# GAUHATI UNIVERSITY
# DEPARTMENT OF ASSAMESE

# PG Syllabus
# CBCS
# 2016

## Syllabus Structure

| Course Code | Semester | Nature of the Course |
|---|---|---|
| | **First Semester** | |
| ASM 1016 | Rise and Development of the Assamese Language | C |
| ASM 1026 | History of Assamese Literature : 1889-2015 | C |
| ASM 1036 | Study of Culture of Assam | C |
| ASM 1046 | History of Sanskrit Literature: History, Features and Genres | C |
| ASM 1054 | Creative Writing | VA |
| | **Second Semester** | |
| ASM 2016 | Assamese Poetry : 1889-2015 | C |
| ASM 2026 | Assamese Prose : 1846-2015 | C |
| ASM 2036 | Assamese Drama and Performance : 1857-2015 | C |
| ASM 2046 | Indian Criticism | C |
| ASM 2054 | Editing | VA |
| | **Third Semester**<br><br>Courses ASM 3016 and ASM 3026 are core (i.e., compulsory). Students shall choose one Elective Course from ASM 3036, ASM 3046, ASM 3056, ASM 3066 and ASM 3076, and another from ASM 3086, ASM 3096, ASM 3106, ASM 3116 and ASM 3126. Course ASM 3126 will also be Elective Open. | |
| ASM 3016 | Assamese Novel: 1890-2015 | C |
| ASM 3026 | Translation : Theory and Practice | C |
| ASM 3036 | World Literature | E |
| ASM 3046 | Ethnic Literature of North-East India | E |
| ASM 3056 | Sanskrit Texts | E |

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|---|---|---|
| ASM 3066 | Varieties of Assamese Language | E |
| ASM 3076 | Contact Languages of North-East India | E |
| ASM 3086 | Modern Indian Literature | E |
| ASM 3096 | Assamese Vaisnavite, Saiva and Sakta Literature | E |
| ASM 3106 | Structure of the Assamese Language | E |
| ASM 3116 | Phonetics | E |
| ASM 3126 | Sankaradeva Studies | E/ EO |
| | **Fourth Semester**<br><br>Courses ASM 4016 and ASM 4026 are core (i.e., compulsory). Students shall choose one elective course from ASM 4036, ASM 4046, ASM 4056, ASM 4066 and ASM 4076, and another from ASM 4086, ASM 4096, ASM 4106, ASM 4116, ASM 4126 and ASM 4136. Course ASM 4136 will also be Elective Open. | |
| ASM 4016 | Textual Criticism and Manuscript Reading | C |
| ASM 4026 | Applied Linguistics | C |
| ASM 4036 | Peripheral Genres of Assamese Literature | E |
| ASM 4046 | Assamese Short Story : 1889-2015 | E |
| ASM 4056 | Comparative Studies of Indo-Aryan Languages | E |
| ASM 4066 | Language Acquisition | E |
| ASM 4076 | Aspects of Multilingualism | E |
| ASM 4086 | Western Literary Criticism | E |
| ASM 4096 | Assamese Criticism | E |
| ASM 4106 | Trends in Linguistics | E |
| ASM 4116 | Tibeto-Burman Languages of Assam | E |
| ASM 4126 | Language Study in Assam | E |
| ASM 4136 | Culture Studies of North-East India | E/ EO |

# Course Outcomes

**ASM 1016: Rise and Development of the Assamese Language**

1. Reconstruct the social history of Assam in the light of the rise of Assamese language.
2. Justify the relationship between tradition of religion and formation of Assamese language.
3. Compare and contrast the social history of early Assamese form of language with that of the Modern Assamese language.

**ASM 1026: History of Assamese Literature: 1889-2015**

1. Trace the phases of Romantic and Modern Assamese literature.

**ASM 1036: Study of Culture of Assam**

1. Reconstruct religious belief of the people of Ancient Assam and compare it with that of the rest of ancient India.

**ASM 1046: History of Sanskrit Literature: History, Features and Genres**

1. Trace the history and heritage of Indian literary tradition.
2. Describe the features of Sanskrit Literature which is considered as the mother of all regional Literature including Assamese.
3. Grasp the Indianness in Indian Literature.

**ASM 1054: Creative Writing**

1. Compare and contrast the genres of creative writing on the basis of imitation and imagination.
2. Create a piece of literature and justify its quality.
3. Describe the experience of reading a piece of literature.

**ASM 2016: Assamese Poetry: 1889-2015**

1. Categorise Assamese poetry (1889-2015) in groups of Romantic and Modern Phases.
2. Describe experience of reading Romantic and Modern Assamese Poetry.
3. Tell the difference between Romantic and Modern Poetry2.Plan to develop intellectual history of Assam with the help of knowledge of stone inscriptions and copperplates.
4. Enumerate the institutions and describe their role in preserving Assamese culture.

**ASM 2026: Assamese Prose: 1846-2015**

1. Trace the development of Assamese prose from 1846 to 2015.
2. Interpret the changes occurring in Assamese prose.
3. State the present features of Assamese prose.

**ASM 2036: Assamese Drama and Performance: 1857-2015**

1. Reconstruct the history of Assamese drama and performance since 1857.
2. Describe the experience of viewing a play
3. Enumerate the trends of Assamese Drama since 1857.

**ASM 2046: Indian Criticism**

1. Describe the Indian systems of evaluating Literature.
2. Trace the thought systems of ancient Indian Literary critics.
3. Interpret Literature from Indian point of view.

**ASM 2054 Editing**

1. Trace the phases of book history in India.
2. Critique a manuscript.
3. Tell the philosophy behind the book-editing

**ASM 3016: Assamese Novel: 1890-2015**

1. Categorise the Assamese novels into different trends.
2. Explain the effects of the socio-political development on Assamese novels.
3. Desingn a spectrum of different themes used in Assamese novels.

**ASM 3026: Translation: Theory and Practice**

1. Illustrate the linguistic and cultural aspects of translation.
2. State the problems of different kinds of translation.
3. Justify the quality of different texts of translation.

**ASM 3036: World Literature**

1. Trace the development of different trends of World Literrature.
2. Interpret Romanticism, Modernism and postmodernism with the help of related texts.
3. Critique a piece of Romantic / Modern/ Postmodern and Sanskrit Literature.

**ASM 3046 Ethnic Literature of North-East India**

1. Trace the development of various ethnic literatures of NE India.
2. Critique the documentation and presentation of ethnic literatures of NE India.
3. Explain the linkage between ethnic literature and modern literature.

**ASM 3056 Sanksrit Texts**

1. Critique the Classical Sanskrit Texts.

**ASM 3066 Varieties of the Assamese Language**

1. Describe different varieties of the Assamese Language in the context of contemporary Linguistics.
2. Organize geographical and social varieties of Assamese Language.

**ASM 3076 Contact Languages of North-East India**

1. Understanding the history of language contact and its impacts
2. Illustrate the contact language scenario of North-East India.

**ASM 3086: Modern Indian Literature**

1. Illustrate the concept of Modern Indian literature and trace its history.
2. Describe the national and regional aspects of Modern Indian literature.
3. Interpret a few major Modern Indian texts in original or translation.

**ASM 3096 Assamese Vaisnavite, Saiva and Sakta Literature**

1. Categorise religious literature of Assam and compare Assamese Vaisnavite literature with Assamese Saiva –Sakta literature.
2. Elaborate the concept of Vaishnavism, Saivaism and Saktaism and Organize literary products under titles like Vaishnava, Sakta, and Saiva literature.
3. Interpret religious beliefs i.e. Vaishnava, Saiva and Sakta with keeping in mind their humanitarian outlook.
4. Generate human values out of the religious outlook prevalent in Assam.

**ASM 3106 Structure of the Assamese Language**

1. Describe the intricate structure of the Assamese Language.
2. Analyse language in sync with contemporary linguistics.
3. Design a synchronic study of the structure of Assamese Language.

**ASM 3116 Phonetics**

1. State practical knowledge of phonetics in the light of computational Linguistics.
2. Describe the phonological aspect of Assamese Language.

