*Palaeohistory of India*, Agam Kala Prakashan, Delhi, 1978.
Jha, D. N.,	*Ancient India in Historical Outline*, Manohar, New Delhi, 2002 reprint.
Kosambi, D. D.,	*An Introduction to the Study of Indian History,* Popular Prakashan, Bombay, 2016 (reprint).
------------	*The Culture and Civilization of Ancient India in Historical Outline,* PPH, Delhi, 2001 (reprint).
Malik, S. C,	*Indian Civilization: The Formative Period*, Indian Institute of Advanced Studies, Shimla, 1999.
Sankalia, H.D.,	*Prehistory of India*, MunshiramManoharlal, New Delhi, 1977.
Ratnagar, Shereen,	*Understanding Harappa: Civilization in the Greater Indus Valley*, Tulika Books, New Delhi, 2017 (4th edition).
Sahu, Bhairabi Prasad (ed.),	*Iron and Social Change in Early India*, OUP, New Delhi, 2006.
Sharma. R.S.,	*India's Ancient Past*, Oxford University Press, New Delhi, 2009.
------------	*Material Culture & Social Formations in Ancient India*, Macmillan India Ltd., New Delhi, 2007 (2nd edition).
--------------	*Sudras in Ancient India, MunshiramManoharlal, Delhi, 2016 (3rdedn.).*
Singh, Upinder,	*A History of Ancient and Early Medieval India*, Pearson, Delhi, 2008.
Thapar, B.K.,	*Recent Archaeological Discoveries in India*, The Centre for East Asian Cultural Studies, Tokyo, 1985.
Thapar, Romila,	*A History of India*, Vol.1, Penguin Books, Delhi, 1996 reprint.
-------------------	*The Penguin History of Early India*, Penguin books, New Delhi, 2002.
Basham, A.L.,	*The Wonder that was India*, Rupa &Co., New Delhi, 2002 reprint.
Chakrabarti, Dilip, K.	*The Oxford Companion to Indian Archaeology: The Archaeological Foundations of Ancient India, Stone Age to AD 13th Century*, Oxford University Press, New Delhi, 2006
Habib Irfan, (ed.)	*The People's History of India*, Vol.-1-4, Tulika Books, New Delhi, 2015.
Majumdar, R.C.et.al. (ed),	*The History and Culture of the Indian People*, Vol.1-II, (BharatiyaVidyaBhavan Series, Delhi, 1945-1960, latest editions)

HIS-150: HISTORY OF INDIA: MAURYA TO POST GUPTA PERIOD

(Contact Hours: 60, Credits:4)

Objective

To introduce the broad socio-economic, political and cultural developments in the Indian subcontinent from 320 BCE - 650 CE.

Learning Outcome

Students will be informed about the historical developments in the period under study.

Unit I   Mauryan Empire

Sources of historical reconstruction; Background of the rise of the Mauryan Empire: the Nanda Dynasty; Invasion of Alexander and its impact; Political history of the Mauryas, society, economy, administration and art; Ashoka's *Dhamma*; the decline of the Mauryas.

Unit II Post- Mauryan Period

Sources; political history of the Indo –Greeks, Sakas, Kushanas and Satvahanas; art and architecture (Gandhara, Mathura and Amaravati School; *Stupa*, *Chaitya* and *Vihara*); religious developments (Hinyana and Mahayana); society and economy (trade and commerce, guilds); the Sangam Age.

Unit III Gupta-Vakataka Age

  Sources**;** political history of the period with reference to Samudragupta and Chandragupta II; society and economy; rise of feudalism**;** cultural developments (architecture, sculpture, paintings with reference to Ajanta; literature and science).

Unit IV Post-Gupta Developments

Political History (Harshavardhana of Kannauj, Pulkesin II Chalukya of Vatapi and Kumara Bhaskaravarman of Kamarupa); political organization and growing importance of *Samanta* system; religious developments (Vaisnavism, Shaivism and Shaktism); Pallava art and architecture.

Suggested Readings

Barua, K.L.,	*Early History of Kamarupa*: *From Earliest Times to the End of the Sixteenth Century*, LBS Publications, Guwahati, 2020.

Bhandarkar, R. G.,	*Vaisnavism, Shaktism and other Minor Religions*, Indology Book House, Varanasi, 1963 (reprint).
Chakravarty, Ranabir,	*Exploring Early India: Upto c.AD.1300*, Ratnasagar, Delhi, 2016.
---------------	*Trade in Early India*, Oxford University Press, New Delhi, 2004
--------------	*Trade and Traders in Early Indian Society,* Manohar, New Delhi, 2002.
Champaklakshmi, R.,	*Trade Urbanization and Ideology in South India*, Oxford University Press, New Delhi, 1996.
Chattopadhyaya, S.,	*Evolution of Hindu Sects: Up to the Time of Samkaracarya*, MunshiramManoharlal, Delhi, 1970.
Coburn, T.,	*Devi-Mahatmya: The Crystallisation of the Goddess Tradition, MotilalBanarasidass, Delhi, 1984.*
Goswami, Ranjit Kumar Dev,	*Essays on Sankardeva*, LBS Publication, Guwahati,1996.
Jaiswal, Suvira,	*The Origin and Development of Vaisnavism: Vaisnavism from 200 BC to AD 500*, MunshiramManoharlal, Delhi, 1980 (reprint).
-----------------	*Caste: Origin, Function and Dynamics of Change,* Manohar, New Delhi, 1998.
Jha, D. N.,	*Ancient India in Historical Outline*, Manohar, New Delhi, 2002 reprint.
Kosambi, D. D.,	*An Introduction to the Study of Indian History,* Popular Prakashan, Bombay, 2016 (reprint).
------------	*The Culture and Civilization of Ancient India in Historical Outline,* PPH, Delhi, 2001 (reprint).
Mukhia, Harbans,	*The Feudalism Debate*, Manohar, New Delhi, 1990 (reprint).
Sharma. R.S.,	*India's Ancient Past*, Oxford University Press, New Delhi, 2009.
------------	*Indian Feudalism*, Macmillan, New Delhi, 2006.
--------------	*Sudras in Ancient India, MunshiramManoharlal, Delhi, 2016 (3rdedn.).*
Shastri, Nilakanta K.A.,	*History of South India*, OUP, Delhi,1996.
Singh, Upinder,	*A History of Ancient and Early Medieval India*, Pearson, Delhi, 2008.
Thapar, Romila,	*A History of India*, Vol.1, Penguin Books, Delhi, 1996 reprint.
----------	*The Penguin History of Early India*, Penguin books, New Delhi, 2002.
---------	*Asoka and the Decline of the Mauryas*, K.P. Bagchi& Co. Calcutta, 2000
--------------	The Mauryas Revisited, K.P. Bagchi& Co. Calcutta, 1993 (Reprint).

Basham, A.L.,	*The Wonder that was India*, Rupa &Co., New Delhi, 2002 reprint.
--------------	*A Cultural History of India*, OUP, New Delhi, 1984 (reprint)
Barpujari, H.k., (ed.)	*The Comprehensive History of Assam*, Vol. I, Gauhati, 2004, (2nd edn.)
Choudhury, P.C.,	*The History of Civilization of the People of Assam to the Twelfth Century A.D.*, DAHS, Gauhati, 1966.
Habib Irfan, (ed.)	*The People's History of India*, Vol.-1-4, Tulika Books, New Delhi, 2015.
Majumdar, R.C.et.al. (eds),	*The History and Culture of the Indian People*, Vol. II-V, (Bharatiya Vidya Bhavan Series, Delhi, 1945-1960, latest editions)

23. HOME SCIENCE

FYUG programme in Home Science: A student will learn in-depth in Home Science undergraduate programme about food and nutrition, communication and extension education, resource management, human development, textile, and clothing. This will develop their professional skills in food & nutrition, textiles, housing, product-making, communication technologies, and human development that will favour in research, innovation, and product designing.

Programme Outcomes (POs): A comprehensive knowledge in Home science will open up ample job opportunities in both public as well as private sectors. Some of the most popular job roles for home science graduates are food analyst, health care professional, food scientist, research assistant, nutritionist, professor/lecturer, chef, textile supervisor, fashion designer, child care, housekeeper, demonstrator, and pantry in-charge.

HSC-100: INTRODUCTORY HOME SCIENCE 1

(Contact Hours: 60, Credits: 4)

Course Objectives (COs):

- To impart the knowledge on the basic concept of nutrition and health.
- To explain the need and the importance of studying human growth and development across life span.
- To get a brief insight on the scope of clothing and textiles.
- To understand different resources and its management.
- To provide knowledge on the different extension teaching methods

Learning Outcomes (LOs):

At the end of the course the student should be able to:

- Understand the various method of cooking and preservation of nutrients during food preparation

- Gain a scientific understanding of growth and development of a child.
- Develop understanding of technical terms involved in textiles
- Appreciation of the significance of management process in efficient use of resources

Unit I- Introduction to Home Science and its relevance in the current era. aim, scope and Content of public health nutrition, child growth and development and Extension Development.

Food- meaning, classification and function and food groups. Nutrition-Concept of Nutrition. Malnutrition and Health, Functions of food, Food groups -Types of food pyramids.

Methods of cooking, preservation of Nutrients while Cooking. Traditional methods

of enhancing the nutritional value of foods-germination, fermentation, etc. Nutraceuticals- the future of Nutrition care for health management, treatment and prevention of diseases.

Unit II- Introduction to Human Development. Concept, Definition and Need to study human

Development. Domains, Stages of development. Principles of Growth and development

Determinants of Development-heredity and Environment. Early Childhood Care and Education – Emerging trends.

Extension Education- objectives and methods used, integration of nutrition education with extension work, when to teach, whom to teach and who is to teach. Principles of planning, executing and evaluating extension education programmers. Designing nutrition and health messages, selecting communication channels, and developing and field-testing communication materials.

Unit III -Origin, Importance and functions of clothing- Social, emotional, psychological. Scope of clothing and textiles. Traditional textiles and costumes of difficent states India – The Northeastern States, Punjab, Himachal, Rajasthan, Hynderabad, Karnataka, Tamil Nadu, Introduction to textile terms- fibre, yarn, fabric, spinning, weaving, knitting. Classification of textile fibres based on source.

General properties of textile fibres- Cellulosic, Protein, Mineral, Man-made

Synthetic.

Unit IV- Concept of Management; Motivating factors in management- Values, Standards and Goals: meaning, types, and influences.

Decision-making-the crux of management, Importance, types of decision; Steps involved in decision-making. Management Process: Planning; Organising; Controlling; Evaluating.

Resources: meaning, classification and characteristics of resources; Factors affecting utilization of Resources. Family life cycle-demands upon resources like time, energy and money.

Suggested Readings

1. Bamji M.S, Prahalad Rao N, Reddy V (2004). Textbook of Human Nutrition Edition, Oxford and PBH Publishing Co. Pvt. Ltd, New Delhi Banarasidas, Bharat Publishers, 1167, Prem Nagar, Jabalpur, 428 001(India)
2. Bhatt D.P (2008), Health Education, Khel Sahitya Kendra, New Delhi
3. Feldman, R., & Babu, N. (2009). Discovering the life span. New Delhi: Pearson
4. Kapadia, S. (2011). Psychology and human development in India. Country paper.
5. Keenan, T., Evans, S., & Crowley, K. (2016). An introduction to child development.
6. Koontz.H. and O'Donnel C Management – A systems and contingency analysis
7. Kreitner. 2009, Management Theory and Applications, Cengage Learning: India
8. Lightfoot, C., Cole, M., & Cole, S. (2012). The development of children (7th ed.). New York: Worth Publishers.
9. Narayanaswamy, N. (2009). Participatory Rural Appraisal: Principles, Methods and
10. Park A. (2007), Park's Textbook of Preventive and Social Medicine XIX Edition M/S
11. Rao V.S. and Narayana P.S., Principles and Practices of Management, 2007, Konark
12. Sandhu, A.S. (2015). Extension Programme Planning. New Delhi: Oxford & IBH Publishing Co.Pvt.Ltd
13. Srilakshmi, B., Dietetics, New Age International (P) Ltd., New Delhi, 2013.
14. Swaminathan M (2007), Essentials of Food and Nutrition. An Advanced Textbook Vol.I, The Bangalore Printing and Publishing Co. Ltd, Bangalore
15. Vatsala R Textbook of Textiles and Clothing, Riddhi International, 2003, Jodhpur
16. Yadav, K and Singh, O.S "Home Science", Atlantic Publishers and distributor and Private Ltd. (2014).

HSC-150: INTRODUCTORY HOME SCIENCE 2

(Contact Hours: 60, Credits: 4)

Course Objectives (COs):

- To study the functions of specific nutrients in maintaining health and understanding the importance of planning a balanced meal

- To describe the characteristics, needs and developmental tasks of different stages in the human life cycle
- To understand the different types of communication patterns
- To evaluate outcomes of effective time management and increase work efficiency.
- To get acquainted with the properties and uses of various textile fibers and different types of yarn.

Learning Outcomes (LOs):

At the end of the course the student should be able to:

- Learn the functions of various nutrients in maintaining good health
- Understand the various developmental stages and requirements of children with special needs.
- Develop effective communication patterns in community development
- Efficiently use energy and time as a resource
- Analyze the types of fibers and yarns and their manufacturing processes.

Unit I: Introduction to nutrition. Balanced diet - Meal planning – steps in meal planning Nutrients: Nutrients Macro and Micronutrients- Sources, functions and deficiency. Carbohydrates, Proteins, Fats. Minerals – Calcium, Iron, Iodine. Vitamins – Fat-soluble vitamins – A, D, E & K. Water soluble vitamins – vitamin C Thiamine, Riboflavin, Niacin. Energy – factors affecting BMR. Fiber – Functions and sources. Nutrient antioxidants with potential health effects.

Unit II: Developmental Tasks during Infancy and Preschool Stage: Physical and Motor Development Social and emotional development, Cognitive and language development Children with special needs and special education: Definition of special needs children and special education, terminologies for children with special needs.

Gender and Development- Concept of gender, gender roles, changing trends.Concept, meaning, scope and significance of ECCE, Developmental

perspective, Neuroscience perspective, Human rights perspective Expansion from ECE to ECCE to ECD

Unit III: Meaning, definition, nature, scope and importance of communication. Functions of communication – information function, command or instructive function, influence or persuasive function and integrative function. Elements of Communication – three elements – source, message, receiver, Types of Communication – Formal and Informal Communication Pattern - one way, two ways, circular

Concept and significance of communication model. Principle of Programme planning, Elements, functions and criteria for developing a plan

Participatory Planning Importance of peoples' participation in Programme planning. Formation of Self-Help Groups.

Unit IV: Management Process applicable to specific resources: Time, Energy & Money Management; Time as a Resource; Tools in making time plan; Steps in making Time Plan.

Energy as a Resource – Energy cost in home making activity, fatigue – types their effect & avoidance of fatigue.

Family Income as a resource – Sources, types & methods of handling family income.

Manufacture and processing of fibres. Properties of (a) Cellulosic fibre- cotton, linen; (b) Protein fibres- Silk, wool; (c) Synthetic/Manmade fibres- nylon, polyester, acrylic, Rayon

Manufacture of yarn and yarn classification. Different fabric construction techniques-weaving, knitting, felting, braiding, Non-woven. Weaving of cloth- terminologies and steps in weaving.

Suggested Readings:

1. Agarwal, J. C. (2007). Early childhood care and education: principles and
2. Berk, L.E. (2005). Child development (5th ed.). New Delhi: Prentice Hall. Cambridge: Cambridge University Press.
3. Canning, N. (2010) Play and practice in the early years: Foundation stage. New Co.New Delhi
4. Dhawan, M. (2011). Education of children with special needs. New Delhi: Isha Books.
5. Fleer, M. (2010). Early learning and development: Cultural–historical concepts in play.

6. Gupta, D. (2007). Development Communication in Rural Sector. New Delhi: Mukhopadhyay

7. Kaul, V. (2009). Early childhood education Programme. National Council of Educational

8. Kreitner. 2009, Management Theory and Applications, Cengage Learning: India

9. Meenakshi Raman and Sangeetha Sharma. (2013). Technical Communication-Principles and Practice. New Delhi: Oxford University Press

10. Nisha, M. (2006). Understanding Extension Education. New Delhi: Kalpay Publications

11. Nutrition and Human Performance. William & Wilkin Publishing USA.Nutrition, Third Edition, Oxford and IBH Publishing Co. P. Ltd., New Delhi, 2012. NY.: Mcgraw-Hill Higher Education.