**ASM 3126: Sankaradeva Studies**

1. Justify the philosophy of Eksarana Nama Dharma by Sankaradeva in relation to All India Medieval Bhakti Movment.
2. Produce a one act play as the structure laid by Sankaradeva's Ankia Bhaona.
3. Trace the outcome of social reformation done by Sankaradeva.

**ASM 4016: Textual Criticism and Manuscript Reading**

1. Explain the Manuscript tradition in different part of the world.
2. Explain mutilated text is restrod.
3. Generate interest in preservation and restoration of intellectual heritage of a nation

**ASM 4026: Applied Linguistics**

1. Explain computational linguistics.
2. Plan to review literature applying discourse analysis.
3. State the tools for analyzing the Assamese language.

**ASM 4036: Peripheral Genres of Assamese Literature**

1. Trace the development of a few peripheral genres in Assamese literature.
2. Explain the emotional effects of reading a piece of travelogue/biography/autobiography/literature for children/scientific fiction.
3. Crtique a piece a travelogue/biography/autobiography/literature for children book.

**ASM 4046: Assamese Short Story:1889-2015**

1. Trace the development of the major trends of Assamese short stories.
2. Describe the emotional effect of reading a few significant Assamese short stories.
3. Interpret a short story.

**ASM 4056: Comparative Studies of Indo-Aryan Languages**

1. Rearrange the evolution of the Assamese language and compare it with other language.
2. Ennumerate the common heritage of the Indian-Aryan languages.
3. Contrast the linguistic variation of Assamese with other Pan Magadhan languages.

**ASM 4066: Language Acquisition**

1. Explain the process of first language acquisition
2. Explain the role of different factors making impact in second language acquisition.
3. Compare between the first and the second language acquisition.

**ASM 4076: Aspects of Multilingualism**

1. Justify the significance of study of language use in a multilingual context.
2. Draw a linguistic map of Assam showing bilingual and multilingual area.

**ASM 4086: Western Literary Criticism**

1. Interpret classicism, Romanticism Modernism, Structuralism, Post-Structuralism and Feminisism with the help of a few selected texts.
2. Compare and contrast different movements in criticism.
3. State the effects of western literary criticism on critiques of Assamese literature.

**ASM 4096: Assamese Criticism**

1. Grasp the history and trends of Assamese criticism.
2. Trace the influence of western and Indian criticism on Assamese criticism.
3. Produce a criticism of a text.

**ASM 4106: Trends in Linguistics**

1. Elaborate semiotics and pragmatics by grasping contemporary theories.
2. Enumerate stylistic elements in a literary text.
3. Reconstruct Assamese Grammar drawing insights from the TG Grammar.

**ASM 4116: Tibeto Burman Languages**

1. Illustrate the Linguistics features of Tibeto Burman Language of Assam.
2. Trace the differences among Rabha, Boro, Mising, Karbi communities and compare the Tibeto Burman Languages with Assamese and other Indio-Aryan Language.
3. Describe the influence of Tibeto Burman Language on the Assamese Language and vise-versa.

**ASM 4126: Language Study in Assam**

1. Mapping the history of language study in Assam
2. Comparethe view points of different Assamese linguists and their impacts.

**ASM 4136: Culture Studies of North-East India**

1. Enumerate the changes in material culture and performing Art with special reference to Moran, Hajong, Sonowal-Kachari, Garo and Manipuri.
2. Justify the role of women in the context of greater Assamese society and culture.
3. Justify the culture of North-East India as synthesized one.

# FIRST SEMESTER

## ASM 1016
## Rise and Development of the Assamese Language
## (Core Course)
## (Credits: 6)

**Unit I:**

Emergence of regional languages in India, spoken words versus literary language, language and religion, polity and language: Inscriptions, Charyapada

**Unit II:**

Assamese as a literary language; royal patronage and reproduction of epics in Assamese; early Assamese texts: Hem Saraswati's *Prahrad Charit* and Madhav Kandali's *Ramayana*

**Unit III:**

Cultural and linguistic encounters: Emergence of Brajabali; emergence of Assamese prose, *Buranji*s and *Charit Puthi*s

**Unit IV:**

Colonialism and Modern Assamese: Shaping of Modern Assamese language, the roles of Missionaries and Assamese intellectuals, print media and the language; standardization of the language.

**References:**


*Anglo-Assamese Relations 1771- 1826: A History of the Relations of Assam with the East India Company from 1721 to 1826, Based on Original Sources*: Surya Kumar Bhuyan
*Asamiya Bhashar Itihas*: Ramesh Pathak
*Asamiya Bhashar Gathan: Aitihya aru Rupantar*: Upen Rabha Hakacham
*Asamiya Bhashar Udbhav aru Bikash*: Upendra Nath Goswami
*Asamiya Gadyasahityar Gatipath*: Harinath Sarma Doloi
*Asamiya Katha Sahitya*: Birinchi Kumar Barua
*Asamiya Lipi*: Upendra Nath Goswami
*Aspects of Early Assamese Literature:* Ed. Banikanta Kakati
*Assamese: Its Formation and Development*: Banikanta Kakati
*Biswalipir Bhumika*: Narayan Das
*Growth of the Assamese Language*: Dimbeswar Neog
*Kamrupasasanavali*: Dimbeswar Sarma
*Kramabikashat Asamiya Kathashaili*: Prafulla Kataki
*Madhav Kandalir Ramayanar Bhasha*: Lilabati Saikia Bora
*Madhyayugar Asamiya Bhasha SahityarRengani*: Dipti Phukan Patgiri
*O Mor Suria Mat:* Dhrubajyoti Bora
*Prachyasasanavali*: Maheswar Neog
*Pratna Asamiya Bhashar Rupatattvik Bishleshan*: Upendra Nath Goswami
*Studies in the Literature of Assam*: Surya Kumar Bhuyan
*The Language of the Gods in the World of Men: Sanskrit, Culture and Power in Premodern India*: Sheldon Pollock
*Udbhavkalin Asamiya Bhasha*: Subasana Mahanta Choudhury

# ASM 1026
# History of Assamese Literature: 1889-2015
# (Core Course)
# (Credits: 6)

**Unit I:**

Salient features of Mafizuddin Ahmad Hazarika's poetry
Salient features of Bhabananda Datta's criticism of poetry
Salient features of Bhaben Barua's poetry
Salient features of Jnan Pujari's poetry

**Unit II:**

Salient features of Nakul Chandra Bhuyan's plays
Salient features of Atul Chandra Hazarika's plays
Salient features of Himendra Barthakur's plays

**Unit III:**

Salient features of Dandinath Kalita's novels
Salient features of Umakanta Sarma's novels
Salient features of Yeshe Dorje Thongchi's novels
Sailent features of Arupa Patangia Kalita's novels

**Unit IV:**

Salient features of Rama Dash's short stories
Salient features of Birendra Kumar Bhattacharyya's short stories
Salient features of Silabhadra's short stories
Salient features of Bipul Khataniar's short stories

**References:**


*Adhunik Asamiya Sahitya Aitihya aru Lakshminath Bezbaroa*: eds. Taranee Deka and Kamaluddin Ahmed
*Adhunik Kabita*: Harekrishna Deka
*Asamiya Aitihasik Upanyas*: Sailen Bharali
*Asamiya Chutigalpor Adhyayan*: Prahlad Baruah
*Asamiya Kabita: Bibartanar Parba*: Bhaben Barua
*Asamiya Kabita: Rupantarar Parba*: Bhaben Barua
*Asamiya Natya Sahitya*: Satyendra Nath Sarma
*Asamiya Sahityar Buranji (Vol. VI)*: Ed. Homen Borgohain
*Asamiya Sahityar Buranji (Vol.V)*: Ed. Ranjit Kumar Dev Goswami
*Asamiya Sahityar Ruprekha*: Maheswar Neog
*Asamiya Shityar Samikshatmak Itibritta*: Satyendra Nath Sarma
*Asamiya Upanyasar Bhumika*: Gobinda Prasad Sarma
*Asamiya Upanyasar Gatidhara*: Satyendra Nath Sarma
*Chutigalpa*: Uday Dutta
*Hiren Gohain Rachanavali, Pratham Khanda*: Eds. Sonit Bijay Das and Munin Bayan
*Kabitar Juti Bichar*: Kabin Phukan

*Kabitar Sabishesh*: Imdad Ullah
*Lakshimnath Bezbaroa*: Ed. Chandra Prasad Saikia
*Lakshminath Bezbaroa: Srijan Aru Manan*: Madan Sarma
*Manchalekha*: Atul Chandra Hazarika
*Natak aru Asamiya Natak*: Sailen Bharali
*Natyakala: Deshi aru Bideshi*: Sailen Bharali
*Prabandha*: Ranjit Kumar Dev Goswami
*Srijan aru Manan*: Imdad Ullah
*Lakshminath Bezbaroa: The Sahityarathi of Assam*: Ed. Maheswar Neog

# ASM 1036
# Study of Culture of Assam
# (Core Course)
# (Credits: 6)

**Unit I:**

Definition, classification and scope of culture with special reference to the culture of Assam

**Unit II:**

Culture of Assam in the early period (from the pre-historical times to the tenth century CE)
People of Assam and their ethnic groups, architecture, sculpture, inscription, religion (magico-religious beliefs, Kairataja dharmamat) and tradition

**Unit III:**

Culture of Assam in the medieval period (from the eleventh century CE to the eighteenth century CE)
History of religions of medieval Assam
Religious institutions: Temple, monastery, sattra, namghar, mosque, pir-dargah
Art, artefacts, architecture and music

**Unit IV:**

Culture of Assam in the modern period (from the nineteenth century CE till the present time)
Socio-cultural institution and organization, cultural assimilation, acculturation, de-Sanskritization, trans-culturalization, preservation of cultural item, and globalization

**References:**


*Asamar Lokakala*: Jugal Das
*Asamar Loka-Sanskriti*: Nirmal Prabha Bordoloi
*Asamar Loka-Sanskriti*: Birinchi Kumar Barua
*Asamar Puthichitra*: Naren Kalita
*Asamar Sanskriti*: Lila Gogoi
*Asamiya Sanskriti Adhyayan*: Kanak Chandra Saharia
*Asamar Sanskriti Samiksha*: Eds. Nabin Chandra Sarma and Kanak Chandra Saharia
*Asamar Sanskritik Aitihya*: Maheswar Neog
*Asamiya Jati aru Sanskriti*: ed. Paramananda Rajbongshi
*Asamiya Jatir Itibritta*: Asam Sahitya Sabha
*Asamiya Lokasanskritir Abhas*: Nabin Chandra Sarma
*Asamiya Sanskriti*: Eds. Hariprasad Neog and Lila Gogoi
*Background of Assamese Culture* : Rajmohan Nath
*Bar Asamar Barnil Sanskriti* : Upen Rabha Hakacham
*Bharatiya Patabhumit Sankari Sahitya aru Satriya Sangeet*: Keshabananda DevGoswami
*Cultural Anthopology* : M.J Herskovits
*Cultural History of Assam* : Birinchi Kumar Baruah
*History and Civilization of the People of Assam*: P.C. Choudhury
*Kala Darpan*: ed. Khagendra Nath Talukdar
*Kamrupar Itibritta*: Ed. Dhiren Sarma
*Pabitra Asam*: Ed. Maheswar Neog
*Pragjyotishar Itihas* : Dimbeswar Sarma
*Purani Asamiya Samaj aru Sanskriti* : Maheswar Neog
*Satra Sanskritir Ruprekha* : Keshabananda Dev Goswami
*The Sankaradeva Movements : Its Cultural Horizons*: Pradip Jyoti Mahanta

# ASM 1046
# History of Sanskrit Literature: History, Features and Genres
# (Core Course)
# (Credits: 6)

**Unit I:**

Poetry:
Mahakavya and Khandakavya

**Unit II:**

Drama and Campu:
Theories of origin, features, types and chronological history

**Unit III:**

Prose:
Features, genres and introduction to prose works

**Unit IV:**

Sanskrit writing in Assam:
Pre-Sankaradeva, Sankaradeva and Post-Sankaradeva periods: Chronological history and features

**References:**


*Asamat Sanskrit Charchar Itihas*: Malinee Goswami
*History of Indian Literature*: M. Wintenitz
*History of Sanskrit Literature*: A. B. Keith.
*Indian Campu Literature: Its Origin and Growth*: R. N. Bandopadhyaya.
*Sanskrit Sahityar Itivritta*: Thaneswar Sarma
*Sanskrit Shahityer Itihas*: Gaurinath Sastri.
*Sanskritayan*: Malinee Goswami
*Survey of Sanskrit Literature*: C.K. Raja.

# ASM 1054
# Creative Writing
# (Value Added Course)
# (Credits: 4)

**Unit I:**

Imitation
Imagination
Anatomical components of poetry, drama and fiction

**Unit II:**

Trends in poetry, drama and fiction
Language of modern poetry and modern novel

**Unit III:**

Performance (Traditional and experimental)
Functional writing

**Unit IV:**

Project

**References:**


*Creative Writing- The Essential Guide*: Tim Atkinson
*Modernism*: Malcolm Bradbury and James Mcfarlane.
*Naïve and the Sentimental Novelist*: Orhan Pamuk
*Postmodernism*: Christopher Butler
*Sahitya Nirman Prasanga*: Natun Sahitya Parishad
*Sristisheel Sahitya: Prerana aru Arhi*: Atanu Bhattacharyya
*The Cambridge Companion to Creative Writing*: David Morley
*The Cambridge Introuction to Creative Writing*: David Morley
*The Creative Compass: Writing Your Way from Inspiration to Publication*: Millman and Prasada
*The Romantic Imagination*: Maurice Bowra
*The Routledge Creative Writing Coursebook*: Paul Mills
*Writing Fiction : A Practical Guide*: Gotham Writers Workshop
*Writing Spirit: Finding Your Creative Soul*: Lynn V. Andrews

# SECOND SEMESTER

## ASM 2016
## Assamese Poetry: 1889-2015
## (Core Course)
## (Credits: 6)

**Unit I:**

Romantic Poetry (First Wave):
Chandra Kumar Agarwala: 'Ajeya' (from *Sanchayan*, ed. Maheswar Neog)
Hem Chandra Goswami: 'Puwa' (from the aforementioned anthology)
Lakshminath Bezboroa: 'Malati' (from the aforementioned anthology)

**Unit II:**

Romantic Poetry (Second Wave):
Raghunath Chaudhury: 'Giri Mallika' (from the aforementioned anthology)
Ambikagiri Raychoudhury: 'Mor Bina' (from the aforementioned anthology)
Devakanta Barua: 'Aprakarsh' (from the aforementioned anthology)

**Unit III:**

Modern Poetry (First Wave):
Hem Barua: 'Poharatkoi Endhar Bhal' (from *Sanchayan*, ed. Maheswar Neog)
Navakanta Barua: 'Samratar Para' (from *Sanchayan*, ed. Maheswar Neog)
Ajit Barua: 'Dukhar Kabita' (from *Sanchayan*, ed. Maheswar Neog)
Nilmoni Phookan: 'Olami Thaka Golapi Jamur Lagna' (from *Sanchayan*, ed. Maheswar Neog)

**Unit IV:**

Modern Poetry (Second Wave):
Hirendra Nath Dutta: 'Chhayamoya' (from *Sanchayan*, ed. Maheswar Neog)
Anis Uz Zaman: 'Ai Tor Andharar Hatkhan Bhangi Dilon' (from *Tarun Prajanmar Kabita*, ed. Harekrishna Deka)
Sameer Tanti: 'Mor Pratito Din aru Ratir Arombhani' (from the aforementioned anthology)
Anubhav Tulasi: 'Cihnajatnar Keitiman Jalamagna Drisya' (from the aforementioned anthology)
Nilim Kumar: 'Guwahati' (from the aforementioned anthology)