12. Santrock, J. (2017). A topical approach to life span development (9th ed.). New segregation to inclusion. New Delhi: Sage.

13. Singh, A. (2015). Foundations of Human Development: A life span approach. ND:

14. Singh, U.K and Nayak, A.K. (2007). Extension Education. New Delhi: Common Wealth Publishers

15. Swaminathan M. (2008) Essentials of Food and Nutrition Bangalore Printing Publishing

24. KHASI

A. Preface

Ka Programme kan ai jingtip ïa ki nongpule shaphang ki tnat bapher ka litereshor kum ka poitri, ka sawangka, ka parom mutdur bad ka thohtah. Ka thmu ruh ban hikai bad pynsngewthuh ïa ki khynnah ha kaba ïadei bad ka sengnia bad ka bishar bniah. Yn hikai ruh ïa ki nongpule ban sngewthuh ïa ki litereshor jong kiwei pat ki jaitbynriew lyngba ka kylla-ktien na ka Sanskrit, ka Greek, ka English bad na kiwei pat ki ktien; bad kham bunsien lyngba ka English kum ka ktien jiar. Ka Programme ka kynthup ruh ïa ki phang pule, kum halor ka ktien Khasi, ka lolshor bad ka kylla-ktien. Shuh shuh, ka kynthup ruh ïa ki phang pule kiba ai jingtbit bad jinglah ba khambha ïa ki nongpule.

[The programme will familiarise students with various genres of Khasi literature including poetry, drama, fiction and prose. It also aims to introduce and expose students with an understanding of literary theory and criticism. It will expose students to the literature of other people through translation from Sanskrit, Greek, English and other languages into Khasi; and mostly through English as a filter language. The programme also includes courses on Khasi language study, Khasi culture and translation. Besides, it also contains courses which will provide skill enhancement and ability enhancement to students.]

Ki jingmyntoi:
1. Kan pynlah ïa ki nongpule ban san ha ka jingsngewthuh bajylliew ïa ki jait litereshor bapher bapher.
2. Kan pynïoh ïa ki nongpule ïa ka jinglah ban pule bishar ïa ki kot pule bad ban sngewthuh ïa ki phangkren bapher kiba don ha ki kot pule.
3. Kan pynsan ha ka jingsngewthuh ïa ka jinglong babha bad ka jinglah ban bishar bniah ïa ki phang kiba don ha ki jingpule.
4. Ki nongpule kin don ka jingsngewthuh ïa ka kramar bad ka jingtbit ban thoh bad ban kren.
5. Kan pynïoh ïa ki nongpule ïa ka jingtip ïa ki nongrim, ki rukom bad ki jait bapher ka kylla-ktien.
6. Kan pynsan ïa ki jinglong babha ka longbriew manbriew bad ïa ka mynsiem ban ieit bad ban tei ïa ka ri bad ka jaitbynriew.

[**Programme Outcomes**:
1. Enabling students to develop an in-depth understanding on the various genres of literature.
2. Equipping students with the ability of critical reading of literary texts and of identifying various themes contained in the texts.
3. Development of moral and critical understanding on various issues found in literary text.
4. Students will be equipped with the knowledge of grammar as well as the communicative competence.
5. Equipping students with the knowledge of the principles, strategies and types of translation.
6. Development of human values and the spirit of patriotism and nation building.

KHA-100: KA MAITPHANG ÏA KA LITERESHOR KHASI

(Contact Hours: 60, Credits: 4)

Ki Jingthmu jong ka phang pule:

Ïa kane ka phang pule la saiñdur ba ki nongpule kin tip ïa ki dur bad ki jait bapher jong ka Poitri, ka Sawangka, ka Parom Mutdur bad ka Thohtah. La saiñdur ruh ba ki nongpule kin sngewthuh ïa ki phangkren kiba ïadei bad ka imlang sahlang kumjuh ruh ïa kiwei pat ki phang ba ki kot pule ki pynphalang.

Ki jingmyntoi na kane ka phang pule:

➢ Ki nongpule kin lah ban sngewthuh ïa ki dur bad ki jait bapher jong ka litereshor khamtam ka phawar.
➢ Ki nongpule kin lah ban sngewthuh ruh ïa ki mat bapher bapher kiba ïadei bad ka imlang shalang.
➢ Kin ïoh ruh ïa ka jinghikai bahok bad bakordor kiba ka jaitbynriew ka ju bud.
➢ Kin don ruh ïa ka mynsiem ban tei ïa ka Ri.

Unit – I   Poitri

1) Rabon Singh   :   "Ka Jingphawar Iasiat thong" na *Ka Kitab*
                              Jingphawar
2) Soso Tham   :   "U Sim bala lait" na *Ka Duitara Ksiar*
3) Enami   :   "I Thakemon" na *Na Ka Thiar ki Longshuwa*
4) Oscar .M.Wahlang :   "Ka Sohlyngngem" na *Ka Jutang jong   ka Sur*
                              Pangnud u Khun Khasi

Unit – II   Sawangka

1) Remy Fancon :   "Ka Sngi Khatduh u Tirot Sing" na *Mynhynnin ,*
                              Mynta bad Lashai

Unit – III   Parom Mutdur

1) K.K. Kharlukhi   :   *Ka Melody*

Unit – IV   Thohtah

1) R.Tokin Roy Rymbai :   "Ki Samla bad la ka Ri" na *Ban Pynieng la*

<p style="text-align: right">ka Rasong bad Kiwei de ki Ese</p>

2) L. Gilbert Shullai   :   "Ki Kur ki Bun Jaitbynriew tang Kawei" na *Talwiar u Sohpetbneng*

Ki kot pule baroh ki long na ka bynta ban pule bniah.

Ki jingthoh kiba ïadei bad ka phang pule:

Chyne, Trocylin. "Ka Mariang kumba ka paw ha ka poim "U Sim Ba La Lait" ba la thoh da u Soso Tham." *Ka Thwet Jingstad(Quest for knowledge)* Vol. IV No.1 December, 2018. pp. 63-66

Fancon, Remy. *Mynhynnin , Mynta bad Lashai,* Don Bosco Press. 2008.

Jyrwa, M.B. "The Issue of Visual Disability in *Ka Melody.*" *Tribal Literature of North-East India*, edited by Badaplin War, Department of Khasi, NEHU, Shillong. 2008, pp.103-108.

Kharlukhi, K.K. *Ka Melody*, Hima Book Stall , 2000.

Lyngdoh, R.S. et al. *Na Ka Thiar ki Longshuwa*, Khasi Authors' Society, 1980.

Majaw,S.S. *Ka Sohlyngngem u Oscar M. Wahlang*, Khasi Book Stall, 1992.

Nongbri, Banniewkor.L. "Ka Phawar Ïasiatkhnam." *Ka Thwet Jingstad(Quest for knowledge)* Vol. IV No.1 December, 2018. Pp.67-73

… "Ka Thaw Phawar bad ka Rukom Phawar ïa ka." *Ka Thwet Jingstad(Quest for knowledge)* Vol. V No.1 December, 2021. pp.32-35

Rymbai, R.Tokin Roy. *Ban Pynieng la ka Rasong bad Kiwei de ki Ese*,Mrs. Witbon Hynniewta Rymbai, 1979.

Shullai, L. Gilbert. *Talwiar u Sohpetbneng*, Scorpio Printing Press,1993.

Singh, Rabon. *Ka Kitab Jingphawar,* Mrs Fair Beaulah Lyngdoh, 2002.

Sten, H.W. *Khasi Poetry: Its Origin and Development*, Mittal Publication, 1990.

Tham, Soso. *Ka Duitara Ksiar*, Mrs. A.D. Dkhar, 1972.

Wahlang, Oscar. M. *Ka Jutang jong ka Sur Pangnud u Khun Khasi*, Ri Khasi Book Agency, 4th ed., 2022.

KHA-150: POITRI, SAWANGKA BAD PAROM MUTDUR

(Contact Hours: 60, Credits:4)

Ki Jingthmu jong ka phang pule:

Ïa kane ka phang pule la saiñdur ba ki nongpule kin sngewthuh ïa ki tnat bapher jong ka Litereshor kum ka Poitri, ka Sawangka, ka Parom Mutdur. La saiñdur ruh ba ki nongpule kin sngewthuh ïa ki dur ki dar bad ki phangkren ha ka Poitri, ka Sawangka bad ka Parom Mutdur.

Ki jingmyntoi na kane ka phang pule:

➢ Ki nongpule kin lah ban sngewthuh khambha ïa ki tnat jong ka litereshor.
➢ Kin don ka jingtbit ban pule bad bishar bniah ïa ki dur kyntien, ki buit-thaw, ki phangkren bad ki snap bapher bapher jong ka Poitri, Sawangka bad Parom Mutdur.

Unit – I   Poitri

1. Soso Tham   : "Ka Duitara" na *Ka Duitara Ksiar*

2. S.S. Majaw   : "Kylla Pongpet" na *Ka Phawar Ksan Rngiew*

3. Kynpham Sing Nongkynrih   : "U Slap u Ap bad la ki Um Bakyntang" na *Ki Mawsiang ka Sohra*

4. Streamlet Dkhar   :"Ka Pharshi Ki 'Tiew" na *Ki Kyrpien Jong Ka Por:Ki Tanka Ha Ka Khasi bad kiwei de ki poim*

5. Banlam Kupar Lyngdoh   : "Saiñ-ruma" na *Khmih Pynor: Ka Thup Poitri Khasi*

Unit – II   Sawangka

1. Dewi Singh Khongdup   : *U Baieit Donshkor*

2. Wan Kharkrang   : "Jubab Aiu sha phin ai?" na *U Syiem ka Mariang bad kiwei ki Playlet*

Unit – III   Parom Mutdur (Khana lyngkot)

1. S.J. Duncan   : "Ki Mad ïa ka Shillong" na *Phuit ka Sabuit bad kiwei kiwei de ki Khana*

2. I.M. Simon   : "U Nonghikai Nongkyndong" na *Shikti na*

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ThweiMutdur

3. Hughlet Warjri   :"Ki Dienjat Khla" na *Ka Nongkylliang (Ki Jingïathuh khana lyngkot)*

Unit – IV   Parom Mutdur (Nobel)

1. L.H Pde   : *Tang Maphi Khun Baieid*

Ki kot baroh ki long na ka bynta ban pule bniah.

Ki jingthoh kiba ïadei bad ka phang pule:

Dkhar, S. *Ka Bishar bniah ïa ka Sawangka U Baieit Donshkor*: ESES PLUSPublications, Reprint 2021.

Dkhar, Streamlet. *Ki Kyrpien Jong Ka Por: Ki Tanka Ha Ka Khasi bad kiwei de ki poim*, ESES PLUS Publications, 2018.

Duncan, S.J. *Phuit ka Sabuit bad kiwei kiwei de ki Khana.* NEHU Publications. 1987.

Kharkrang, Wan. *U Syiem ka Mariang bad kiwei ki Playlet*, Rilum offset Printing House, 2011.

Khongdup, Dewi Singh.*U Baieit Donshkor*, Ka Matti Ladehi Syiem, 2009.

Lyngdoh, Banlam Kupar. *Khmih Pynor: Ka Thup Poitri Khasi*, Ri Khasi Book Agency, 2022

Majaw, Icylda. *Ka Khana Lyngkot Kum Ka Buit Thaw Litereshor*, Sunny Hill, 2015.

Majaw, S.S. *Ka Phawar Ksan Rngiew*, Don Bosco Press, 2014.

Nongkynrih, Kynpham Singh. *Ki Mawsiang ka Sohra*, Pine Cone, 2001.

Pde, L.H.*Tang Maphi Khun Baieid,* Author, 1984.

Sawkmie, Joyfully. *Ki Phangkren Halor ka Imlang Sahlang ha ki Nobel Khasi: Ka Bishar Bniah.,* Don Bosco Press, Shillong, 2017.

Simon, I.M. *Shikti na Thwei Mutdur ,* G.M.S. Pariat, 2001.

Tham, Soso. *Ka Duitara,*Mrs. A.D. Dkhar, 1972.

Warjri, Hughlet. *Ka Nongkylliang (Ki Jingïathuh khana lyngkot),* Scorpio Printers, 1985.

25. MASS COMMUNICATION AND VIDEO PRODUCTION

Preface

The global demand for professional content creators has reached an unprecedented level due to the widespread adoption of digital technology, and the world's fascination with the magic of the moving image, shows no signs of slowing down. Film and television production encompasses a range of roles including producers, directors, cinematographers, scriptwriters, motion-graphics designers, and editors. This course is a hands-on production-based program, designed to equip students with the necessary knowledge and creative, technical, and managerial skills, to produce high-quality content for film, TV, live broadcasts, documentaries, commercials, and music videos. The course Mass Communication and Video Production also focuses on writing practices for visual media and provides solid theoretical framework on visual cultures, film and television studies touching upon contemporary debates. The course equips students with transferable practical skills that makes them highly employable, while also preparing them for a career in academia.

Program Outcomes

1. Providing hands on training in film- making and television production.
2. Providing a comprehensive outlook on filmmaking and television production as a profession while also developing in students an aptitude in conducting further research in the said fields of study.
3. Providing an introduction to mass communication studies
4. Providing an overview of the media scene in India, and the management and entrepreneurial aspects of the media profession itself.

MVP-100: INTRODUCTION TO MASS COMMUNICATION

(Contact Hours: 60, Credits: 4)

Course Objective:*This paper aims at introducing the students to the basics of what is communication and how this communication gets expanded through mass media and practically applied to the visual medium.*

Learning Outcomes

- Students will be able to identify, examine and critically engage with communication processes at different levels.
- Students will be able to identify and understand the classical models of communication.
- Students will be equipped with an in-depth understanding of communication theories.
- Students will be trained in basic image making skills and will be able to put together and present coherent audio visual narratives.

Unit I	**Defining Communication** Definitions, Importance and Communication process, Levels of Communication, Meaning of Mass Communication and Mass Media-Functions of Mass Communication, Verbal and Non-Verbal Communication, Elements of Communication process, Barriers to Communication Process, Types of Communication, Defining Communication through Social Media.
Unit II	**Communication Models** Communication Model-Meaning and concept, Lasswell's Model, Shannon & Weaver's Model, ABX Model, Gerbner's Model,Osgood & Schramm's Model, Berlo's Model.
Unit III	**Communication Theories** Introduction to Communication Theory -Magic Bullet theory, Individual Difference Theory, Cultivation Theory,Agenda Setting Theory, Gate keeping Theory,Cultural Imperialism Theory, Play Theory, Uses & Gratification Theory, Mcluhan's Theories of the Media, Criticism of the Media, Impact of Social media on Mass Communication, Mobilisation,Political information and agenda-setting through Social Media, normative theories of the press.
Unit IV	**AV Story Telling** Basic structure of Storytelling, Narrative Structures, introduction to basic photography, camera techniques and function, natural lighting, understanding sound and visual with reference to visual composition.

Suggested Readings -

- Berger, A. A. (1995). *Essentials of mass communication theory*. Sage.
- Biagi, S. (2012). *Media impact: An introduction to mass media*. Cengage Learning.
- McQuail, D., &Windahl, S. (2015). *Communication models for the study of mass communications*. Routledge.
- Vivian, J., &Maurin, P. J. (2012). *The media of mass communication*. Pearson Canada.
- McLuhan, M. (2004). *Understanding Media: The Extensions of Man; Marshall McLuhan*. TPB.

Additional Readings

- Bolter, J. D., Grusin, R., &Grusin, R. A. (2000). *Remediation: Understanding new media*. mit Press.
- Schram, W. E. (1954). The process and effects of mass communication.
- McCombs, M. (2014). *Setting the agenda: Mass media and public opinion*. John Wiley & Sons.
- Joel Sartore, (2019). Photo Basics. National Geographic, illustrated edition.

MVP-150: VISUAL COMMUNICATION

(Contact Hours: 60, Credits: 4)

Objective: *The aim of this paper is to enable the students to ideate, conceptualize and communicate in terms of images.*

Learning Outcomes

- The students will be able to understand principles of visual communication.
- The students will be able to understand different approaches to various aspects of visual imageries.
- The students will be able to evaluate art and art history from a visual cultural studies perspective.
- The students will be able to interpret the politics of image.