**References:**


*Adhunik Asamiya Kabita*: Purna Bhattacharya
*Adhunik Asamiya Kabitar Tinita Stor*: Eds. Malinee Goswami and Kamaluddin Ahmed
*Adhunik Asamiya Kabitat Pratik aru Citrakalpa*: Loopa Deka Barua
*Adhunik Asomiya Kabita* (Enlarged edition): Kamaluddin Ahmed
*Adhunik Kabita*: Harekrishna Deka
*Anushilon*: Arindam Borkotoki
*Asamiya Kabita: Bibartanar Parba*: Bhaben Barua
*Asamiya Kabita*: Karabi Deka Hazarika
*Asamiya Kabita: Rupantarar Parba*: Bhaben Barua
*Asamiya Kabitar Kahini*: Bhabananda Datta
*Bhasha Sahityar Shobha*: Pranati Sarma Goswami and Bibha Bharali
*Chandra Kumar Agarwala*: Kabin Phukan
*Chandrakumarar Kabita Samagra*: ed. Nagen Saikia
*Hiren Gohain Rachanavali, Pratham Khanda*: Eds. Sonit Bijay Das and Munin Bayan

*Jowa Shatikar Kabita: Asamiya Navanyasi Sahityar Parampara*: Dilip Barua.
*Kabitar Juti Bicar*: Kabin Phukan
*Kabitar Sabishesh*: Imdad Ullah
*Nairajya aru Nirman*: Manoj Sarma
*Prabandha*: Ranjit Kumar Dev Goswami
*Raghunath Choudhuri: Romanticatar para Bastavataloi*: ed. Parikshit Baisya
*Ragunath Choudhuryr Kabya Bichar*: Umesh Deka and Nilmohan Roy
*Ramanyasbad aru Lakshminath Bezbaroar Kabita*: Kamaluddin Ahmed
*Romantic Kabita aru Kabya Bicar*: Basanta Sarma
*Sahitya: Romantic aru Adhunik*: Upendra Nath Sarma
*Srijan aru Manan*: Imdad Ullah

# ASM 2026
# Assamese Prose: 1846-2015
# (Core Course)
# (Credits: 6)

**Unit I:**

Anandaram Dhekial Phukan: 'Asam Deshar Sangkhep Katha' (from *Arunodoi*, ed. Maheswar Neog)
Nidhi Lebi Farwel: 'Bidya aru Gyan Labhar Phal Ki' (from *Arunodoi (1855-1865)*, ed. Arupjyoti Saikia)
Ratneswar Mahanta: 'Manobritti' (from *Ratneswar Mahanta Rasanawali*: ed. Jogendranarayan Bhuyan)

**Unit II:**

Lakshminath Bezbaroa: *Mor Jivan Sowaran* (Chapters I and II)
Satyanath Bora: 'Bor Lokar Charitra Adhyayan' (from *Srestha Asamiya Nirbachita Prabandha, Part I*: ed. Homen Borgohain)
Kaliram Medhi: 'Sankardev aru Chaitanyadev' (from the aforementioned anthology)

**Unit III:**

Banikanta Kakati: 'Soundarjyar Pratarana' (from *Sahitya aru Prem*)
Krishna Kanta Handique: 'Biswa Sahityar Patabhumit Asamiya Sahitya' (from *Krishnakanta Handique Sahitya Sambhar*: ed. Jatindranath Goswami)
Trailokyanath Goswami: 'Prachin Aru Adhunik Sahitya' (from *Sahitya Alochana*)

**Unit IV:**

Atul Chandra Baruah: 'Samaj, Krisi aru Gaonor Itibritta' (from *Atul Chandra Boruah Rachanawali (Part II)*: ed. Kanak Chandra Deka)
Hiren Gohain: 'Mahan Oupanyasik Birinchi Kumar Barua' (from *Hiren Gohain Rachanawali, Pratham Khanda:* ed. Sonit Bijay Das and Munin Bayan)
Homen Borgohain: 'Asamiya Chutigalpa (1940-1970)' (from *Asamiya Galpa Sankalan, Vol II*, ed. Homen Borgohain)

**References:**


*Adhunik Asamiya Sahitya*: Maheswar Neog
*Anatomy of Prose: Marjorie Boulton*
*Arunodaoir Dhalphat:* ed. Birinchi Kumar Barua
*Arunodoi*: ed. Maheswar Neog
*Asam Bondhu (1885-1886)*: ed. Nagen Saikia
*Asamiya Gadya Sahityar Gatipath*: Hari Nath Sarma Doloi
*Asamiya Katha Sahitya (Purani Bhag)*: Birinchi Kumar Borua
*Asamiya Lorar Mitra*: ed. Jogendra Narayan Bhuyan
*Asamiya Sahityaloi Missionary Sakalar Avadan*: Banikanta Sarma
*Banhir Patot Chintar Rengoni*: Compiled and edited by Namita Deka
*Banikanta Kakati Rachanawali*: ed. Maheswar Neog
*Gadya Padyer Dwandwa: Sisir Kumar Das*
*Kramabikashat Asamiya Kathashaili*: Prafulla Kataki
*Prose: Literary Terms and Concept: Kathleen Kuiper*
*Rhythm of Prose*: William Morrison Patterson
*Theory of Prose:* Victor Shklovsky

# ASM 2036
# Assamese Drama and Performance: 1857-2015
# (Core Course)
# (Credits: 6)

**Unit I:**

Trends in Assamese Drama: 1857-2015
With special emphasis on amateur theatre, mobile theatre and radio plays

**Unit II:**

Rudraram Bordoloi: *Bangal Bangalani*, ed. Jyotirmoy Jana
Padmanath Gohain Barua: *Gaonburha* (from *Gohain Barua Rachanavali*, ed. Maheswar Neog)
Lakshminath Bezbaroa: *Chakradhwaj Sinha* (from *Bezbaroa Granthavali, Vol. II*, ed. Atul Chandra Hazarika
Jyotiprasad Agarwala: *Karengar Ligiri* (from *Jyotiprasad Rachanavali*, ed. Satyendra Nath Sarma)

**Unit III:**

Mahendra Borthakur: *Saraguri Chapori*
Arun Sarma: *Sri Nibaran Bhattacharyya* (from *Arun Sarmar Nirbachito Natak*)
Karuna Deka: *Luitkanya* (from *Adhunik Asamiya Natya Sambhar*, ed. Jagadish Patgiri)

**Unit IV:**

Proscenium Theatre in Assam
Brechtian influence on Assamese Theatre
Recent experimental theatres of Assam

**References:**


*Abhinayacharya Brajanath Sarma: Jivan aru Sangram*: Dhiren Sarma
*Adhunik Natya Cinta*: Satya Prasad Baruah
*Asamiya Lokanat*: Nabin Chandra Sarma
*Asamiya Natak: Swarajottar Kal*: Sailen Bharali
*Asamiya Natak: Swarajottar Kal*: Sailen Bharali
*Asamiya Natya Nritya Kala*: Suresh Chandra Goswami
*Asamiya Natya Sahitya*: Satyendra Nath Sarma
*Asamiya Natyasahityar Jilingali*: Harichandra Bhattacharya
*Asamiya Sahityat Pashcyatya Prabhav*: Pragyotish College
*Assamese Farce: It's Origin and Its Development*: Dinesh Chandra Sarma
*Bhabendra Nath Saikiar Natyasambhar*: ed. Utpal Datta
*Bhasha Sahityar Itihas*: Lilabati Saikia Borah
*Indian Theatre*: Nemichandra Jain
*Loka Natya Parampara*: Sailen Bharali
*Manchalekha*: Atul Chandra Hazarika
*Natakar Byavaharik Dish*: Jagadish Patgiri and Akhil Chakravarty
*Natakar Katha*: Pona Mahanta
*Nat-Katha: Parichalona Ityadi*: Basanta Saikia
*Natya-Kala: Dehi-Bideshi*: Sailen Bharali
*Origin and Development of Assamese Drama on the Stage*: H. C. Bhattacharya
*Performance Theory*: R. Schechner
*Performance Tradition of India*: Suresh Awasthi
*The Semiotics of Theatre and Drama*: Kair Elam
*Theory of Drama*: A. Nicoll