Unit I	**Definition and understanding:** History of visual communication- from cave art to digital. Visual literacy- elements of visual literacy, Iconology Visual Perception process, the eye, the brain - Colour, Form, Depth, Movement. **Principles of Visual and other Sensory Perceptions-** Gestalt Theory Constructivism Theory Cognitive Approach

	Semiotics
Unit II	**Visual culture**- Visualizing- Visual power- Visual pleasure Fundamentals of Design- Definition- Approaches- Elements - Line, Shape, Space, Color, Texture, Form- Principles of Design – Symmetry, Rhythm, Contrast, Balance, Mass/ Scale. Introduction to Typography- The Anatomy of Typesetting Text, Typefaces, Fonts and Families, Typeface Categories, The Design Psychology – Tools of Design. Culturally-Related Design, Web & Interactive Design, Ads layout, Posters layout.
Unit III	**Concept of Art, Structure, Form and Meaning.** Art as -Commerce, Commodity, human creation. Images: Reality and constructed. Functions of art in society. Art history and artist from different art movements.
Unit IV	**Introduction to Image making-** Image Issues: Techniques of image reading- connotation denotation, stereotypes, Image and gender Imagination and image. A Historical Approach to Understanding Documentary Photographs: Dialogue, Interpretation and Method.

Suggested Readings -

- Kattula ,Vidyasagar(2022). Decoding Visual Communication: Semiotics.

- Boylan Alexis. (2020)Visual Culture.

- Lupton, Ellen. (2017). Design Is Storytelling.

- **J. Davis Meredith, Hunt Jamer (2017). Visual Communication Design: An Introduction to Design Concepts in Everyday Experience.**

- **Lester Paul M. (2013),Visual Communication: Images With Messages**

Additional Readings-

- Sandler, Morgan. (2018). Visual Storytelling: How to Speak to the Audience Without Saying a Word: How to Speak to Your Audience Without Saying a Word.

- Bailey, G, A. (2014).Art in Time: A World History of Styles and Movements.

- Jonathan Baldwin, Lucienne Roberts. (2006).*Visual Communication: From Theory to Practice*

- **Carolyn Handa. (2006). Visual Rhetoric in a Digital World.**

- Smith, K, Moriarty, S,Barbatsis, Kenney K.(2005)Handbook of Visual Communication

- Gombrich. E.H. (1995). The Story of Art.

26. MATHEMATICS

Preface

The programme aims to lay a strong basic foundation for higher mathematics both in pure and applied branches of Mathematics. It is meant for students who wish to pursue their careers involving mathematical research and skills. The programme is intended to teach the students the art of problem solving activities in both branches of Mathematics.

Programme Outcomes:

At the end of the course, students:

1. Willhave a strong foundation in both the pure and applied Mathematics.
2. Will be able to ask logical questions and also be able to solve them.
3. Will be able to interact with people from outside the state and communicate their ideas effectively.
4. Will have a sound knowledge in programming and computation.

MTH-100: FUNDAMENTAL MATHEMATICS-I

(Contact Hours: 60, Credits: 4)

Objectives: The primary objective of this course is to introduce the foundational concepts of calculus and techniques of problem. The students will also learn the methods of classical algebra and the art of solving a cubic equation.

Course Outcomes : After this course students will be able to learn the rigorous idea of limit of a function which is foundational to grasp the concepts of continuity, differentiation. In addition to this the students will be able to calculate the volume and surface area of solids of revolution and learn the applications of continuity and derivative in Higher Algebra.

Unit I : Limit and Continuity   (15 hours)

ε-δ definition of limit of a real valued function; standard theorems; limit at infinity and infinite limits; ε-δ definition of continuity of a real valued function; standard theorems; geometrical interpretation of continuity; discontinuity - types of discontinuity; properties of continuous functions; Intermediate Value Theorem and its applications; fixed point theorem; location of roots - theorem and its application.

Unit II : Differentiability   (15 hours)

Differentiability of a real-valued function of a real variable; geometrical significance; standard theorems; stationary point; local extrema; Rolle's Theorem, Lagrange's Mean Value Theorem, Cauchy's Mean Value Theorem and their applications; differentiability and monotonicity; concavity; inflection point; differential; successive differentiation; Leibnitz's Theorem.

Unit III : Integral Calculus   (15 hours)

Definite Integral as a limit of a sum; fundamental theorem of integral calculus; properties of definite integral; applications of definite integral - area under a curve, length of simple plane curves, volume and surface areas of solids of revolution in standard cases; reduction formulas for $\int sin^n x\, dx$, $\int cos^n x\, dx$, $\int tan^n x\, dx$, $\int e^{ax} x^n\, dx$, $\int x^n \log x^n\, dx$, $\int sin^n x\, cos^m x\, dx$.

Unit IV : Complex Numbers & Theory of Equations   (15 hours)

Complex Numbers - properties; polar representation; Polynomials over $\mathbb{Z}, \mathbb{Q}, \mathbb{R}, \mathbb{C}$ - definition and standard properties; Division Algorithm; gcd, Euclidean Algorithm, Unique Factorisation Theorem over $\mathbb{Q}, \mathbb{R}, \mathbb{C}$ (statement and application); root of a polynomial; detailed study of the roots of a polynomial; Fundamental Theorem of Algebra (statement and corollary) and its failure over $\mathbb{Z}, \mathbb{Q}, \mathbb{R}$; Remainder Theorem and Factor Theorem; Synthetic division; multiple roots; complex roots and surd roots; Descartes' rule of signs; Relation between roots and coefficients of a polynomial; symmetric functions of roots with special reference to cubic equations; n^{th} roots of unity; De Moivre's Theorem and its applications; Euler's Theorem (statement only); solution of a cubic equation by Cardan's Method.

Notes: A candidate must obtain the minimum pass marks (as per NEHU Rule) to clear the course.

Suggested Readings:

1. Calculus, H. Anton, I. Bivens, S. Davis, Wiley India Pvt. Ltd. (2015).
2. Differential Calculus, R.K. Ghosh, K.C. Maity, New Central Book Agency Ltd. (2011).
3. Integral Calculus, R.K. Ghosh, K.C. Maity, New Central Book Agency Ltd. (2013).
4. Higher Algebra Classical, S.K. Mapa, Levant Books India (2021).
5. Mathematical Analysis, S.C.Malik , S.C.Arora, New Age International Publication (2021).
6. Thomas Calculus, G.B.Thomas, J. Hass, C. Heil, Pearson Education (2018).
7. Calculus: Early Transcendentals, J. Stewart, Cengage India Pvt Ltd. (2017).
8. Introduction to Real Analysis, R.G. Bartle, D. R. Sherbert, Wiley India Edition (2021).
9. Higher Algebra, B.Das, S.R.Maity, AsokePrakasan (2010).

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MTH-150: FUNDAMENTAL MATHEMATICS-II

(Contact Hours: 60, Credits: 4)

Learning Objectives: The primary objective of this course is to study the properties of standard geometrical objects in two and three dimensional spaces. The course will also introduce the basic concepts of multivariable calculus and vector calculus with applications in Physics.

Unit I : Two Dimensional Geometry (15 hours)

Transformation of coordinates - Change of axes, invariants, removal of xy term.

Pair of straight lines - General and homogeneous equations of second degree, angles between pair of straight lines represented by a second degree equation, bisectors of the angles between a pair of straight lines through the origin.

Conics - General equation of second degree, reduction to standard form, equation of tangents, conditions of tangency, equation of normal, parametric form of conics, conjugate diameters of ellipse and hyperbola.

Unit II : Three Dimensional Geometry (15 hours)

Planes - General equation of a plane, normal form of a plane, angle between two planes, perpendicular distance of a point from a plane, planes through intersection of two planes.

Spheres - General equation of a sphere, plane section of a sphere, sphere through a given circle, tangent plane, intersection of two spheres.

Cones - Equation of a cone with a conic as a guiding curve, enveloping cone, mutually perpendicular generators, tangent planes, reciprocal cone, right circular cone.

Unit III : Multivariable Differential Calculus (15 hours)

Real-valued functions of two and three real variables $(f: \mathbb{R}^2 \to \mathbb{R}, f: \mathbb{R}^3 \to \mathbb{R})$; Limits and continuity of real-valued functions of two and three real variables (basic concepts and simple problems); Partial Derivatives of first order and its geometrical significance.

Second order partial derivatives - basic concepts and examples; Schwarz's theorem (statement and examples only); Laplacian; Chain rule; Euler's theorem on homogeneous functions upto three variables.

Unit IV : Vector Calculus   (15 hours)

Scalar and vector products of three and four vectors - properties, geometrical significance, and applications.

Vector-valued functions of real variables $(f: \mathbb{R} \to \mathbb{R}^2, f: \mathbb{R} \to \mathbb{R}^3)$; Derivative of a vector-valued function of a real variable; Properties and geometrical applications - arc length, unit tangent vector, normal vector, curvature.

Gradients of real-valued functions of two or three variables - physical and geometrical significance, and elementary properties; Directional derivatives of real-valued functions of two or three variables and its geometrical significance, maximum directional derivative; Tangent planes and normal lines.

Divergence \& Curl - physical and geometrical significance, and elementary properties; Solenoidal and irrotational vector fields.

Course Outcomes :After this course students will be able to understand the properties of geometrical objects in two and three dimensions. They will learn conceptual variations while advancing from one variable to several variable in calculus. In addition to this they will intuitively understand how the language of vectors is used in other fields of science like Physics.

Notes: A candidate must obtain the minimum pass marks (as per NEHU Rule) to clear the course.

Suggested Readings:

1. Calculus, H. Anton, I. Bivens, S. Davis, Wiley India Pvt. Ltd. (2015).
2. Analytical Geometry and Vector Analysis, B. Das, Orient Book Company (2008).
3. Analytical Solid Geometry, S. Narayan, P.K. Mittal, S. Chand & Company (2007).
4. Differential Calculus, R.K. Ghosh, K.C. Maity, New Central Book Agency Ltd. (2011).
5. Vector Analysis, R.K. Ghosh, K.C. Maity, New Central Book Agency Ltd. (2011).
6. Analytical Geometry and Vector Analysis, J.G. Chakravorty, P.R. Ghosh, U.N. Dhur& Sons Pvt Ltd. (2012).
7. Calculus: Early Transcendentals, J. Stewart, Cengage India Private Limited. (2017).
8. Calculus and Analytic Geometry, G.B. Thomas Jr., R.L. Finney, Pearson Education India (2010).
9. Vector Calculus, S. J. Colley, Pearson (2012).

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27. MEDIA TECHNOLOGIES

Preface

With the instating of the National Education Policy 2020, and upon scaling the demands of the media professional market today, including that of research and academia in the said field, the said course is being offered as a BA in Media Technologies.The Media Technologies Course simultaneously focuses on the theoretical underpinnings as well as the practices associated with photography, sound for media and digital media technologies. While continuing to concentrate on advanced photography studies and sound for media (that has proven to be in demand by students undertaking the said course since its inception in 2001), with the rise in convergent media technologies, and with the growing demand for digital media skills becoming the need of the hour, the course also specifically focusses on digital media studies.

Program Outcomes

1. Providing a comprehensive approach in understanding photography, sound production and digital media studies.
2. Developing a hands-on advanced professional expertise in photography skills, photojournalism and in comprehending the aspects of photography genres, aesthetics and other more advanced forms of comprehending the art itself.
3. To create an understanding of the several facets of digital media.
4. To develop skills to produce content for the digital media space.
5. To introduce and meet the needs and opportunities in digital media.
6. Providing a hands-on approach to understanding advertising both as a subject of study and a professional expertise.

MET-100: INTRODUCTION TO COMMUNICATION THEORY

(Contact Hours: 60, Credits: 4)

Objective: This is a foundational paper which will explore the various facets of communication, theories and models of communication. It will also explore the communication process through the different media channels such as the traditional and folk media to mass media and the emerging digital media outlets.

Learning Outcomes

- **LO1:**Students will be able to understand the InDesign environment, creating a workspace that is suitable to the student's workflow, set-up document according to the required page size for their publications and learn how to save and export their design publications.
- **LO2:**Students will be able to create and modify text and objects, threading text frames, creating page numbers and creating jump lines, working with spell check and creating a user custom dictionary.
- **LO3:**Students will be able to understand how to work with typography, creating and applying color and gradient to text and objects and creating and applying the different types styles in InDesign
- **LO4:**Students will be able to import and modifying graphic, create sophisticated tables and working with transparency and effects for text and objects.

Unit I	• Basic Concepts of Communication, types, elements, barriers, characteristics of communication, models of communication.
Unit II	• Introduction to Communication Theory • Magic Bullet theory, Individual Difference theory, Cultivation theory, Agenda Setting Theory, Gate keeping Theory, Cultural Imperialism Theory, Play Theory, Uses & Gratification Theory. • Communication Model-Meaning and Concept
Unit III	• Working with Typography: Adjusting vertical spacing, Changing fonts and type styles, Fine-tuning columns, Creating drop cap, Adjusting letter and word spacing, Creating tabs and indents, Adding rule above a paragraph. • Working with Color: Creating and applying colors, Working with gradients, Creating tint, Creating spot colors, Applying colors to text and objects, Using advance gradient techniques. • Working with Styles: Creating and applying paragraph styles, Creating and applying character styles, Creating and applying object styles, Creating and applying table and cell styles, Globally updating styles.

Unit IV	- Importing and Modifying Graphics: Adding graphics from other programs, Comparing graphics and bitmap graphics, Updating revised graphics, Adjusting display quality, Working with clipping paths, Working with alpha channels. - Creating Tables: Converting text to table, Formatting a table, Creating header row, Adding graphics to table cells, Creating and applying table and cell styles. - Working with transparency: importing and colorizing a grayscale image, Applying transparency settings, Adding transparency effects to imported vector and bitmap graphics, Importing and adjusting Illustrator files that use transparency, Applying transparency settings to text, Working with effects.

Suggested Readings-

- Adobe InDesign CS6, Classroom in a book, The official training workbook from Adobe Systems, 2012
- The Fundamentals of Graphic Design. First Edition by Ambrose, Gavin. and Harris, Paul. (2008) Lausanne, Switzerland: AVA Publishing.

Additional Readings-

- Graphic Design the New Basics. Second Edition by Lupten, Ellen and Philipps, Jennifer Cole. (2015) New York: Princeton Architectural Press.
- Real World Adobe InDesign CS by Olav Martin Kvern and David Blatner (Peach pit Press). 1st Edition, 2010

MET- 150: INTRODUCTION TO NEW MEDIA

(Contact Hours: 60, Credits: 4)

Objective: This paper will introduce the students into emerging new media forms and help them to produce and manage content across multiple platforms, including print, radio, the Internet, television, social media and other digital and interactive platforms.

Learning Outcomes

LO1: Students will be able tograsp a comprehensive understanding of the new media landscape.

LO2: Students will be able to gain media skills required in the approach of emerging convergent media practices that require new media skills to be incorporated within the students portfolio of work.

LO3: Students will be able to gather comprehensive understanding of important terminologies that have been developed over time as part of the new media landscape has also been taken into account.

LO4: Students will be able to understand concepts related to new media and digital studies and will be prepared to take on a hands-on approach to the practice in new media skills and techniques itself.

Unit I	**New media**- Meaning and Characteristics, Principles of New Media, The New Media Interface , New Media Economy **Understanding New Media Technologies & Applications** Digitization of media- _media convergence, Constituents of new media- _Web 2.0-3.0, Blogs, Micro Blogs, Wikis, Social Media, Constituents- _Facebook, Twitter, Wordpress, Blogger, YouTube, Docs, Drive, Hangouts, social bookmarking, slideshare, Skype.
Unit II	**New Media Ecology, Installations & Screens** , Elements of Transmedia Narratives across multiple media, Gaming & Storytelling, digital games, player cultures, online games & their impact, New Media Art
Unit III	**Impact of New Media on Journalism,** Mass Communication The new media practitioners- _Characteristics and new roles of Journalists in the Internet age and the Digital Era. Creating and managing a Blog, trends in web/online Journalism and Communication.
Unit IV	**New Media Ethical issues** - Journalism ethics and restraint in new media, IPR Copyright & Legal issues in cyber space, Using social media to engage public, Activism in Cyber space, ICT's in new media; ICT and Social Inclusion, Globalization & Emerging Cyber cultures

Suggested Readings -

- Poster, M. (2018). *The second media age*. John Wiley & Sons.
- Manovich, L. (2001). *The language of new media*. MIT press.
- Reeves, B., &Nass, C. I. (1996). *The media equation: How people treat computers, television, and new media like real people and places*. Cambridge university press.
- Jenkins, H. (2006). *Convergence culture: Where old and new media collide*. NYU press.

Additional Readings-

- Flew, T. (2007). *New media: An introduction*. Oxford: Oxford University Press.
- Gerbaudo, P. (2018). *Tweets and the streets: Social media and contemporary activism*. Pluto Press.
- Lievrouw, L. A., & Livingstone, S. (Eds.). (2002). *Handbook of new media: Social shaping and consequences of ICTs*. Sage.
- Castells, M. (2004). *The network society A cross-cultural perspective*. Edward Elgar.

28. MICROBIOLOGY

Programme in Microbiology:

The microbiology program focuses on practical applications, providing students with a comprehensive understanding of microbiological tools, techniques, and methodologies. Through a combination of theory and experiential learning, students establish a strong foundation in microbiological principles, laboratory techniques, and data analysis. They acquire proficiencies in microbial culturing, microscopy, molecular biology, and biochemical analysis. These skills enable them to investigate the characteristics and behavior of microorganisms, explore their genetic composition, and analyze biochemical data. By integrating theory with practical experience, students develop a profound understanding of microbiology and essential proficiencies for project work, analysis, and report preparation. This prepares them for successful careers in research, healthcare, and environmental monitoring, where their expertise in microbiology is highly valued.

ProgrammeOutcomes(POs): Expectedoutcomeoftheprogramme:

PO1: Demonstrate comprehensive understanding of microbiological principles, tools, techniques, and methodologies.

PO2: Acquire proficiency in microbial culturing and laboratory techniques for studying bacteria, fungi, and viruses.

PO3: Utilize microscopy effectively to observe and classify microorganisms based on cellular structures.

PO4: Apply molecular biology techniques to explore genetic composition and mechanisms of microorganisms.

PO5: Apply biochemical techniques to analyze metabolic pathways and physiological characteristics of microorganisms.

MIC-100: INTRODUCTORY MICROBIOLOGY

(Contact Hours: 75, Credits: 4)

Course Objectives (Cos):

This course is design with an objective to provide the basic information about the history of microbiological development. Further this course is also design to provide basic information and understanding about the different types of microorganisms and different culture media used for their growth.

Learning Outcomes (LOs)

1. Thorough knowledge and understanding of the concepts of basic microbiology
2. Learn about the working principle of Dark field and Bright Field Microscope

3. Learn about the different types of microorganisms

4. Understanding the fundamentals of culturing and growing microorganisms.

Unit I: History of Microbiology

1. Theory of Biogenesis and Abio-genesis (Spontaneous generation).
2. Contribution of Scientists to the field of Microbiology- Antony Von Leuwenhoek, Louis Pasteur, Joseph Lister, Robert Koch, Alexander Flemming, Iwanovsky.
3. Scope and branches of Microbiology.

Unit II: Basic principles and concept

1. Microscope: Bright field and Dark field Microscope.
2. Sterilization: Dry heat (hot air oven, incineration); Moist heat (autoclave, pasteurization), Radiation (U.V rays, Gamma rays) Chemicals agents (Alcohol, phenols); Filtration (membrane filter)
3. Culture Media: Basal media, selective media, differential media, enriched and enrichment Media; pure culture techniques.

Unit III: Introduction to types of Microorganisms

Distribution, occurrence, morphology, mode of reproduction and economic importance.

1. Bacteria, Viruses and Fungi.
2. Viriods and Prions.
3. Cyanobacteria, Protozoa and Algae.

Unit - IV: Practical   (Contact hours 30)

1. Good laboratory practice in Microbiology and safety measures.

2. Study of aseptic technique-Preparation of cotton plug, wrapping of glassware, transfer of media and inoculum.
3. Preparation of culture media- Solid and liquid.
4. Pure culture techniques- Serial Dilution, pour plates, spread plates.
5. Slide study – Bacteria (Cocci and Bacilli), Fungi (*Aspergillus* and *Penicillium*), Cyanobacteria (*Anabaena* and *Nostoc*).

Suggested Readings:

1. Atlas R. M, Mosby (2005). Principles of Microbiology.

2. A.R. Mitra and K. Sarkar(2016). Practical Manual of Modern Microbiology. Himalaya Publishing House

3. Benson Harold J. W.C.B (2006). Microbiological Application. McGraw-Hill of India Private Limited

4. Dubey, R.C. and Maheshwari, D.K (1999). Text book of Microbiology. S. Chand & Company Ltd.,New Delhi.

5. Dubey, R.C. and Maheshwari, D.K (1999). Practical Microbiology. S. Chand & Company Ltd., New Delhi.

6. J.M. Cappuccino and Sherman, N. 11th Edition. Pearson (2014). Microbiology: A laboratory manual.

7. Pelczer, M.J. and Chan, E.C.S (2003). Elements of Microbiology. Tata McGraw-Hill.

8. Prescott, Harley and Klein's(2008). Microbiology, Mac Graw Hill Higher education.

9. Stainer, RY, Ingraham, JL, Wheelis, ML., and Painter, P.R(2000). General Microbiology. The Macmillan Press Ltd.

MIC-150: BACTERIOLOGY

(Contact Hours: 75, Credits: 4)

Course Objectives (Cos):

This course is design with an objective to provide the basic features of bacteria, their growth and adaptation. Further, this course also provides information regarding bacterial classification, reproduction and significance.

Learning Outcomes (LOs):

1. To describe the classification of bacteria.
2. Know about the morphology and structure of bacterial cells.
3. Know about the nutritional requirements of bacteria for their growth and reproduction.

Unit I:Structure and Classification

1. Overview of Bergey's manual of classification
2. Fine structure and function of bacterial-
a. Cell wall and Cell membrane,
b. Cytoplasm and Nucleoid,
c. Flagella, Pili/Fimbriae,
d. Slime layer and Capsule,
e. Spores and Cyst.

Unit II: Staining of bacteria

1. Principles and procedure –
a. Simple staining and Negative staining
b. Differential staining- Gram's staining and acid-fast staining
c. Structural staining- Endospore, capsule and flagella.

Unit III: Bacterial growth and Reproduction

1. Bacterial   reproduction- Asexual
2. Mathematical nature and expression of growth- Growth curve, Generation time and Growth rate,
3. Culture techniques-Batch, Continuous (Chemostat, Turbidostat)and Synchronous cultures
4. Quantitative measurements of growth.

Unit - IV: Practical   (Contact hours 30)

1. Morphological characterization of bacteria- Colony and Microscopic characteristics.
2. Estimation of bacterial growth by Spectrophotometry

3. Measurement of cell dimension by micrometry.
4. Staining- Simple and negative.
5. Differential staining- Gram's staining.

Suggested Reading:

1. Atlas R. M, Mosby (2005).Principles of Microbiology.
2. A.R. Mitra and K. Sarkar (2016). Practical Manual of Modern Microbiology. Himalaya Publishing House.
3. Benson Harold J. WCB (2006). Microbiological Application, McGraw-Hill of India Private Limited
4. Dubey, R.C. and Maheshwari, D.K (1999). Practical Microbiology. S. Chand & Company Ltd., New Delhi.
5. J.M. Cappuccino and Sherman, N. 11th Edition. Pearson (2014). Microbiology: A laboratory manual.
6. Pelczer, M.J. and Chan, E.C.S (2003).Elements of Microbiology. Tata McGraw-Hill.
7. Prescott, Harley & Klein's (2008), Microbiology, Mac Graw Hill Higher education.
8. Stainer, R.Y, Ingraham, J.L, Wheelis, M.L., and Painter, PR. (2000). General Microbiology. The Macmillan Press Ltd.

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29. MIZO

Programme Outcomes:
1. Enabling students to develop an in-depth understanding on the various genres of literature.
2. Equipping students with the ability of critical reading of literary texts and of identifying various themes contained in the texts.
3. Development of moral and critical understanding on various issues found in literary text.
4. Students will be equipped with the knowledge of grammar as well as the communicative competence.

MIZ-100: INTRODUCTION TO MIZO LANGUANGE

(Contact Hours: 60, Credits: 4)

Course Objective:

This paper will introduce the student to the origin and the developmentof the Mizo language. It will also help them in learning the variousperiods of Mizo Literature together with poetry. By introduction ofthese topics, the students will be trained to understand the community,religion, gender and politics of the different period. It will also expandtheir knowledge in the subject and acquire deeper insight into thelanguage and literature.

Learning Outcomes:

The students will gain a coherent and systematic knowledge of thedifferent aspects of Mizo language and literature. Students will befamiliarized with the development, background, initial attempts of Mizoliterature, its periodization and nomenclature. They will also learn andbe acquainted with the contribution of writers and poets through thedifferent periods.

UNIT 1: INTRODUCTION TO MIZO LANGUAGE (Mizotawngchanchin)

    1. Mizo tawngbulbal - Lalthangliana Philips

    2. Mizo tawngtobulleh a chhehvel - B. Lalthangliana

UNIT-2: Mizo Literature hunpui then dan lehhla

UNIT -3: 1. Relthang ka dawn zo lo - Capt. L. Z. Sailo

    2. AukhawkLasi–Lalzuithanga

UNIT- 4: 1. Falak Rairah - J. Liankhuma

2. Dawi ang I dawm ang u - C. Chhuanvawra

Suggested Readings:

1. Fungki Bu thar- CTBEB Publication, 2012

2. Thuhlaril (Literary trends & History of Mizo Literature), CTBEB

Publication, Aizawl, 2006

3. Lalthangliana, b,ed.ZotawngBulpuileh a hmanna , MCI

Publication. 2002

5. Lalzuithanga, AukhawkLasi, 1983

MIZ-150: MIZO POETRY, SHORT PLAY AND LEGENDS

(Contact Hours: 60, Credits: 4)

Course objective:

This course is a combination of traditional heroes and the socio-politicalscenario of Mizoram during the 1960's. It informs the students thevalues of an ideal man in traditional Mizo society and the change thattook place. It encourages the student for improvement anddevelopment as an individual and the community as a whole.

The romantic poems are the artistic expressions of the different poetsto give them exposure to traditional cultural experiences

Learning outcome:

The course will enable students to learn traditional values. it will alsoinculcate in them a spirit of competition for improvement anddevelopment.

Unit 1 Ramngaihhla(Patriotic songs)

1. Harh la harh la Zoram - Rokunga

2. Khawkhawmhla - Suakliana

3. Tho la ding ta che - V. Thangzama

Unit-2 Short plays

1. Thangthar Nun - Khawlkungi

2. Thawmvunga - Dr.laltluanglianaKhiangte

3. Hmasawnnnarahbi - P C. Lalrinpuia

Unit 3 LengzemHla(Romantic poems)

1. Nghilhlohna par - P. S. Chawngthu

2. Mangtha - Lalzova

3. Di Hmeltha–BuangiSailo

Unit 4 Legends

1. PasalthaKhuangchera

2. PasalthaVanapa

Suggested Readings:

1. Fungki Bu thar- CTBEB Publication, 2012

2. Khiangte, Laltluangliana, Khawlkungileh a kutchhuak. 2011

3. Ngirtling- CTBEB Publication, 2012

4. Zawla, K. Mizo Pi lehPuteleh an thlahtechanchin, 2011

5. Lalzuithanga, Mizo Legend (a study of Mizo legendary tales),

Aizawl, 2019

6. Contemporary short stories from Mizoram- Margaret Ch.Zama .

Published by Sahitya Akademi

30. NEPALI

Under Graduate Nepali degree provides curriculum on Nepali literature including its history, prose, poetry and grammar to equip students to undertake higher studies in the subject as well as pursue career and employment based on the acquired knowledge at the undergraduate level of learning.

Programme outcome (PO):

At the end of the Undergraduate Programme in Nepali, the graduates will be able to:

PO 1: Apply knowledge of Nepali language and literature at an appropriate level to the discipline.

PO 2: Understand the history of Nepali literature and articulate the same while executing knowledge with peers.

PO 3: Acquire knowledge in domain of Nepali Prose, Poetry and Grammar enabling their applications .

PO 4: Apply written and oral communication skills to communicate effectively in academia and research.

NPL-100: HISTORY OF NEPALI LITERATURE AND POETRY

नेपाली साहित्येतिहास र काव्य

(Contact Hours: 60, Credits: 4)

प्रस्तुत पाठ्यक्रमले इसाको एघारौं शताब्दीदेखि एक्काइसौं शताब्दीसम्म क्रमसः विकास हुँदै आएको नेपाली साहित्येतिहास तथा विभिन्न कालमा प्राप्त केही प्रमुख कवि र तिनका कविताको परिचय गराउने अवसर प्रदान गर्ने छ।(The paper covers the history of Nepali Literature and Poetry from 10th Century AD to 21st Century AD).

Course Objectives:यस पाठ्यक्रमका मुख्य उद्देश्यहरू यस प्रकार छन् (The major objectives of the course are):

CO1: नेपाली साहित्येतिहास तथा कविता-विकासको इतिहासका विषयमा जान्नु। (To provide an overview of historical development of Nepali literature and poetry).

CO2: नेपाली कविताको पूर्व-आधुनिक कालको अध्ययन र केही प्रमुख कविहरूको परिचय दिनु। (To develop understanding of the importance of ancient to Modern history of Nepali poetry and introduction of prominent poets).

CO3: नेपाली कविताको आधुनिककालको परिभाषा, अध्ययन, स्वछन्दतावादी तथा समसामयिक धाराका प्रमुख कविहरूको परिचय गराउनु।(To learn the importance of modern history of Nepali poetry and prominent poets -Romantic and Contemporary).

CO4: पूर्व-आधुनिककाल तथा आधुनिककालका प्रमुख कविहरूको योगदान जान्नु र उनीहरूका विषयमा लेख्नसक्ने क्षमताको विकास गर्नु। (To develop the understanding and writing skills of poets and their contributions).

Learning Outcomes: प्रस्तुत पाठ्यक्रम अध्ययन गरिसकेपछि विद्यार्थीहरू निम्नलिखित ज्ञान र क्षमता प्राप्त गर्न सक्षम हुनेछन् :(On successful completion of this course, students are expected to learn the following:)

LO1: नेपाली साहित्येतिहासको पृष्ठभूमि, प्रारम्भिक प्रयास, काल विभाजन र नामकरण जान्न। (Know about the development, background, Initial attempts of Nepali Literature, Periodisation process and nomenclature of Nepali literary history)

LO2: नेपाली कविताको पूर्व-आधुनिककाल तथा माध्यमिककालको परिचय र केही महत्वपूर्ण कविहरूको योगदानका विषयमा जानकारी पाउन।(Learn about the introduction of Pre-Modern Period of Nepali poetry and the contribution of the poets).

LO3: नेपाली कविताको आधुनिककालको परिचय तथा स्वछन्दतावादी एवं समसामयिक धाराका केही प्रमुख कविहरूको अध्ययन गर्न। (Know about the Modern Period of Nepali poetry and the contribution of the poets).

LO4 :प्राथमिक, माध्यमिक र आधुनिककालका केही प्रतिनिधि कवि र तिनका प्रमुख कविताहरू अध्ययन गर्न।

(Understand about Prominent Poets of Pre-Modern Period and Modern Period).