*Traditional Indian Theatre*: Kapila Vatsyayan
*Trends in Contemporary Assamese Theatre*: Namrata Pathak
*Western Influence on Assamese Drama*: Pona Mahanta
*Western Influence on Bengali Drama*: P. R. Sen

# ASM 2046
# Indian Criticism
# (Core Course)
# (Credits: 6)

**Unit I:** Sabdashakti
(Words and meaning; power of word)
Dhvani: Concept, evolution and application
Vakrokti: Concept and application

**Unit II:**
Rasa: Concept, evolution and application
Guna and Riti: Concept and application

**Unit III:**
Bhaktivadi rhetoricians of medieval India

**Unit IV:**
Nativism
Western native, Indian features, origin and development

**References:**


*An Introduction to Study of Literature*: W. H. Hudson
*Dhvani Aru Rasatattva*: Mukunda Madhav Sharma
*Nandan Tattva: Prachya aru Pascyatya*: Troilokya Nath Goswami
*Nativism in Literature*: Bhalchandra Nemade
*Nativism*: Makarand Paranjape
*Sahitya aru Sanjna*: Prafulla Kataki
*Sahitya Darshan*: Manoranjan Shastri
*Sahitya Upakramanika*: Mahendra Bora
*Sahitya Vidya Parikrama*: Tirtha Nath Sharma
*Samalocana Sahitya*: Troilokya Nath Goswami
*The Nativist as Post-Colonial Critic*: G.N. Devy

# ASM 2054
# Editing
# (Value Added Course)
# (Credits: 4)

**Unit I:**

The philosophy and objectives of book-editing
General book editing
Book history in India and Assam
The genesis of book editing

**Unit II:**

Acquisition and evaluation of manuscripts

**Unit III:**

Copy-editing
Book making
Style
Proof
Production and printing

**Unit IV:**

Relationship between editorial and other departments of publishing

**References:**


*A History of Reading*: A. Marguel
*A Treasury of Literary Manuscript*: Chris Fletcher
*Copy Editing*: Judith Butcher
*Editors on Editing*: Gerald C. Gross
*Editors on Editing*: H Y Sharada Prasad and Others
*Grantha Sampadana: Eti Somu Abhash*: Paresh Malakar and Taranee Deka
*New Hart's Rule*: R. M. Ritter
*Print Areas: Book History in India*: Abhijit Gupta and Swapan Chakrabarty
*The Chicago Manuel of Style*: Chicago University Press
*The Fiction Editor: The Novel and the Novelist*: Thomas McCormack

# THIRD SEMESTER

## ASM 3016
## Assamese Novel: 1890-2015
## (Core Course)
## (Credits: 6)

**Unit I:**

Trends of Assamese novel

**Unit II:**

Rajanikanta Bordoloi: *Rahdai Ligiri*
Rasna Barua: *Seuji Patar Kahini*
Medini Choudhury: *Banduka Behar*

**Unit III:**

Debendranath Acharya: *Jangam*
Mamani Roysom Goswami: *Nilakanthi Braja*
Homen Borgohain: *Pitaputra*

**Unit IV:**

Bhupendranarayan Bhattacharya: *Marudyan*
Debabrat Das: *Dhusaratar Kabya*

**References:**


*Asamiya Aitihasik Upanyas*: Sailen Bharali.
*Asamiya Sahityar Buranji, Vol. VI*: ed. Homen Borgohain.
*Asamiya Upanyasar Bhumika*: Satyendra Nath Sarma
*Asamiya Upanyasar Gati Prakriti*: Sailen Bharali
*Asamiya Upanyasar Gatidhara*: Satyendra Nath Sarma.
*Asamiya Upanyasar Itihas*: Gobindra Prasad Sarma
*Asamiya Upanyasat Janajatiya Jiban*: Jitanjari Barpujari
*Esha Bacharar Asamiya Upanyas*: Ed. Nagen Thakur.
*Janajatiya Jibanbhittik Asamiya Upanyas*: Ajit Saikia
*Naribad Aru Asamiya Upanyas*: Gobindra Prasad Sarma
*Post-War Assamese Novel*: Umesh Deka.
*Swarajottar Asamiya Upanyas*: Prafulla Kakati.
*The Art of the Novel*: E.M. Forster
*The Rise of the Novel*: Ian Watt
*Upanayasar Adhunik Samalocana*: Hiren Gohain.
*Upanyas aru Asamiya Upanyas*: Govinda Prasad Sarma.
*Urbanisation and Assamese Fiction*: Taranee Deka

# ASM 3026
# Translation: Theory and Practice
# (Core Course)
# (Credits: 6)

**Unit I:**

Linguistic aspects of translation with special attention to Roman Jakobson's essay 'On Linguistic Aspects of Translation' (from *Translation Studies Reader*, ed. Lawrence Venuti)

**Unit II:**

Cultural aspects of translation, and Translation and nationalism with special attention to Krishnakanta Handiqui's essay 'Anubadar Katha' (from *Krishnakanta Handiqui Rachana Sambhar*, ed. Jatindra Nath Goswami)

**Unit III:**

Equivalence in translation, loss and gain in translation, faithful translation.
Ad-verbatim translation, semantic translation, idiomatic translation.
Translation of scientific and literary texts, transcreation, adaptation, translation through apps.

Study/Analysis of adaptation (to examine the difference emerged while adapting a text to a different medium):
Bhabendranath Saikia's novel *Antareep* and his screenplay of *Agnisnan* (ed. Utpal Datta)

**Unit IV:**

Evaluation of translated works (to examine the standard of translation):

- Comparison between the English *Mrityunjay* (Trans. D.N. Bezboruah) and the original Assamese *Mrityunjay* (by Birendra Kumar Bhattacharyya).
- Comparison between the poems in *Ancient Gongs* (Trans. Pradip Acharya) and their original Assamese versions available in *Hiren Bhattacharyyar Kabita: Prathamar Para Ataibor*
- Comparison between *Ahar Mahar Edin* (Trans. Nirajana Mahanta Bezbora) and the original Hindi *Ashadh Ka Ek Din* (by Mohan Rakesh).

Mini Projects on literary (such as poems, short stories, and others) as well as non-literary (such as pamphlets and advertisements) texts prescribed by the teacher in the class. These projects will be regarded as Home Assignments (10 marks). Sessional test(s) and Class Seminar(s) will carry additional 5 marks each. Home Assignments, Sessional test(s) and Class Seminar(s) will thus constitute 20 marks in total, reserved as the internal marks.

**References:**


*A Textbook of Translation*: P. Mewmark.
*Anubad Parikrama*: Prafulla Kataki.
*Anubadar Katha*: Abul Leis.
*Asamiya Chalachitrar Chha-Pohar*: Apurba Sarma
*Chalachitra Katha*: Utpal Datta
*Chalachitra-Samay-Samaj-Nandanttwa*: Ed. Utpal Datta
*Introduction: Translation Studie*s: *Theories and Application*s: Jeremy Munday.
*Jyotiprasadar pora Jahnu-Jangdao aru Anyanya: Asamar Chalachitrar Athta Dashakar Mulyayan*: Manoj Borpujari
*Translation across Culture*: Ed. Katharina Reiss.
*Translation and Understanding*: Sukanta Choudhury.
*Translation Studies Reader*: Ed. Lawrence Venuti.
*Translation Studies*: Susan Bassnett.

*Tulanamulak Sahitya aru Anubad Kala*: Karabi Deka Hazarika
*Tulanamulak Sahitya aru Anubadar Bichar*: Nirajana Mahanta Bezbora.