एकाइ-१ (Unit-1) नेपाली साहित्येतिहासको विकास :

(i) नेपाली साहित्येतिहासको पृष्ठभूमि

(ii) नेपाली साहित्येतिहासका प्रारम्भिक प्रयास

(iii) नेपाली साहित्येतिहासको कालविभाजन प्रक्रिया र नामकरण

एकाइ-२ (Unit-2) नेपाली कविताको पूर्व आधुनिक काल :

(i) प्राथमिक काल (परिचय र प्रमुख कवि)

(ii) माध्यमिक काल(परिचय र प्रमुख कवि)

एकाइ-३(Unit-3) नेपाली कविताको आधुनिक काल :

(i) स्वछन्दतावादी धारा (परिचय र प्रमुख कवि)

(ii) समसामयिक धारा (परिचय र प्रमुख कवि)

एकाइ-४ (Unit-4)कवि र काव्य

(i) सुवानन्ददास	_	पृथ्वीनारायण
(ii) भानुभक्त आचार्य	–	चपला अबलाहरू
(iii) मोतीराम भट्ट	–	प्यारा राम
(iv)) लक्ष्मीप्रसाद देवकोटा	–	यात्री
(v) हरिभक्त कटुवाल	–	आकाशका तारा के तारा
(vi) पारिजात	_	म सडक बोल्दै छु

सन्दर्भग्रन्थः

१. उपाध्याय, केशवप्रसाद, **प्राथमिककालीन कविर काव्य प्रवृत्ति**, काठमाडौं : साझा प्रकाशन, सन् १९८५।

२. उपाध्याय, टेकनारायण र जोशी, वसन्तराज, **स्नातकीय नेपाली साहित्य**, शिलाङ्ग : नेपाली पाठ्यपुस्तक प्रकाशन समिति, सन् २०१५।

३. थापा,वशु र राई, विक्रम, **नेपाली कविता कल्प**, दार्जिलिङ् : एकता बुक्स्, सन् २०१२।

४. नेपाल, घनश्याम, **नेपाली साहित्यको परिचयात्मक इतिहास**,सिलगढी : नेपाली साहित्य प्रचार समिति, सन् १९९१।

५. लुइटेल, खगेन्द्रप्रसाद, **नेपाली कविताको इतिहास**, काठमाडौं : विद्यार्थी पुस्तक भण्डार, सन् २०००।

६. लुइटेल, खगेन्द्रप्रसाद, **नेपाली काव्य समालोचना**, काठमाडौं : विद्यार्थी पुस्तक भण्डार, सन् २००५।

७. शर्मा, मोहनराज र श्रेष्ठ, दयाराम, **नेपाली साहित्यको इतिहास**, काठमाडौ : साझा प्रकाशन, सन् १९८९।

८. शर्मा, तारानाथ, **नेपाली साहित्यको इतिहास**, काठमाडौं : सहयोगी प्रकाशन, सन् २००१ ।

NPL-150: LINGUISTICS, POETICS AND GRAMMAR

भाषाविज्ञान, काव्यशास्त्र र व्याकरण

(Contact Hours: 60, Credits: 4)

प्रस्तुत पाठ्यक्रमले भाषासँग सम्बन्धित भाषाविज्ञान,काव्यशास्त्र र व्याकरणका बारेमा जान्न र बुझ्नका लागिमञ्च प्रदान गर्ने छ। (The course provides platform to learn and acquire understanding about linguistics, poetics and grammar related to language).

Course Objectives: यस पाठ्यक्रमका मुख्य उद्देश्यहरू यस प्रकार सुचिबद्ध छन् (The course objectives are listed as)

CO1: भाषाविज्ञानमा लेखन कौशलका आधारभूत अवधारणाहरू विकास गर्न सक्षम हुने छन्।(Develop the fundamental concepts of the writing skill in Linguistics.

CO2: लेखनका आधारभूत अवधारणाहरूबारे लेख्न, कविता लेखनको सीपको विकास गर्न सक्षम हुने छन्। (Learn to write fundamental concepts of the writing skill in Poetics).

CO3: काव्यशास्त्रका मुख्य भिन्नताहरूबारे लेख्न सिक्ने छन् र कवितामा रचनात्मक लेखन विकास गर्न सक्षम हुने छन्। (Learn to write about the Major Modes of Poetics and develop creative writing in poetry).

CO4: नेपाली व्याकरण सिकेर साहित्यिक विधाहरूमा लेखन कौशलको विकास गर्ने छन्। (Learn Nepali Grammar and develop the writing skills in literary genres).

Learning outcomes:प्रस्तुत पाठ्यक्रम अध्ययन गरिसकेपछि विद्यार्थीहरू निम्नलिखित ज्ञान र क्षमता प्राप्त गर्न सक्षम हुने छन्: (On successful completion of this course, students are expected to learn the following)

LO1: भाषाविज्ञानको परिभाषा,भिन्नता, नेपाली भाषाका विशेषताहरू र तिनका शाखाहरूबारे जान्नसक्ने क्षमता। (Ability to know about the definition of Linguistics, distinction, characteristics of Nepali Language and their branches).

LO2: कविता, कवि, कविताका उद्देश्यबारे जान्नसक्ने क्षमता। (Ability to know about the Poetics, Poet, Poetics Purpose).

LO3: काव्यशास्त्रका मुख्य भिन्नताहरू र यसका प्रकार(छन्द, अलङ्कार र रस)बारे जान्नसक्ने क्षमता, कारक र विभक्ति,सन्धि र समास, उखान र बाग्धारा आदिको क्षमता विकास। (Ability to know about the Major Modes of Poetics and its Types (Chanda, Alankar Rasa , Case, Case-ending, Compoundand Morpheme, Proverbs and phrases).

एकाइ-१ (Unit-1) भाषाविज्ञान :

   (i) भाषाको परिभाषा, भेद र विशेषता

   (ii) भाषा र भाषिका

   (iii) भाषाविज्ञानका शाखाहरूको परिचय

एकाइ-२ (Unit-2) काव्यशास्त्र परिचय :

(i) कवि र काव्य

(ii) काव्य प्रयोजन

(iii) काव्य हेतु

एकाइ-३ (Unit-3) काव्यशास्त्रका प्रमुख भेद:

(i) छन्दको परिचय र प्रकार(अनुष्टुप,शार्दूलविक्रीडित,झ्याउरे र सवाई)

(ii) अलङ्कारको परिचय र प्रकार(यमक, अनुप्रास, उपमा र रूपक)

(iii) रसको परिचय र प्रकार

एकाइ-४ (Unit-4) नेपाली व्याकरण :

(i) कारक र विभक्ति

(ii) सन्धि र समास

(iii) उखान र बाग्धारा

सन्दर्भग्रन्थः

१. अधिकारी, हेमाङ्गराज, **पूर्वीय समालोचनाको सिद्धान्त**, काठमाडौं : साझा प्रकाशन, सन् १९९०।

२. उपाध्याय, केसवप्रसाद, **साहित्य-प्रकाश**, काठमाडौं : साझा प्रकाशन, सन् २००२।

३. थापा, मोहन हिमांशु, **साहित्य परिचय**, काठमाडौं : साझा प्रकाशन, सन् १९९०।

४. न्यौपाने, टङ्कप्रसाद, **भाषाविज्ञानको रूपरेखा**, काठमाडौं : जय प्रकाशनसन् २००५।

५. पराजुली,कृष्णप्रसाद, **राम्रो रचना मिठो नेपाली**, काठमाडौं : साझा प्रकाशन, सन् १९९८।

६. बन्धु, चुडामणि, **भाषाविज्ञान**, काठमाडौं : साझा प्रकाशन, सन् २००४।

७. भण्डारी, राजेन्द्र, सम, पारसमणि, **भाषा-साहित्य**, गान्तोक : सहकारी लिमिटेड, सन् २००२।

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31. PHILOSOPHY

About FYUP Programme of Philosophy:

The Programme will have a trust in developing what philosopher Hannah Arendt had once termed as 'life of the mind'. Similar expression is found in noted Indian Philosopher Krishna Chandra Bhattacharya, who called the growth of intellect as 'swaraj in ideas'. The Programme in Philosophy aims at developing critical thinking and an ability to raise significant questions on any knowledge related issue from multiple points of view such as metaphysical, spiritual, logical, scientific, ontological, ethical and a host of such categories of reasoning and ideas.

On the practical side, learning philosophy would enable students to distinguish between what is rational and what is irrational, what is logical and what it illogical. Going deeper, philosophical aptitude would help in developing deeper understanding of a text or a formula or even a software program. As philosophers tend to find out the basic structure of understanding in any given frame of knowledge, philosophical abilitiy to reason, argue and contradict the given shall yield a substantive amount of high level and mature analytical ability and practical approaches in applying those analytical finds.

Programme Outcomes:

1) Enhancement of ability for Critical analysis of a situation, problem or text of knowledge to a level that would mark originality and maturity.
2) Development of refined and sophisticated capability to self-assess and to respond to genuine needs of humanity in terms of universal values like goodness, truth and beauty.
3) Practical skills of analytical, logical and linguistic analysis to solving problems that arise at every walk of life.
4) A virtuous, moral and aesthetic selfhood that recognizes difference and looks for underlying unity between school of thoughts and their applied dimensions
5) Better managerial skills to manage human relations and ability to deliberate and resolve conflicts by way of providing good reasons wherever called for.
6) A versatile, multidisciplinary capacity to see connections between various branches of science, metaphysics, religion and any collectively arrived at decision-making process.
7) Development of healthy, accommodative, inclusive approaches to issue of life creating good citizenship values inculcated through philosophical knowledge.
8) Scientific bent of mind, democratic temperament and ability to draw distinctions that clarifies any confusion centering an issue or in case of difference of opinions.
9) Induction into a synthesizing role of culture and education by philosophical combining of disciplines and traditions of thought that are very important from historical and civilizational points of view.

10) An artistic, creative, rigorous and a sharp capacity to grasp and understand things at a deeper level than what goes by commonly held beliefs.

11) Achievement of a potential to be different in a purposive and productive manner that bridges between theory and practice.

PHI-100: UNDERSTANDING PHILOSOPHY

(Contact Hours: 60, Credits: 4)

Course Objectives (CO): To impart basics of knowledge through sophisticated philosophical approaches that makes a first-hand knowledge of reality possible.

Learning Outcomes (LO): Analytical and logical ability, capacity to apply philosophical knowledge in practical contexts of life, Science, human values and Technology.

Unit-I: Meaning and Method of Philosophy

   (a) Meaning of Philosophy
   (b) Relation of Philosophy to Science
   (c) Relation of Philosophy to Religion

Unit-II: Sources of Knowledge

   (a) Western: Empiricism, Rationalism and Critical Philosophy
   (b) Indian: Perception, Inference and Verbal Testimony
   (c) Phenomenological: Experience and Transcendence

Unit-III: Theories of Truth

   (a) Coherence
   (b) Correspondence
   (c) Pragmatism

Unit-IV: Theories of Reality

   (a) Monism, Dualism and Pluralism
   (b) Realism and Idealism
   (c) Internal Realism

Suggested Readings:

   1. Hospers, John, *An Introduction to Philosophical Analysis*, Allied Publishers, New Delhi,1980.

2. Russell, Bertrand ,*Problems of Philosophy*, Oxford University Press, Oxford, 1912.
3. Hiriyanna, M, *The Essentials of Indian Philosophy*, George Allen & Unwin,London, 1985.
4. Smith, N. K. (trans.),*Immanuel Kant's Critique of Pure Reason*, Palgrave Macmillan, London, 2007.
5. Sharma, C. D., *Critical Survey of Indian Philosophy*, Motilal Banarasidass, New Delhi, 1975.
6. Datta,D. M., Chatterjee, S., *Introduction to Indian Philosophy*, University of Calcutta, Kolkata,1984.
7. Lehrer, Keith, *Knowledge*, Clarendon Press, Oxford, 1974.
8. Niiniluoto, Ilkka, *Critical Scientific Realism*, Chapter 7, Oxford University Press, London, 2002.
9. Goldberg, S.C., *Relying on others: An essay in Epistemology*, Oxford University Press, London, 2012.

PHI-150: ETHICS

(Contact Hours: 60, Credits: 4)

Course Objectives (CO): Teaching students basic theories of Ethics, how to argue in Ethics.

Learning Outcomes (LO): Making students aware of primacy of Ethics in everyday affair, Making students capable of establishing ethical view and practice in every aspect of personal and social .

Unit-I: Nature and Scope of Ethics

   (a) Nature and Scope of Moral Philosophy
   (b) Nature of Moral Judgments
   (c) Ethics and Meta-ethics

Unit-II: Moral Concepts and Issues in Applied Ethics

   (a) Good, Right, Duty and Virtue
   (b) Purusartha, Niskama Karma and Ahimsa
   (c) Public and Private Good

Unit-III:Ethical Theories

   (a) Teleological: Hedonism, Utilitarianism

(b) Deontological (Kant's Categorical Imperative)

(c) Moral Education

Unit-IV:Theories of Punishment

(a) Preventive

(b) Reformative

(c) Retributive

Suggested Readings:

1. MacIntyre, Alasdair., *A Short History of Ethics*, Rutledge and Kegan Paul, London, 1967.
2. Frankena, William K.,*Ethics,* Prentice Hall of India, New Delhi, 1982.
3. Walzer, Michael, *Spheres of Justice: A Defense of Pluralism and Equality*, Basic Books,New York, 1983
4. Taylor, Michael, *Anarchy and Cooperation*,Wiley Blackwell, New York,1976.
5. Jain,Amit, *Karma, Dharma and Moksha: The Art and Science of Living Dying and Enlightenment*, D.K. Printworld, New Delhi,2012.
6. Sharma, C. D., *Critical Survey of Indian Philosophy*, Motilal Banarasidass, New Delhi, 1975.
7. Datta,D. M., Chatterjee, S, *Introduction to Indian Philosophy*, University of Calcutta, Kolkata, 1984.
8. Hand, M., *A Theory of Moral Education*, Routledge, London, 2018.
9. Hiriyanna, M., *The Essentials of Indian Philosophy*, London George Allen & Unwin 1985.
10. Shaida, S. A*., Problems of Ethics*, Spectrum Publications, New Delhi, 2003.
11. Prasad, R., *Karma, Causation and Retributive Morality: Conceptual essays in Ethics and Metaethics*, ICPR and South Asia Books, New Delhi, 1990.
12. Kovesi, Julius, *Moral Notion*, Routledge & Kegan Paul, London, 1969.
13. Prasad, R.**, "**The theory of Purusārthas: Revaluation and reconstruction", *Journal of Indian Philosophy*, vol.9, pp.49–76, 1981.

32. PHYSICS

Preface

The Four Years UG Physics syllabus under NEP-2020 has been framed to enhance the knowledge acquired at the +2 level and to motivate and inspire the students to create deep interest in Physics.

Programme Outcomes

Upon successful completion of these courses, the students will be able to understand basic laws of Physics and their applications in solving most of the microscopic and macroscopic dimensional problems in nature.

PHY-100: MATHEMATICAL PHYSICS, PROPERTIES OF MATTER AND WAVES

(Contact Hours: 75, Credits: 4)

Course Objectives:Mathematical physics serves as a tool to understand physics. Mechanics helps the students to understand the basic laws of physics in day-to-day life and Waves and Vibrations help to understand different types of wave motion in physical systems. Practical will help students to determine and verify physical quantities related to mechanics and waves.

Learning Outcomes:Upon successful completion of this course, the students will be able to understand how to solve various problems of physics using mathematical tools; various laws of motion and properties of matter using mechanics; waves and oscillation in different physical media. These principles are basic requirements for higher studies of physics. The practical performed by the students will help them to measure some of the important physical quantities related to mechanics and waves for better understanding of the topics.

Unit I: Mathematical Physics-I   **(15 hours)**

Vector Calculus: Scalar and vector field, Definitions and significance of Gradient, Divergence and Curl, Gauss's divergence theorem, Stoke's Theorem, Green's Theorem (without proofs) in Cartesian coordinates.

Coordinate systems: Polar, Spherical and Cylindrical co-ordinates.

Differential Equations: Ordinary differential equation, 1st order homogeneous linear differential equations and 2nd order homogeneous linear differential equations with constant coefficients.

Unit II: Mechanics and Properties of Matter (15 hours)

Newton's Laws of Motion, Free body diagram and applications.

System of particles and rigid body motion: Center of Mass (CM) and Laboratory frames, motion of the center of mass. Linear and angular momentum of a system of particles. Moment of inertia of sphere, disc and cylinder.

Frames of reference: Inertial and non-inertial frames, uniformly rotating frame of references, Centrifugal and Coriolis force and their applications.

Elasticity: Hooke's Law, Elastic constants and their relations, Poisson ratio, torsional cylinder, bending of beam, cantilever (weightless) loaded at the free end.

Fluid Dynamics: Equation of continuity, Bernoulli's theorem and its applications, Surface tension and surface energy, Capillarity and formation of droplets, Streamline and turbulent flow, Viscosity, Terminal velocity, Stoke's Law, Poiseulle's equation.

Unit III: Waves and Oscillations (15 hours)

Simple harmonic motion (SHM): Differential equation of simple harmonic motion and its solution. Superposition of two simple harmonic oscillations. Lissajous figures and their uses.

Damped and forced oscillations: Damped SHM, energy of damped SHM, Q-value of damped oscillations. Forced vibrations, Transients and steady state oscillations of forced vibrations, and condition of resonance.

Wave motion: Representation of plane progressive wave, Classical wave equation of a plane progressive wave and its general solution. Energy and energy density of a plane progressive wave. Qualitative idea of spherical waves. Phase velocity and group velocity.

Unit IV: Experimental Physics-I (30 hours)

1. Determination of the value of acceleration due to gravity (g) using Bar Pendulum.

2. Determination of the acceleration of gravity (g) using Kater's Pendulum.

3. Determination of the moment of inertia of a regular solid about an axis passing through its centre of gravity using torsional pendulum.

4. Determination of the rigidity modulus of a cylindrical body by static torsion apparatus.

5. Determination of co-efficient of viscosity of liquid by capillary tube method.

6. Determination of the surface tension of a liquid by Jaeger's method

7. Determination of the frequency of a tuning fork by Melde's method.

8. Determination of Young Modulus of a wire by Searle's Method.

Suggested readings: (All latest edition)

1. Essential of Mathematical methods K. F. Riley and M. P. Hobson, Cambridge University (2011).
2. An Introduction to Mechanics: Daniel Kleppner and Robert Kolenkow, Cambridge University Press (2011).
3. A Treatise on General Properties of Matter: Chatterjee and Sengupta, New Central book Agency, Kolkata (2011).
4. Mechanics: J. C. Upadyaya, Himalaya Publishing House, Agra (1999).
5. The Physics of Waves and Oscillations, N. Bajaj, McGraw Hill Education, Europe (2017).
6. Schaum's Outline of Mathematics for Physics Students (Schaum's Outline Series) (2011).
7. Mechanics: D. S. Mathur, S. Chand & Co., New Delhi (2000).
6. Acoustics, Waves and Oscillations: S. N. Sen, New Age International (1990).
7. Waves and Oscillation: R. N. Choudhuri, New Age International (2010).
8. B. Sc. Practical Physics, C. L. Arora, S. Chand & Co. (2005).
9. A Text Book of Practical Physics, S. K. Ghosh, New Central Book Agency, Kolkata (2004).
10. A Text Book on Practical Physics, K. G. Majumdar& B. Ghosh, Sreedhar Publishers, Calcutta

PHY-150: ELECTRICITY AND MAGNETISM, OPTICS AND ELECTRONICS

(Contact Hours: 75, Credits: 4)

Course Objectives:The course on Electromagnetism will help the students to understand the effect of charge at rest and in motion and dielectric properties of the matter. Study of geometrical optics will help the students to picturize image formation. The basics of electronics are required to understand the different functions of electronic devices. The practical will help the students to determine physical properties of electrical and electronic components and also help them to understand the optics related topics.

Learning Outcomes:Upon successful completion of this course, the students will be able to understand the basic laws of electricity and magnetism, the formation of optical images, concepts of both analog and digital electronics. The practical will help the students in handling the multimeter, potentiometer and function generators, whereas the experiments performed on optics will help to measure different parameters of lenses.

Unit I: Electricity and Magnetism (15 hours)

Coulomb's law and Electric field, Electrostatic potential, Gauss' law in electrostatics (both differential and integral forms) and its application due to a linearly charged rod and a solid sphere, Polarization and displacement vector, Gauss' law in dielectric media.

Biot and Savart's Law and its application due to a straight conductor and solenoid, Ampere's law and its applications, Law of magnetostatics in differential forms.

Integral and Differential form of Faraday's laws, Modification of Ampere's law, Maxwell's equation in free space and in dielectric medium.

Circuits, Kirchhoff's Laws, Series and Parallel resistances, Capacitances, Parallel plate capacitor. Use of complex numbers to find impedance and voltage in series and parallel LCR circuits, Power dissipation, Quality factor and Resonance.

Unit II: Theory of image formation and matrix optics (15 hours)

Fermat's Principle and its applications to reflection and refraction at plane and curved boundaries.

General theory of image formation: Cardinal points of an optical system, Refraction through a thick lens, Relation between the distances of cardinal points, Combination of thin lenses separated by a distance.

Matrix optics: Reflection, refraction and translation matrices, Lens maker formula by matrix method, System matrix of thin and thick lens, Equation of image plane.

Unit III: Electronics-I (15 hours)

Binary system, Binary to decimal and decimal to binary conversion, Binary arithmetic-addition and subtraction, Signed binary numbers, two's complement scheme.

Logic gates: OR, AND, NOT gates and their realization with diodes and transistors, NOR and NAND as universal gates.

Boolean algebra: De' Morgan's theorems, Boolean expression, Simplification of Boolean expression and their representation with basic logic gates.

Diodes and their applications, Bipolar junction transistor (BJT): Different current components and characteristics of a BJT, CB and CE configurations and related characteristics, active, cut-off and saturation regions, current amplification factors in CB and CE configuration.

Unit IV: Experimental Physics-II (30 hours)

1. Determination of the value of an unknown low resistance using potentiometer.

2. Determination of the value of EMF of a Cell using potentiometer.

3. Determination of the resistance per unit length of the meter bridge wire by Carey-Foster method.

4. Determination of the value of unknown capacitance using De-Sauty's method.

5. Determination of the focal length of two thin lenses in contact using displacement method and verification of the result by measuring the focal length of individual lenses.

6. Determination of refractive index of the materials of a prism by measuring angle of prism and minimum deviation using spectrometer.

7. To find the frequency response of series LCR circuit.

8. To find the frequency response of parallel LCR circuit.

9. Construction and verification of AND and OR gates using diodes and resistors.

10. Study the characteristics of a transistor (CE/CB mode).

Suggested readings: (All latest edition)

1. Foundations of Electromagnetic Theory, John R. Reitz, Frederick J. Milford, and Robert W. Christy, Pearson (2008).
2. Electricity and Magnetism: D. C. Tayal, Himalayan Publisher (2019).
3. Electricity and Magnetism: K. K. Tewari, S. Chand & Co., New Delhi (2012).
4. Electricity and Magnetism: Edward M. Purcell, Mc-Graw Hill Education (2013).
5. A textbook of Optics: D. N. Subrahmanyam, BrijLal and M. N. Avadhanulu, S. Chand & Co., New Delhi (2012).
6. Physical Optics: A. K. Ghatak, Tata Mc-Graw Hill India (1997).
7. Modern Optics: A. B. Gupta, Books and Allied (P) Ltd. (2006).
8. Basic Electronics: D. C. Tayal, Himalayan Publisher (2010).
9. Basic Electronics: Devices, Circuits and its Fundamentals: S. Kal, Prentice Hall India, New Delhi (2002).
10. Principles of Electronics: V. K. Mehta and R. Mehta, S. Chand & Co., New Delhi (2005).
11. B. Sc. Practical Physics, C. L. Arora, S. Chand & Co. (2005).
12. A textbook of Practical Physics, S. Ghosh, New Central Book Agency, Kolkata (2004).
13. A textbook of Practical Physics, K. G. Mazumdar, Syndicate Press (2006).
14. B. Sc. Practical Physics, Harnam Singh, P. S. Hemne, S. Chand & Co., New Delhi (2011).

33. POLITICAL SCIENCE

Preface

About the Programme: The four-year undergraduate programme (FYUG),revised as per the New Education Policy 2020 framework is designed to enhance the basic theoretical, concetual and analytical skills of the students. The undergraduate Programme in PoliticalScience continues to be among the most sought-after and prestigious programmesoffered at the University. The course covers the entire spectrum of the major sub-discipline of Political Science, Multidisciplinary Courses (MDCs), SkillEnhancement Courses (SECs), Ability Enhancement Courses (AECs) and Value AddedCourses (VACs).

Programme Outcomes: The studentswill be able to understand the basic concepts,foundational, theoretical and advancedknowledge in Political Science. Courses on Multidisciplinary, SkillEnhancement, Ability Enhancement and Value Added Courses will broaden theirunderstanding of the issues and problems in addition to their core discipline.

POL-100: POLITICAL THEORY

(Contact Hours: 60, Credits: 4)

Course Objectives:

This course aims to introduce basic concepts, ideas and theories in Political Science. It will also examine the various perspectives, dimensions and relevance of political theory.

Learning Outcomes:

This course will enable students to understand the basic political theory concepts and engage them in critically analyzing the subject. It will also provide an opportunity for the students to familiarize themselves with contemporary interpretations of the theories and views of scholars for a deeper understanding of the subject.

Unit 1: Nature, Scope and Significance of Political Theory.
Theories of the Origin of State: Social Contract,Evolutionary and Marxist.
Sovereignty: Nature, Characteristics, Monistic and Pluralistic theories.

Unit II: Rights: Natural, Legal and Marxist Theory of Rights.
Liberty: Negative and Positive.
Equality:Kinds of Equality, Relationship between Liberty and Equality.

Unit III: Law: Natural, Sociological and Marxist Theories of Law.
Justice: Natural, Distributive and Social Justice.
Political Obligation: Grounds of Political Obligation and Resistance.

Unit IV: Dimensions of Democracy: Social, Economic and Political;
Liberal and Marxist Perspectives.

Suggested Readings:

Barker, E., *Principles of Social and Political Theory*, Calcutta, Oxford University Press, 1976.
Barry, N.P., *Introduction to Modern Political Theory*, London, Macmillan, 1995.
Bercht, A., *Political Theory: The Foundations of Twentieth Century Political Thought*, Bombay, The Times of India Press, 1965.
Bhargava, Rajib and A. Acharya, *Political Theory: An Introduction*, Pearson, 2008
Cunningham, F., *Theories of Democracy – A Critical Introduction*, London and New York, Routledge, 2002.
Dahl, R., *A Preface to Democratic Theory*, Chicago, University of Chicago Press, 1965.
Engels F., *Origin of Family, Private Property and the State*, 1902 (English Edition)
Dunn, J., *Modern Revolutions*, London, The Clarendon Press, 1989.
Held, D., *Models of Democracy*, Cambridge, Polity Press, 1987.
-----------, *PoliticalTheory Today*, Cambridge, Polity Press, 1991.
Heywood, Andrew, *Political Theory: An Introduction*, New York, Palgrave Macmillan, 2002.
Johari, J. C., *Contemporary Political Theory*, New Delhi, Sterling, 2004.
---------------, *Principles of Modern Political Science*, New Delhi, Sterling, 2004.
Kukathas, C and P. Pettit, *Rawls' A Theory of Justice and its Critics,* Cambridge, Polity Press, 1998.
Macpherson, C.B., *Democratic Theory: Essays in Retrieval*, Oxford, The Clarendon Press, 1977.
Macpherson, C.B., *The Real World of Democracy*, Oxford University Press, 1970.
Milliband, R., *Marxism and Politics*, Oxford, Oxford University Press, 1977
Poggi, G., *The Sate: Its Nature, Development and Prospects*, Cambridge, Polity Press, 1990.
Ramaswamy, S., *Political Theory: Ideas and Concepts*, Delhi, Macmillan, 2002.
Sartori, G., *Democratic Theory*, Oxford University Press, 1974.
Singh, R., *Reason, Revolution and Political Theory*, New Delhi, People's Publishing House, 1997.Thakurdas, F., *Essays in Political Theory*, New Delhi, Gitanjali, 1992.
Varma, S.P., *Modern Political Theory*, New Delhi, Vikas, 1993.
Vincent Andrew, *The Nature of Political Theory*, OUP, 2007.
Wasby, S., *Political Science: The Discipline and its Dimensions*, Calcutta, Scientific Book Agency, 1970.

POL-150: INDIAN POLITICAL SYSTEM

(Contact Hours: 60, Credits: 4)

Course Objectives:

The paper focuses on the political processes and the actual functioning of the Indian political system with an emphasis on the role of social and economic processes.

Learning Outcomes:

The paper will familiarise students with the dynamics of Indian Politics and enable them to understand both constitutional and the socio-economic dimensions of the Indian political system.

Unit I: Nature of Indian State: Historical and Ideological basis.

Fundamental Rights, Duties and Directive Principles of State Policy.

Unit II: Federalism and Parliamentary Democracy: Union-State Relations,

Working of Parliament, Judicial Review and Judicial Activism.

Unit III: Changing Nature of Party System, Role of Political Parties and Pressure groups in Indian politics.

Unit IV: Globalization, Economic Liberalization and Indian Politics.

Suggested Readings:

Abbas, H. et.al (eds*), Indian Government and Politics*, Pearson, New Delhi, 2011.

Austin, G., *Working a Democratic Constitution: The Indian Experience*, Delhi, Oxford University Press, 2000.

Basu, D.D., *An Introduction to the Constitution of India,* New Delhi, Prentice Hall, 1994.

Baxi, U., *The Indian Supreme Court and Politics*, Delhi, Eastern Book Company, 1980.

Baxi and B. Parekh (ed.), *Crises and Change in ContemporaryIndia*, New Delhi, Sage, 1994.

Bhambri, C.P., *The Indian State: Fifty Years*, New Delhi, Shipra, 1999.

Brass, P., *Politics of India since Independence, 2ⁿᵈ edn.*, Cambridge, Cambridge University Press, 1994.

-------------, Caste, *Faction and Party in Indian Politics, 2 Vols.*, Delhi, Chanakya Publications, 1984-1985.

------------, *Ethnic Groups and the State,* London, Croom Heim, 1985.

------------, *Language, Religion and Politics in North Indi*a, London, Cambridge University Press, 1974.

Frankel, F. R. et.al., (eds.) *Transforming India: Social and Political Dynamics of Democracy*, New Delhi, OUP, 2000.

R.L. Hardgrave, *India: Government and Politics in a Developing Nation*, New York, Harcourt, Brace and World, 1965.

Hassan, Zoya, (ed.), *Party and Party Politics in India*, New Delhi, OUP, 2003.

Jayal, N. G., (ed.) *Democracy in India*, Delhi, Oxford University Press, 2001.

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Kohli, A., *Democracy and Discontent: India's Growing Crisis of Governability*, Cambridge, Cambridge University Press, 1991.

M.P. Singh and S. R. Raj (eds), *Indian Political System,* Pearson, New Delhi, 2012

Mukherjee, Rahul, *India's Economic Transition*, New Delhi, OPU, 2007

Narang, A.S., *Indian Government and Politics*, Gitanjali Publishing House, New Delhi, 2012.

Shakir, M., *State & Politics in Contemporary India*, Delhi, Ajanta, 1986.

Omvedt, Gail., (ed.) *Land, Caste and Politics in Indian States*, Delhi, 1981.

Oommen, T.K., *Protest and Change, Study in Social Movements*, New Delhi, Sage, 1990.

Pylee, M.V., *An Introduction to the Constitution of India*, New Delhi, Vikas, 1998.

Saez, L., *Federation Without a Centre: The Impact of Political and Economic Reform on India's Federal System*, New Delhi, Sage, 2002.

Sathe, S.P., *Judicial Activism in India*, New Delhi, OUP, 2002.

Thakur, R., *The Government & Politics of India*, London, Macmillan, 1998.

Vanaik, A., *The Pointful Transition: Bourgeois Democracy in India*, London, Verso, 1990.

Warjri, Antarwell., *The Role of Political Parties in the Success and Failures of Coalition Governments in Meghalaya*, RI Khasi Book Agency, Shillong, Meghalaya, 2022

34. SOCIAL WORK

Programme Outcome :

The Social Work programme provides students with knowledge, values and skills necessary for culturally sensitive generalist social work practice. The curriculum is designed to prepare students to provide services that aid in well-being of individuals, families, groups, organizations and communities. The students are expected to integrate theoretical and applied knowledge in order to engage in the planned change processes at the micro, mezzo and macro levels of practice and overall promotion of social, economic and sustainable just society.

BSW-100: SOCIAL WORK: AN INTRODUCTION

(Contact Hours: 60, Credits: 4)

Course Objectives: To orient the students with the basic concepts relevant to Social Work practice.

Learning Outcomes: Students will become aware of the development of Social Work practice, its nature and skills.