# ASM 3036
# World Literature
# (Elective Course)
# (Credits: 6)

**Unit I:**

| | |
|---|---|
| Kalidasa: | *Purvamegha* of *Meghaduta* (from *Meghaduta*, trans. Chandradhar Baruah/ Gauridutta Sarma |
| Matsuo Bashō: | 'The Old Pond' (Recommended translation: 'Eta Purana Pukhuri' from Nilmoni Phookan's *Japani Kabita/ Anusristi*) |
| T. S. Eliot: | *Love Song of J. Alfred Prufrock (*Recommended translation: 'J. Alfred Prufrock-r Premgaan' from *Ajit Barua Kabita Samagra*, ed. Kushal Dutta) |
| Federico García Lorca: | 'Lola' (Recommended translation: 'Lola' in Nilmoni Phookan's *García Lorcar Kabita* / *Anusristi*) |

**Unit II:**

| | |
|---|---|
| Henrik Ibsen: | *An Enemy of the People (*Recommended translation: *An Enemy of the People*: by Amarendra Kalita) |
| Samuel Beckett: | *Waiting for Godot (*Recommended translation: *Godot-r Pratikshat*: by Sailen Bharali) |

**Unit III:**

| | |
|---|---|
| Guy de Maupassant: | 'The Necklace' (Recommended translation: *Alankar*: by Ajit Barua (from Ajit Barua's *Maupassant-r Galpo*) |
| Frantz Kafka: | 'Metamorphosis' (Recommended translation: *Rupantar*: by Silabhadra) |

**Unit IV:**

| | |
|---|---|
| Earnest Hemingway: | *For Whom the Bell Tolls* (Recommended translation: *Deva Dundubhi Baje Kar Babe*: by Birendra Kumar Bhattacharyya) |
| Gabriel Garcia Marquez: | *One Hundred Years of Solitude* (Recommended translation: *Nisangatar Esha Basar*: by Kamala Sengupta) |

**References:**


*A History of Poetry*: David Perkins.
*Albert Camus*: Philip Thody.
*Basho's Narrow Road: Spring & Autumn Passages*: Matsuo Basho
*Colonial & Postcolonial Literature*: E. Boehmer.
*Colonialism/Postcolonialism*: Robert Young.
*Godot-r Pratikshat*: Tr. Sailen Bharali.
*Haiku--The Sacred Art: A Spiritual Practice in Three Lines*: Margaret D. Mcgee
*Ibsenar Natya-Pratibha*: Tarini Kanta Bhattacharya.
*Kalidasa for the 21st century Reader*: Mani Rao
*Kalidasa's Meghaduta*: E. Hultzsch
*Key to Modern Poetry*: L. Durrell.
*Magic(al) Realism*: Maggie Ann Bowers.
*Meghaduta, The Cloud Messenger*: Thomas Clark
*Modernism*: David Ayers.
*Modernism*: Malcolm Bradbury and James Mcferlane.
*Modernism*: Steven Matthews.
*On Love and Barley: Haiku of Basho*: Matsuo Basho, Lucien Stryk

*Postmodernism*: Christopher Butter.
*Ramanyasbad*: Mahendra Bora.
*Romantic Kabita Aru Kabya Bichar*: Basanta Kumar Sarma.
*Romanticism:* C. M. Bowra.
*Romanticism*: L. Abercrombie.
*Romanticism*: Nicholas Roe.
*Sahityar Chinta-Charcha*: Biren Barkakati.
*The Art of Haiku: Its History through Poems and Paintings by Japanese Masters*: Stephen Addiss
*The Design of T. S. Eliot's Poetry*: E. Drew.
*The Haiku Aesthetic: Short form Poetry as a Study in Craft*: Jean LeBlanc
*The Mirror and the Lamp*: M. H. Abrams.
*Truth of Poetry*: Michael Humburger.
*Twentieth Century Drama*: B. Gascoigne.

# ASM 3046
# Ethnic Literature of North-East India
# (Elective Course)
# (Credits: 6)

**Unit I:**

Ballad and folktales of N.E. India (Etiological, Trickster tales, Animal tales)

**Unit II:**

Existence of Aryan and non-Aryan peoples in N.E. India and its out come in their literature (chants and hymns, Sakta and Saiva literature)

**Unit III:**

Patronization of Christian Missionaries and British dignitaries for initiation of ethnic literature of N. E. India (Translation of the *Bible*, Publication of Grammar and Dictionaries, documentation of folk-literature)

**Unit IV:**

Background of Modern literature of N.E. India with special reference to Boro, Garo, Rabha, Mishing and Khasi literature

**References:**


*Asamiya aru Bangla Loka-Sahitya*: Prafulla Kr Nath
*Asamiya Kahinigit*: Bhaba Prasad Chaliha
*Ballads and Tales of Assam*: Prafulladutta Goswami
*Boro Adhunik Sahitya*: Anil Boro
*Boro Loka-Sahitya*: Madhu Boro
*Ehora Janajatiya Chutigalpa*: Ed. Upen Rabha Hakacham.
*Folk Songs and Folk Tales of the Bodos*: M. M. Brahama
*Garo Sanskritir Ruprekha*: Dhirendra Narayan Mazumdar
*Garo Jungle Book*: William Carrey
*Hena-Hucha: Asamiya Janojatiya Loka-Sahityar Sankalan*: Ed. Upen Rabha Hakacham.
*History of Garo Literature*: K. Sangma
*Janajati aru Garo Janajati*: Bimal Mazumdar
*Janajatiya Sadhu*: Satyendra Nath Borkataky
*Rabha Bhasha aru Sahitya*: Upen Rabha Hakacham.
*Rabha Loka-Sahitya Aitihya-Parampara aru Pranalivaddhakaran*: Upen Rabha Hakacham.
*Siphung-Gunggang*: Ed. B. Dutta
*The Epiclore of the Garos*: D. S. Raangumothu
*The Garos*: A. Playfair
*The Glimpses of the Garos*: P.C. Karr.
*Uttar-Purbanchalar Loka-Sahitya*: Nabin Chandra Sarma

# ASM 3056
# Sanskrit Texts
# (Elective Course)
# (Credits: 6)

**Unit I:**

Kavya:

Kalidasa: *Raghuvamsam*: Cantos 1-2

**Unit II:**

Nataka:

Kalidasa: *Abhijnansakuntalam*

**Unit III:**

Prakarana:

Shudraka: *Mricchakatikam*

**Unit IV:**

Upakatha:

Vishnu Sarma: 'Panchatantra Kathamukham' (from *Panchatantra*)

**References:**


*Abhijnansakuntalam: Ek Samiksha*: T. Sarma
*Abhijnansakuntalam*: Preface by R. M. Dey
*History of Sanskrit Literature*: A.B. Keith
*Law and Practices of Sanskrit Drama*: S. N. Shastri
*Mricchakatikamimamsa*: Malinee Goswami
*Raghurapi Kavyam*: Malinee Goswami
*Sanskrit Drama*: A.B. Keith
*Sanskritayan*: Malinee Goswami
*Types of Sanskrit Drama*: D.R. Mankad
*Upama Kalidasasya*: Mukunda Madhava Sharma

# ASM 3066
# Varieties of Assamese Language
# (Elective Course)
# (Credits: 6)

**Unit I:**

Dialectology: Isogloss, Diaglossia; Dialect Geography: Methods of Regional Dialect Study; Regional Varieties in Assam: Upper Assam, Darangi, Morigayan and Lower Assam (Kamrupi, Goalporia)

**Unit II:**

Social Varieties: Methods of Social Dialect study, Social Varieties in Assam: Language forms of the Kaivartas and Moriyas.