CONTENTS:

Unit I: Introducing Social Work:
- Nature, Definition, Scope, Philosophy, Values, Ethics, Assumptions,
- Methods, Functions and Principles in Social Work;
- Roles of a Social worker;

Unit II: Historical development of Social Work:
- Development of professional social work- USA, UK, India
- Social work as a profession
- Social work Education in India
- Indigenisation of Social work

Unit III: Basic concepts relating to Social work:
- Social work, Social service, Social welfare, Social reforms
- Social justice, Social security, Social action, Social development

- Voluntary Organisations in India

Unit IV: Tools and Processes in Social work
- **Social Work Process:** Study, Assessment, Goal formation, Treatment, Evaluation, Follow-up and Termination
- **Social Work Tools:** Contacting key persons, Collateral Contacts, Observation, Interviewing, Home- visits and Recording

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Chowdhury D Paul. (1992) *Introduction to Social work*. New Delhi: Atma Ram and Sons
Compton, B. R. (1979): Social work processes, Illinios: The Dorsey Press.
Friedlander Walter A: Concepts and Methods of Social Work, New Delhi, PrenticeHall.1964.
Gore, M. S. (1965) Social work and Social work Education, New Delhi: Asia Publishing House.
Jainendra Kumar Jha: Encyclopaedia of Social Work 1st September 2002, India
Madan, G. R. (2000): Indian Social Problems – Social disorganization and Reconstruction, Allied Publishing, New Delhi.
Mishra, P. D, 1st January 1994, New Delhi, India - Social Work Philosophy & Methods
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Moorthy, M.V and Narayana Rao S: Field work in Social Work, Dept of Sociology and Social Work, Andra University, Waltair, 1970.
Prakash avi and Devi Rameshwar (2001): Social Work Practice in India, Mangal Deep Publication.
Publication Division, Ministry of Welfare, Govt of India: Encyclopaedia of Social Work in India (All Volumes) 1987.
Skidmore, Rex A and Thackeray, Milton G: Introduction to Social Work, Prentice Hall, Englewood Cliffs, New Jersey, 1982.
Rameshwari Devi and Ravi Prakash: Social Work Methods, Practices and Perspectives
Upadhya, R. K. 1st January 2021, Social Case work, New Delhi, India
Wadia, A. R. (1968): History and Philosophy of Social Work in India, Mumbai: Allied Publisher Private Ltd.

BSW-150: ORIENTATION FOR FIELD-WORK

(Credits: 4)

Course Objectives: to orient and familiarize the students with different Non-governmental and Governmental settings..

Learning Outcomes: Through the field visits students will develop an understanding of services provided by various organizations in terms of meeting the needs of the people. This will help them gain practical knowledge.

GUIDELINES FOR ORIENTATION VISIT:

The college shall arrange 10 orientation visits for 10 days of fieldwork sessions for the students. During the orientation visits, the students will develop an understanding of different types of activities/action, research and training programmes and projects run by these organizations. Each student shall be required to submit the report of orientation visits within 15 days of such visit. The teacher and the fieldwork coordinator have to accompany the students for such visits.

The understanding acquired by the students shall be evaluated as part of the second semester examinations and the field supervisors are expected to assess the capability achieved by the students, and offer suggestions and guidelines to the students for further clarity and improvement.

The Orientation visit should be on any of the following thematic areas/organisations given under:

- **Rehabilitation centre**
- **Old age home**
- **NGOs working for vulnerable Women**
- **Vulnerable Children**
- **Destitute –Homeless, Refugees, Victims of Disasters**
- **Juvenile Home**
- **Community development**
- **Mental Health**
- **Correctional Settings**
- **Domestic Workers**
- **Institution for the specially-abled**
- **Hospitals**

- **SHGs**

The students are required to interact with the various personnel working in the agencies/ organizations and collect the information on the following points during their visits which will be incorporated in their orientation report.

1. History and philosophy of the agency/organization
2. Organizational structure of the agency/organization with special emphasis on the category of personnel engaged
3. Area of working of the agency/organization with reference to the different field of social work
4. The client, group, agency, or the organization served by the agency/organization
5. Networking strategies with similar types of the agency/organization
6. Sources of funding of the agency/organization
7. Intervention strategies adopted by the agency/organization for serving the various groups
8. Success stories, if any, of the agency/organization

The student shall undergo 10 days of fieldwork lab sessions as per the 10 orientation visits. The objective of the fieldwork lab session is to make students understand the basic components required in report writing and to brief the students on the basic social work knowledge, skills and tools to be used during the orientation visits. An IC/GC with the student is paramount to make them understand the importance of Orientation Visits and report writing.

Evaluation Criteria: the students shall be evaluated on the learnings acquired during the Orientation Visits which is based on the basic social work knowledge and on their fieldwork reports (Internal Assessment) and fieldwork viva (External Assessment). The total marks of the assessment shall be 100. Internal assessment shall be 25 marks based upon each of the skills and tools as mentioned in this paper, with equal weightage. The external assessment or the fieldwork viva shall be of 75 marks and will be based on the comprehensive summary of all the reports on the orientation visits as well as the knowledge acquired during the fieldwork with respect to the mentioned requirements.

35. SOCIOLOGY

Preface

About the FYUG programme of Sociology: The four year undergraduate programme (FYUG) has been devised as per New Education Policy 2020 framework. Under this programme, various courses such as major courses, multi disciplinary courses (MDCs), skill enhancement courses (SECs), ability enhancement courses (AECs) value added courses (VACs) will be offered to the students.

Programme Outcomes (POs): The students will be able to understand, examine and analyse the conceptual and theoretical issues in sociology which will enable them to draw insights and articulate the empirical events. Multi-disciplinary courses will help them to widen their understanding on the issues and problems outside their core discipline. Furthermore, the students will get an opportunity to enhance their skills on the theme of their choice.

SOC-100: INTRODUCTION TO SOCIOLOGY

(Contact Hours: 60, Credits: 4)

Course Objectives (COs): The course intends to familiarize the students with the origin of sociology as a discipline.

Learning Outcomes (LOs): The students will be able to develop insights to understand the sociological concepts which will help them to examine the sociological issues and problems. The students will learn nature, scope and methods of sociology. They will also learn various concepts of sociology.

Unit I- Sociology and its Trajectory

Definition, Origin and Development of Sociology

Nature, Scope and Method of Sociology

Relationship with other Social Sciences/Humanities: Political Science, History, Philosophy and Anthropology

Unit II - Sociological Concepts

Society and Community, Associations and Institutions

Status and Role; Structure and Function

Folkways and Mores; Norms and Values
Unit III - Socialization and Culture

Socialization: Meaning, Stages and Agencies

Culture: Meaning, Elements and Cultural Lag

Civilization: Meaning and Distinction with Culture
Unit IV – Social Change

Evolution, Progress and Development

Factors of Social Change: Culture, Demography and Technology

Agencies of Social Change: Education, Law and Planning

Suggested readings:

Abraham, M. Francis. 2006. *Contemporary Sociology*. New Delhi: OUP.

Albrow, Martin. 1999. *Sociology*: The Basics. London: Routledge.

Alex, Inkeles. 1979. *Sociology*. London: Prentice Hall.

Bottomore, T. B. 2014. *Sociology*. London: George Allen and Unwin.

Davis, K. 1949. *Human Society*. New Delhi. The Macmillan Co.

Giddens , A. 2021. *Sociology*. Cambridge: Polity Press.

Ginsberg, Morris. 2016. *Sociology*. California: OUP.

Gisbert, P. 2010. *Fundamentals of Sociology*. New Delhi: Orient Blackswan.

Haralambos, M. 1980. *Sociology: Themes and Perspectives*. New Delhi: OUP.

SOC-150: PRINCIPLES OF SOCIOLOGY

(Contact Hours: 60, Credits: 4)

Course Objectives (COs): The course intends to familiarise the students with various social institutions and sociological concepts.

Learning Outcomes (LOs): The students will be able to understand the aspects of diverse social institutions such as marriage, family, polity, economy and religion. The students will also learn sociological concepts such as social control, social groups and social process which will help them to analyse the sociological issues and problems.

Unit I - Social Institutions I:

Marriage: Meaning and Types, Functions

Family: Meaning, Types and Changes

Kinship: Meaning, Types and Usages

Unit II - Social Institutions II:

Polity: Stateless Societies, State and Nation

Economy: Production, Consumption, Distribution and Property

Religion: Beliefs and Rituals, Sacred and Profane

Unit III - Social Control:

Meaning and Definition

Types of Social Control- Formal and Informal: Law; Custom

Conformity, Deviance and Delinquency

Unit IV – Social Group and Social Processes:

Social Group: Meaning and Types (Primary and Secondary, Reference Groups, In-Group and Out-Group)

Interaction, Cooperation, Competition, Conflict

Assimilation, Acculturation and Accommodation

Suggested readings:

Abraham, M. Francis. 2006. *Contemporary Sociology*. New Delhi: OUP.

Albrow, Martin. 1999. *Sociology: The Basics*. London: Routledge.

Alex, Inkeles. 1979. *Sociology*. London: Prentice Hall.

Bottomore, T. B. 2014. *Sociology.* London: George Allen and Unwin.

Davis, K. 1949. *Human Society*. New Delhi. The Macmillan Co.

Giddens , A. 1989. *Sociology*. Cambridge: Polity Press.

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Gisbert, P. 2010. *Fundamentals of Sociology*. New Delhi: Orient Blackswan.

Haralambos, M. 1980. *Sociology: Themes and Perspectives*. New Delhi: OUP.

Fox, Robin. 1984. *Kinship and Marriage: An Anthropological Perspective* Harmondsworth: Penguin Books.

Goode, William J.1984. *Family*. New Delhi: Prentice Hall of India.

Majumdar, D.N.and Madan, T. N. 1956. *An Introduction to Social Anthropology*. Bombay: Asia Publishing House.

Uberoi, P. (ed.). 1994. *Family, Kinship and Marriage in India*. Delhi: OUP.

36. STATISTICS

Preface:

The Four-Year Undergraduate (FYUG) programme in Statistics offers courses in Statistical theory and methods with applications to various fields including Biology, Environment and Health studies, Agriculture, Economics, Business,Engineering,and research methodology.

Programme Outcomes (POs): On successful completion of the course, a student is expected learn scientific methodsand tools to transform data into meaningful and actionable information and acquireevidence-based decision-making skills under uncertainty. A student is expected to develop mathematical comprehension ability essential for tackling diverse statistical applications.

STA-100: INTRODUCTORY STATISTICS

(Contact Hours: 75, Credits: 4)

Course Objectives: To impart the students a thorough knowledge on the development, meaning and definition of Statistics, various types of data, graphical representation of data, concept of concept of univariate, bivariate and multivariate data, descriptive statistics, correlation, regression, analysis of bivariate data and theory of attributes.

Learning Outcomes: Upon successful completion of this course, the students will understand how the subject Statistics has emerged and developed in analysing data. Students will understand different data types on the ways to represent them. They will get idea of measuring relationship between variables.

UNIT-I: Introduction to Statistics

Historical development of Statistics. Definition and meaning of Statistics. Collection of Data: meaning and need of data, primary and secondary data, scientific methods of collecting primary data,sources of secondary data. Types of data: Qualitative, Quantitative, Cross-Sectional, Time series, Discrete and Continuous,Univariate, bivariate and multivariate data. Scales of Measurement. Presentation of data (Univariate): Classification, tabulation and diagrammatic representation of data.

UNIT-II: Descriptive measures

Descriptive Measures of data- concepts and properties of different measures of central tendency and dispersion (univariate data) and their application in different scales of measurement. Moments; skewness and kurtosis.

UNIT-III: Bivariate Analysis and Theory of Attributes

Tabulation and diagrammatic representation of bivariate data: scatter diagram. Covariance, correlation and its properties. Rank correlation. Regression, Principle of least squares and fitting of Linear regression.
Analysis of Categorical Data: Consistency of Categorical Data. Independence and Associationof Attributes.

UNIT-IV: Practical (30 hours)

Problem on drawing of line, bar, multiple bar, divided bar & pie diagrammes, Problem on drawing of histogram, frequency polygon, frequency curve, ogives. Problem on measures of central tendency. Problem on measures of dispersion. Problem on moments (up to 4th Orders). Problem on coefficients of skewness & kurtosis. Problem on correlation and regression coefficients (for both, grouped & ungrouped data). Problem on fitting of Straight Line. Problem on Spearman's rank correlation coefficient.

Suggested readings:

1. Goon, A.M., Gupta, M.K. and Dasgupta, B. (2002): Fundamentals of Statistics, Vol. I& II,8th Edn. The World Press, Kolkata.
2. Gupta, S. C., & Kapoor, V. K. (2002). Fundamental of Mathematical Statistics. Sultan Chand & sons.
3. Mann, Prem S. (2007). Introductory Statistics, 7th Edition. John Wiley & Sons.
4. Medhi, J. (2006). Statistical Methods: An Introductory Text. New Age International (Pvt) Limited, New Delhi.
5. Agarwal, B.L. (2020). Basic Statistics, 6th Edition. New Age International (P) Limited.
6. Ott, R Lyman., Longnecker Michael. (2010). An Introduction to Statistical Methods and Data Analysis, 6th Edition. Cengage Learning.
7. Mood, A.M., Graybill, F.A., Boes, D.C. (2007). Introduction to the Theory of Statistics, 3rd Edition. Tata McGraw-Hill Education Pvt Ltd, Chennai.
8. Miller, Irwin., Miller, Marylees. (2006). John E Freund's Mathematical Statistics with Applications, 8th Edition. Pearson Education India, New Delhi.

STA-150: INTRODUCTION TO PROBABILITY AND APPLIED STATISTICS

(Contact Hours: 75, Credits: 4)

Course Objectives: To impart the students a knowledge on the concept of probability and to prepare them for careers in business, industry, or government.

Learning Outcomes: Upon successful completion of this course, the students will be able to understand what probability is as well as associated concepts such as an event, an outcome, and a sample space; to determine the number of births and deaths that occur within the nation; to understand the meaning, importance and method of constructing *index numbers*; understand time series data, its components and its applications to various fields; acquire knowledge and develop analysis skills on industrial experimentation, acquire knowledge on acceptance sampling principles and methods.

UNIT-I: Elementary Probability

Concept of probability: Random experiment, outcome, trial, event, sample points, sample space (Discrete and Continuous), favourable events, equally likely events, mutually exclusive, independent and exhaustive events. Concept of Permutation and Combination. Definition of probability: Classical and statistical and their limitations. Additive and multiplicative theory of probability. Conditional probability. Bayes' theorem and its applications.

UNIT-II: Vital Statistics and Index Number

Sources of Demographic Data. Measurements of Mortality: Crude Death Rate, Age-Specific Death Rate, Standardized death Rates, Infant Mortality Rate, Concept of Life Table. Measurements of Fertility: Crude Birth Rate, General Fertility Rate, Total Fertility Rate, Gross reproduction Rate, Net Reproduction Rate.

Index numbers: Definition, applications of Index Number; Problem Involved in Constructing Index Number. Simple and Weighted Aggregate Methods: Laspeyre's, Paasche's, Dorbish-Bowley's, Marshal-Edgeworth's and Fisher's Index Numbers. Simple and Weighted Average of Price Relative Method. Time and Factor Reversal Tests. Cost of Living Index number (CLIN).

UNIT-III: Time Series and Statistical quality control

Time series: Its Components, Illustrations, Additive and Multiplicative Models. Estimation of Trend by Methods of Moving Average and Mathematical Curves.
Seasonal Variation: Meaning, Estimation of Seasonal Variation by ratio to trend method and Link Relative Method.

Statistical Process and Product Control, General Theory of Control Charts, Control Limits, tools for Statistical Quality Control (SQC). Control Charts - for Mean, σ, R, p and c. advantages and limitations of AQC, Acceptance Sampling Plan, Producer's and Consumer's Risks.

UNIT-IV: Practical (30 hours)

Problems on Computation of Measures of Mortality and Fertility. Problem on Construction of Complete Life Tables. Problems on Construction of Control Charts - for Mean, σ, R, p and c.
Problem on Computation of Trend using Mathematical Curves (up to degree two) and Moving Average Method.
Problem on Computation of Seasonal Variations using ratio to trend method and Link Relative Method.Problems on Construction of Index Numbers using Laspeyre's, Paasche's and Fisher's Methods. Problem on Construction of Cost of Living Index Number.

Suggested readings:

1. Goon, A.M., Gupta, M.K. and Dasgupta, B. (2002): Fundamentals of Statistics, Vol. I& II,8th Edn. The World Press, Kolkata.
2. Gupta, S. C., & Kapoor, V. K. (2002). Fundamental of Mathematical Statistics. Sultan Chand & sons.
3. Gupta, S. C., & Kapoor, V. K. . Fundamental of Applied Statistics. Sultan Chand & sons.
4. Mann, Prem S. (2007). Introductory Statistics, 7th Edition. John Wiley & Sons.
5. Medhi, J. (2006). Statistical Methods: An Introductory Text. New Age International (Pvt) Limited, New Delhi.
6. Agarwal, B.L. (2020). Basic Statistics, 6th Edition. New Age International (P) Limited.
7. Ott, R Lyman., Longnecker Michael. (2010). An Introduction to Statistical Methods and Data Analysis, 6th Edition. Cengage Learning.
8. Mood, A.M., Graybill, F.A., Boes, D.C. (2007). Introduction to the Theory of Statistics, 3rd Edition. Tata McGraw-Hill Education Pvt Ltd, Chennai.
9. Hogg, R.V., Tanis, E.A., Rao, J.M. (2009). Probability and Statistical Inference, 7th Edition. Pearson Education, New Delhi.
10. Miller, Irwin., Miller, Marylees. (2006). John E Freund's Mathematical Statistics with Applications, 8th Edition. Pearson Education India, New Delhi.