**Unit III:**

Ethnic Varieties: Ethnicity and Language Variation, Methods of Ethnic Dialect Study, Ethnic varieties in Assam: Rabhamese, Mishing-Asamiya and Hajong-Asamiya

**Unit IV:**

Contemporary Assamese: Print and Electronic Media

**References:**


*A Study on Kamrupi: A Dialect of Assamese*: Upendra Nath Goswami
*Adhunik Bhasha Bijnan Parichay*: P.N. Dutta Baruah
*Asamiya aru Asamar Bhasha aru Upabhasha*: Upen Rabha Hakacham
*Asamiya aru Asamar Bhasha*: Eds. Biswajit Das and Phukan Basumatary
*Asamiya Bhasha aru Upabhasha:* Upendra Nath Goswami
*Asamiya Bhashar Upabhasha*: Ed. Dipti Phukan Patgiri
*Darangi Upabhasha Adhyayan*: Jiban Pathak
*Dialectology: An Introduction*: W.N. Francis
*Dialectology*: J.K. Chambers and Peter Trudgill
*Goalparia Upabhasha*: *Rup Baichitrya*: Eds. Bibha Bharali and Kalpana Talukdar
*Kamrupi Upabhasha: Eti Adhyan*: Bibha Bharali
*Lokabhasha: Loka Sanskriti*: Pabitra Sarkar
*Rabhamese: Bhasha aru Nidarsan*: Upen Rabha Hakacham
*Sociolinguistics:* Ed. J.B. Pride
*The Handbook of Sociolinguistics*: Ed. Florian Coulmas
*Upabhasha Bijnan*: Dipankar Moral
*Upabhasha aru Asamar Upabhasha*: Ed. Dipti Phukan Patgiri
*Upabhasha Bijnanar Bhumika*: Ramesh Pathak

# ASM 3076
# Contact Languages of North-East India
# (Elective Course)
# (Credits: 6)

**Unit I:**

Introduction; Factors and forms of language contact; Code-mixing and Borrowing: Substrate influence

**Unit II:**

Language Shift and Language maintenance: History, Impacts and Factors

**Unit III:**

The Nature of Pidgins: Sadani, Nagamese, Arunachali Assamese.

**Unit IV:**

The Process of Creolisation: History, Classification, Creol genesis.

**References:**


*An Introduction to Pidgins and Creols*: John A. Holms
*Asamar Bhasha*: Bhimkanta Baruah
*Asamar Bhasha:* Eds. Bibha Bharali and Banani Chakravarty
*Asamiya aru Asamar Bhasha Upabhasha*: Upen Rabha Hakacham
*Asamiya aru Asamar Bhasha*: Ed. Biswajit Das and Phukan Basumatary
*Assamese: Its Origin and Substratum*: Bhagaban Moral
*Bhasha aru Samaj*: Sapon Duara
*Contact Languages: A Wider Perspective*: Sarah G.Thomason
*Impact of Code Switching-Mixing in Assamese: A SynchronicStudy*: Arup Kumar Nath
*Language Contact*: Yaron Matras
*Language Contact: An Introduction*: Sarah G.Thomason
*Naga Pidgin: A Sociolinguistic Study of Inter-Lingual Communication Patern in Nagaland*: M. V. Sreedhar
*Nagamese Kathalaga Niyam*: Bhimkanta Baruah
*Pidgin and Creole Languages*: R. A. Hall, Jr.
*Rabhamese Bhasha aru Nidarshan*: Upen Rabha Hakachan
*The Handbook of Sociolinguistics*: Ed. Florian Coulmas

# ASM 3086
# Modern Indian Literature
# (Elective Course)
# (Credits: 6)

**Unit I:**

Concept of modern Indian literature
History of modern Indian literature

**Unit II:**

Nationalism and its impact on modern Indian literature
Recent trends of moern Indian literature (with special reference to the major trends in poetry, novel and short story in Assamese, Bengali, Oriya and Hindi after 1947)

**Unit III:**

Premchand: *Godan* (Recommended translation: *Godan*: by Nirupama Phukon)
K. C. Panigrahi: *Matir Manush* (Recommended translation: *Matir Manuh*: by S.N. Sarmah)
Mahasweta Devi: *Aranyer Adhikar* (Recommended translation: *Aranyar Adhikar*: by Kalpanath Gogoi

**Unit-IV:**

Rabindranath Tagore: 'Ae Katha Janite Tumi' (from *Balaka*)
Mahadevi Verma: 'Mai Palakate Pan Karicho' (from *Dipsikha*)
Ajneya: 'Jaidol' (from *Jaidol*)
Rabindranath Tagore: 'Kabuliwala' (from *Ekuri Eta Chutigalpa*, Tr. Birendra Kumar Bhattacharyya)

**References:**


*Adhunik Bharatiya Sahitya*: Sailen Bharali
*Aspects of Comparative Literature*: Indranath Choudhury
*Bharatiya Sahityar Tulanamulak Adhyayan*: Prafulla Kumar Nath.
*Comparative Indian Literature*: Ed. K.M. George
*Comparative Literature: Indian Dimension*: Swapan Mazundar
*Modernity and Comparative Literature*: Ed. KM George
*Rabindra Chinta aru Bharatiya Sahitya Bichitra*: Pallabi Deka Buzarbaruah
*The Idea of Comparative Literature in India*: Amiya Dev
*Tulanamulak Bharatiya Sahitya, Bichar aru Bisleshan*: Prafulla Kumar Nath
*Tulanamulak Bharatiya Sahitya*: Nirajna Mahanta Bezbora
*Tulanamulak Sahitya aru Anubad Bichar*: Prafulla Kataky
*Tulanamulak Sahitya aru Anubad Kala*: Karabi Deka Hazarika
*Tulanamulak Sahitya, Tattva aru Prayog*: Prafulla Kumar Nath

# ASM 3096
# Assamese Vaisnavite, Saiva and Sakta Literatures
# (Elective Course)
# (Credits: 6)

**Unit I:**

History, Philosophy and Background of Vaisnavite Movement in India with special reference to Assam.

**Unit II:**

Concept of Vaisnavism (Bhaktibad) and Assamese Vaisnavite literature.
Sankaradeva: *Kirtan Ghosa*
Madhavadeva: *Namghosa*

**Unit III:**

Concept of Saivism, history of Saivism in Assam and Assamese Saiva literature.
Rudra Sinha: *Siva Purana*

**Unit IV:**

Concept of Saktism, history of Saktism in Assam and Assamese Sakta literature.
Ruchinath Kandali: *Sri Sri Chandi*

**References:**


*Asamar Baisnav Dharma aru Darsan*: Anima Dutta
*Asamar Dharmar Buranji: Andhar aru Pohar*: Maheswar Neog.
*Asamar Vaisnava Dharma aru Sahitya*: Kanak Chandra Saharia
*Asamat Sakti Sadhana aru Sakta Sahitya*: Harinath Sarma Doloi
*Bhakti Marga aru Bharatiya Bhakti Sahitya*: Prafulla Kumar Nath.
*Bhakti Ratnakar of Sankardeva and History of the Concept of Bhakti*: Ed. Maheswar Neog
*Bhakti Sahitya*: Bimal Mazumdar
*Bhaktibad*: Tirtha Nath Sarma
*Bhakti-Rahasya*: Swami Vivekananda
*Bhakti-Yoga*: Swami Vivekananda
*Devi*: Nirmal Prabha Bordoloi
*Loka Devata Siva*: Birenda Kumar Gohain
*Mother Goddess Kamakhya*: Banikanta Kakati
*Neo Vaisnavite Movement and Sattra Institution of Assam*: Satyendra Nath Sarma.
*Purani Kamrupar Dharmar Dhara*: Banikanta Kakati
*Purani Sahitya Adhyayan*: Satyendra Nath Sarma
*Sankardeva Adhyayan Prasanga*: Aitihya Aru Parampara: Kesavananda Deva Goswami
*Sankardeva and His Times*: Maheswar Neog
*Sankari Sahityar Samiksha*: Ed. Bhaba Prasad Chaliha
*Sankari Sanskriti Adhyayan*: Ed. Bhaba Prasad Chaliha
*Siva*: Nirmal Prabha Bordoloi
*Sri Sri Chandi*: Ed. Nabin Chandra Sarma
*Sri Sri Chandi*: Ed. Parikshit Hazarika
*Tattva Katha*: Lakshminath Bezbaroa
*The Religion of Love and Devotion*: Lakshminath Bezbaroa
*Vaisnava Bhaktidhara aru Santa Katha*: Upendra Nath Goswami
*Vaisnavite Myth and Legend*: Banikanta Kakati