37. ZOOLOGY

The FYUG programme in Zoology:

The key learning objectives of the programme in Zoology include the following: -

Students will imbibe a comprehensive understanding of the principles and concepts of zoology, including the organization and diversity of the animal kingdom, genetics, cell biology, biochemistry, developmental biology, molecular biology, biotechnology physiology, endocrinology, ecology, evolution, behaviour, parasitology, and entomology.

Students will be able to design, conduct, and analyze experiments to investigate questions related to zoology. They will also be able to evaluate scientific evidence, critically analyze data, and interpret results.

Students will develop effective written and oral communication skills in order to convey scientific information, including the ability to write laboratory reports, scientific papers, and presentations.

Students will develop critical thinking skills necessary to analyze and evaluate scientific evidence, assess the validity of scientific claims, and identify and solve problems related to zoology.

Students will learn and adhere to ethical principles and professional standards in scientific research and in interactions with animals, colleagues, and the public.

Students will develop skills in the use of technology and information resources relevant to zoological research and communication, including the use of databases and software.

Students will be exposed to interdisciplinary perspectives, including the interface between zoology and other scientific disciplines, such as molecular biology, biotechnology, and conservation biology.

Students will be exposed to and appreciate the diversity of animal life and the role of zoology in understanding and promoting conservation and the well-being of animals and humans. They will also learn to work effectively with diverse groups of people.

Students will develop a curiosity for learning and a desire to continue their education throughout their lives, including staying current with developments in the field of zoology.

Programme Outcomes (POs)

Upon successful completion of the four-year undergraduate programme in Zoology, the students will be able to:

POs1

- Demonstrate a deep understanding of the fundamental principles of Zoology, including its historical context, its relevance to society, and its relationship with other scientific disciplines.
- Identify, describe, and classify organisms from different taxa, including their morphology, functional anatomy, physiology, behaviour, and ecology.
- Develop a strong foundation in genetics, evolution, cell and molecular biology and ecology, and apply this knowledge to understand the patterns and processes that shape the diversity of life on Earth.
- Develop practical skills in laboratory techniques, fieldwork, and data analysis, including the use of statistical software and the interpretation of datasets.

POs2

- Apply the scientific method to investigate and solve biological problems, including designing experiments, collecting data, analyzing results, and drawing conclusions.
- Apply critical thinking and analytical skills to evaluate scientific literature, assess competing hypotheses, and develop evidence-based arguments.
- Communicate scientific information effectively to different audiences, including writing scientific reports, giving oral presentations, and participating in scientific discussions.

POs3

- Demonstrate an understanding of the ethical and societal implications of biological research and the responsible conduct of science.
- Develop transferable skills, including teamwork, problem-solving, time management, and adaptability, that will be useful in a variety of professional settings.
- Develop a passion for lifelong learning and a commitment to stay current with the latest advances in Zoology, through participation in professional development opportunities and engagement with the scientific community.

ZOO-100: TAXONOMY AND ANIMAL DIVERSITY

(Contact Hours: 75, Credits: 4)

Course Objectives (Cos):

- To impart the fundamental concepts in Animal Taxonomy and Diversity
- To introduce the notion of biodiversity

Learning Outcomes (LOs)

On completion of the course, students will be able to:

- Understand the importance of systematics, taxonomy and structural organization of animals.
- Appreciate the diversity of non-chordates and chordates living in varied habit and habitats.
- Be in a position to critically analyze the organization, complexity and characteristic features of non-chordates and chordates familiarizing them with the morphology and anatomy of representatives of various animal phyla.
- Enhancement of collaborative learning and communication skills through practical sessions, team work, group discussions, assignments and projects.
- Learn the skills for dissection of anatomical systems in an invertebrate and a vertebrate.
- Identify the major structures of the nervous system and statocysts in prawn, the digestive and reproductive systems in fish.
- Learn the principles, procedure, and skill of permanent mounting of biological specimens.
- Identify some anatomical structures of invertebrates and vertebrates, and their roles in the organisms' biology.
- Identify animals and to describe the identifying characters. They will also be able to classify the animals following the taxonomic hierarchy.

Unit-I: Taxonomy: Definition of taxonomy, phylogeny, systematics, category, taxon, classification, nomenclature; Biological species concept; Taxonomic hierarchy; Binominal nomenclature.

Seven-kingdom classification of organisms according to Michael A. Ruggiero et.al., (2015) which include Archaea, Bacteria, Protozoa, Chromista, Fungi, Plantae, and Animalia.

Salient features and classification of kingdom Protozoa up to phylum with example of representatives from each phyla.

Protozoa: Paramaecium - Morphology and reproduction.

Salient features and classification of the following phyla up to class with example of representatives from each class: Porifera, Cnidaria, and Platyhelminthes.

Porifera: *Sycon* - Morphology and canal system.

Cnidaria: *Obelia* - Morphology and reproduction.

Platyhelminthes: *Taeniasolium* – Morphology and the life cycle.

Unit-II: Salient features and classification of the following phyla up to class with example of representatives from each class: Nematoda, Annelida, Onychophora, Arthropoda, and Mollusca.

Nematoda: *Ascarislumbricoides* –Morphology and the life cycle.

Annelida: Leech - Morphology and urogenital system.

Onychophora: *Peripatus*–Morphology.

Arthropoda: Prawn - Morphology and Reproductive systems.

Mollusca: *Pila* - Morphology and Nervous Systems.

Introduction to Minor Phyla.

Unit III: Salient features and classification of the following phyla up to class with example of representatives from each class: Echinodermata, Hemichordata, and Chordata.
Echinodermata: *Asterias* - Morphology and water vascular system.
Hemichordata: Morphology of *Balanoglossus.*
Cephalochordata: Morphology of *Amphioxus.*
Urochordata: Morphology of *Ascidia.*
Cyclostomata: *Petromyzon*– Morphology.
Pisces: *Labeo* - Morphology and respiratory systems.
Mammalia: Rabbit - Morphology, digestive, circulatory and nervous systems

Unit-IV: **Practical**   (Contact hours: 30)
   1. Dissection
   a) Dissection of Prawn - nervous system; b) Dissection of Prawn - statocysts; c) Dissection of *Channa*/*Labeo*/common carp - digestive system; d) Dissection of *Channa*/*Labeo*/common carp - reproductive system.

   2. Mounting
   a) General protocol for preparation of permanent mount; b) Permanent mount of: *Obelia* colony, parapodium of *Nereis*, gemmules of sponge, and cycloid scale of fish.

   3. **Museum Specimens**

   (Preferably representatives from the different classes/orders of the phylum. The number within the brackets indicates the minimum number of specimens to be studied).

   a) Protozoa whole mount (2); b) Porifera (2); c) Cnidaria (3); d) Platyhelminthes (2); e) Nematoda (1); f) Annelida (3); g) Onychophora (1); h) Arthropoda (5); i) Mollusca (5); j) Echinodermata (3); k) Hemichordata (1); l) Cephalochordata (1); m) Urochordata (1); n) Agnatha (1); o) Pisces (4); p) Amphibia (3); q) Reptilia (3); r) Aves (2); s) Mammalia (3).

   *Note:
- For the Seven Kingdom classification, follow the classification scheme from "Ruggiero, M. A., et.al., (2015). A higher level classification of all living organisms. *PloS one*, 10(4), e0119248.
- For Invertebrates classification, follow the classification schemes from "Barnes, R.D. (2006). Invertebrate Zoology, 7th Edition, Cengage Learning, India."
- For Chordate Classification, follow the scheme from "Kardong, Kenneth V. (2015). Vertebrates: Comparative Anatomy, Function, Evolution, 8th Edition, McGraw-Hill Education.

Suggested Readings:

1. Barnes, R.D. (2006). Invertebrate Zoology. (7th ed.). Cengage Learning, India.

2. Brusca, R.C., Moore, W., & Shuster, S.M. (2016). Invertebrates. (3rd ed.). Oxford university press. New York.

3. Chaki, K.K., Kundu, G., & Sarkar, S. (2021). Introduction to General Zoology Vol 1. (1st ed.). New Central Book Agency. Kolkota.

4. Chaki, K.K., Kundu, G., & Sarkar, S. (2021). Introduction to General Zoology Vol 2. (1st ed.). New Central Book Agency. Kolkota.

5. Ganguli, B.B., Adhikari, S., & Sinha, A.K. (2011). Biology of Animals: Volume I. (3rd ed.). New Central Book Agency. Kolkota.

6. Ghosh, K.C. and Manna, B. (2009). Practical Zoology. (3rd ed.). Central Book Agency, Kolkota.

7. Kardong, Kenneth V. (2015). Vertebrates: Comparative Anatomy, Function, Evolution, 8th Edition, McGraw-Hill Education. New York.

8. Kotpal, R.L. (2019). Modern Textbook of Zoology: Invertebrates. (12th ed.). Rastogi Publications. Meerut.

9. Kotpal, R.L. (2019). Modern Textbook of Zoology: Vertebrates. (4th ed.). Rastogi Publications. Meerut.

10. Lal, S.S. (2011). Practical Zoology: Invertebrate. (10th ed.). Rastogi Publications. Meerut.

11. Lal, S.S. (2015). Practical Zoology: Vertebrate. (10th ed.). Rastogi Publications. Meerut.

12. Mayr, E. &Ashlock, P.D. (1991). Principles of Systematic Zoology. (2nd ed.). McGraw-Hill (India). New Delhi.

13. Pechenik, J. A. (2015). Biology of the Invertebrates. (7th ed.). McGraw-Hill Education. New York.

14. Pough, F.H., & Janis, C.M. (2019). Vertebrate Life. (10th ed.). Oxford University Press. New York.

15. Ruggiero, M. A., Gordon, D. P., Orrell, T. M., Bailly, N., Bourgoin, T., Brusca, R. C., ...& Kirk, P. M. (2015). A higher level classification of all living organisms. PloS one, 10(4), e0119248.

16. Sinha, A.K., Adhikari, S., Ganguli, B.B., and Goswami, B.C.B. (2012). Biology of Animals: Volume I. (7th ed.). New Central Book Agency. Kolkota.

17. Verma, P.S. (2010). A Manual of Practical Zoology: Chordates. (11th ed.). S. Chand & Co. New Delhi.

18. Verma, P.S. (2010). A Manual of Practical Zoology: Invertebrates. (15th ed.). S. Chand & Co. New Delhi.

19. Verma, P.S., & Jordan, E.L. (2013). Chordate Zoology. (14th ed.). S.Chand& Co. New Delhi.

20. Verma, P.S., & Jordan, E.L. (2022). Invertebrate Zoology. (16th ed.). S.Chand& Co. New Delhi.

21. Young, J. Z. (2004). The Life of Vertebrates. (3rd ed.). Oxford university press. New York.

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ZOO-150: FUNCTIONAL AND COMPARATIVE ANATOMY

(Contact Hours: 75, Credits: 4)

Course Objectives (Cos):
- The course will provide in depth knowledge of the biology of form and functions.
- It will examine vertebrate anatomy to understand how the structures develop, how they evolve, interact with one another and allow animals to live in variety of environments.

Learning Outcomes

Upon completion of the course, students will be able to:

- Learn about the importance of structural organization of animals.
- Understand evolutionary history and relationships of different groups through functional and structural affinities.
- Critically analyze the organization, complexity and characteristic features of different groups making
- Understand the morphology and anatomy of representatives of various animal phyla.
- Compare and contrast each organ system across various vertebrate groups.
- Understand the evolutionary relatedness of various groups of invertebrates and vertebrates through affinities study.
- Learn the skills for dissection of anatomical systems in an invertebrate and a vertebrate and identify the major structures of the accessory respiratory organs and afferent branchial system of fish.
- Identify some anatomical structures, histological samples of tissues and organs, and whole mounts of specimens.
- Identify and learn the characteristic features of bones in a mammal.

Unit-I:	Protozoa: Locomotion and nutrition.
	Porifera: Canal system and skeletal systems.
	Cnidaria: Polymorphism in Siphonophora; Corals and coral reefs.
	Annelida: Excretory system.
	Arthropoda: Comparative study of respiratory systems.
	Mollusca: Torsion and detorsion in Gastropoda
Unit II:	Echinodermata: Comparative study of water vascular system.
	Hemichordata: Affinities of *Balanoglossus*.
	Cephalochordata: Affinities of *Amphioxus*.
	Urochordata: Retrogressive metamorphosis in *Ascidia*.
	Agnatha: Comparative study of *Petromyzon* and *Myxine*.

Pisces: Scales and fins in fishes; Accessory respiratory organs.

Unit-III: Amphibia: Comparative study of the morphological features of the three orders.

Reptilia: Venomous and non-venomous snakes; Poison apparatus and mechanism of biting.

Aves: Comparative study of Flight and flightless birds.

Mammalia: Affinities of Monotremata, Affinities of Marsupialia, and dentition in mammals.

Comparative anatomy of kidney in vertebrates.

Comparative anatomy of heart in vertebrates.

Comparative anatomy of respiratory organs (skin, gills, lungs, and air sacs) in vertebrates.

Practical   **Credit 1 (Contact hours: 30)**

Unit-IV: 1. **Dissection**
   a) Accessory respiratory organs in teleost fish; b) Dissection of Channa/Labeo/common carp - Afferent branchial vessels

2. **Permanent mounting**
   a) Setae of earthworm; b) Scales (placoid and ctenoid) of fish; c) Feathers {down, filoplume, contour (showing barb and barbules)} of birds.

3. **Study of permanent sections**
   a) Histological study of tissues: epithelia, connective, muscle, and nervous; b) Histological study of stomach, intestine, kidney, liver, lungs, testis, and ovary of vertebrate; c) Transverse sections of: *Ascaris* male and female; Earthworm through typhlosolar region; *Amphioxus* through branchial region.

4. **Osteology**
   a) Study of skull of rabbit/guinea pig b) Study of pelvic and pectoral girdle of rabbit/guinea pig; c) Study of humerus, radius-ulna, femur, tibio-fibula of rabbit/guinea pig; d) Study of vertebrae: Atlas, axis, and typical vertebra of rabbit/guinea pig.

Suggested Readings:

1. Barnes, R.D. (2006). Invertebrate Zoology. (7th ed.). Cengage Learning, India.
2. Brusca, R.C., Moore, W., & Shuster, S.M. (2016). Invertebrates. (3rd ed.). Oxford university press. New York.
3. Ganguli, B.B., Adhikari, S., & Sinha, A.K. (2011). Biology of Animals: Volume I. (3rd ed.). New Central Book Agency. Kolkota.

4. Ghosh, K.C. and Manna, B. (2009). Practical Zoology. (3rd ed.). Central Book Agency, Kolkota.
5. Kardong, Kenneth V. (2015). Vertebrates: Comparative Anatomy, Function, Evolution, 8th Edition, McGraw-Hill Education. New York.
6. Kotpal, R.L. (2019). Modern Textbook of Zoology: Invertebrates. (12th ed.). Rastogi Publications. Meerut.
7. Kotpal, R.L. (2019). Modern Textbook of Zoology: Vertebrates. (4th ed.). Rastogi Publications. Meerut.
8. Lal, S.S. (2011). Practical Zoology: Invertebrate. (10th ed.). Rastogi Publications. Meerut.
9. Lal, S.S. (2015). Practical Zoology: Invertebrate. (10th ed.). Rastogi Publications. Meerut.
10. Parker, T.J., &Haswell, W.A. (1972). Textbook of Zoology Vol.I: Invertebrates (7th ed.). Macmillan Education Australia.
11. Parker, T.J., &Haswell, W.A. (1972). Textbook of Zoology Vol.II: Vertebrates. (7th ed.). Macmillan Education Australia.
12. Pechenik, J. A. (2015). Biology of the Invertebrates. (7th ed.). McGraw-Hill Education. New York.
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19. Young, J. Z. (2004). The Life of Vertebrates. (3rd ed.). Oxford university press. New York.

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