# ASM 3106
# Structure of Assamese Language
# (Elective Course)
# (Credits: 6)

**Unit I:**

Phonology: Assamese Phonology and Morphophonemic Alternation; Assamese Phones and Allophones; Stress and Juncture of Assamese Language

**Unit II:**

Morphology: Classification of Assamese Morphemes; Inflection: Number, Gender, Person and Case; Declension: Verb system and Conjugation

**Unit III:**

Syntax: Introduction to Generative Grammar; Universal Grammar; Lexical and Functional Categories; Constituency and structural relations; Phrase Structure Rules

**Unit IV:**

Semantics: The principle of compositionality; the different dimensions of meaning (assertion, presupposition, and implicature)

**References:**


*Asamiya Bhashar Ruptatta*: Lilabati Saikia Bora
*Asamiya Bhashar Byakaran*: Upendranath Goswami
*Asamiya Bhashar Rupkatha*: Upendranath Goswami
*Asamiya Byakaranar Moulik Bichar:* Golok Chandra Goswami
*Asamiya Ruptattvar Maulik Bichar*: Upen Rabha Hakacham
*Aspects of the Theory of Syntax*: Noam Chomsky
*Barna Prakash*: Golok Chandra Goswami
*Bhashartha Bijnan*: Bhagaban Maral
*Bhashabijnanar Jilikani*: Pranita Devi
*Semantics in Generative Grammar*: Irene Heim, Angelika Kratzer
*Structure of Assamese*: Golok Chandra Goswami
*Syntactic Structures*: Noam Chomsky
*Syntax: A Generative Introduction*: Andrew Carnie
*Understanding Morphology*: Martin Haspelmath
*Understanding Phonology*: Carlos Gussenhoven and Haike Jacobs

# ASM 3116
# Phonetics
# (Elective Course)
# (Credits: 6)

**Unit I:**

The vocal tract; Consonants & Vowels, States of the Glottis: Voicing, Voice quality, Consonants: Place, Manner; Vowels

**Unit II:**

Non-segmental Phonetics in context; Tone, Stress, Intonation, Juncture, Nasalization

**Unit III:**

Introduction to Acoustics: Nature of sound and sound propagation, Waveform analysis F0, intensity, voicing, Vowel acoustics

**Unit IV:**

Making recordings, Introduction to Praat: Fricative acoustics, Stop acoustics, Nasalization acoustics; Audition and Perception

**References**:


*A Course in Phonetics*: Peter Ladefoged
*Acoustic and Auditory Phonetics*: Keith Johnson
*Articulatory Phonetics: Tools for Analyzing the World's Languages*: Anita C. Bickford and Rick Floyd
*Byabaharik Dhwani Bijnan*: Dipankar Maral
*Dhwani Bijnanar Bhumika*: Golok Chandra Goswami
*Introduction to Assamese Phonology*: Golok Chandra Goswami
*Speech Acoustics and Phonetics*: Gunnar Fant
*The Sounds of Language: An Introduction to Phonetics & Phonology*: Elizabeth Zsiga
*Understanding Phonetics*: Patricia Ashby

# ASM 3126
# Sankaradeva Studies
# (Elective Course/ Elective Open Course)
# (Credits: 6)

**Unit I:**

Sankaradeva and his times:
The medieval period of Assam: historical, political, economical and religious backgrounds

**Unit II:**

Literary influence on Sankaradeva:
Literary contribution of Sankaradeva (Kabya, Nat, Geet)

**Unit III:**

Religion and philosophy of Sankaradeva:
Vaisnavism, Neo-Vaisnavism, Advaita, Visistadvaita

**Unit IV:**

Sankaradeva and the Socio-cultural Renaissance of Assam:
Social reform, reconstruction of the Assamese society.
Relevence of Sankardeva in present time.

**References:**


*Anunad*: Ed. Ranjit Kumar Dev Goswami
*Asamiya Jatiya Jivanat Mahapurusiya Parampara*: Hiren Gohain
*Assam Mein Bhagavat Dharma aur Sankardev ka Darshan*: Bapchandra Mahanta
*Bedanta aru Vaishnavdharma*: Yogiraj Bose
*Bharatiya Patabhumit Sankari Sahitya aru Sattria Sangeet*: Kesavananda Dev Goswami
*Bishay Sankaradeva*: Nagen Saikia
*Descriptive Bibliography of Sankardeva Studies*: Bimal Mazumdar
*Essays on Sankaradeva*: Ranjit Kumar Dev Goswami
*Gurucarit Katha*: Maheswar Neog
*Mahapurusa Srimanta Sankaradeva*: Nabin Chandra Sarma
*Prabandha*: Ranjit Kumar Dev Goswami
*Sankaradava and His Times: Early History of the Vaisnava Faith and Movement in Assam:* Maheswar Neog
*Sankaradeva Charcha*: Bimal Mazumdar
*Sankaradeva*: Lakshminath Bezbaroa
*Sankaradeva-Sahityaka aru Vicarak*: K. N. Prasad 'Magadh'
*Sarbabharatiya Bhakti Andolan aru Sankaradevar Kirtan Ghosa*: Bhavajit Bayan
*The Neo-Vaisnavite Movement and Sattra Institutions of Assam:* S.N. Sarma
*The Philosophy of Sankaradeva: An Apprisal*: Nilima Sharma
*The Religion of Love and Devotion*: Lakshminath Bezbaroa
*Vaishnava Bhaktidhrma aru Santa Katha*: Upendra Nath Goswami
*Yugnayak Sankardeva*: Dimbeswar Neog

# FOURTH SEMESTER

## ASM 4016
## Textual Criticism and Script Study
## (Core Course)
## (Credits: 6)

**Unit I:**

Introduction:
Definition, aims and objectives of Textual Criticism

**Unit II:**

Theory of Textual Criticism and it application

**Unit III:**

History of Textual Criticism in Assam

**Unit IV:**

Manuscript and features
Assamese manuscripts including illustrated manuscripts
Manuscript reading
History of Assamese Script and Evaluation

**References:**


*Asamiya Lipi*: Upendra Nath Goswami
*Development of Script of Ancient Kamarupa*: T. P. Verma
*Evalution of Assamese Script*: Mahendra Bora
*Introduction to Indian Textual Criticism*: S. M. Katre
*Path Samiksa*: Maheswar Neog
*Path Samiksha (Sutra aru Prayogvidhi)*: Malinee Goswami
*Prolegomena, Mahabharata Adiparva*: V.S. Sukthankar

# ASM 4026
# Applied Linguistics
# (Core Course)
# (Credits: 6)

**Unit I:**

Computational Linguistics: Natural Language Processing: analyzing and using co-occurrences of words in text; context-free grammars and parsing

**Unit II:**

Discourse Analysis: The structure of discourse; Narrative Analysis; Conversation Analysis

**Unit III:**

Lexicography: Analysis of the lexicon: relations between words, levels of the lexicon, lexical borrowing, lexical norm, linguistic purism; different types of dictionaries and different types of lexicographic design, electronic dictionaries, parts of the lexicographic entry, the microstructure and macrostructure of dictionary

**Unit IV:**

Application of linguistic knowledge for first and second language teaching methods: Difference between first and second language learning, language teaching methods, Application of Descriptive Linguistics, Sociolinguistics and Psycholinguistics in language teaching.

**References:**


*A Practical Guide to Lexicography*: Ed. P. Sterkenburg
*Abhidhan Prasanga: S*. N. Goswami
*Abhidhan Tattva*: ed. Arpana Konwar
*An Introduction to Discourse Analysis*: M. Coulthard
*Asamiya aru Asamar Jati Janagosthi: Prasanga aru Sanga*: Upen Rabha Hakacham
*Bhasha Bijnanar Bhumika*: Ramesh Pathak
*Contemporary Applied Linguistics: Language Teaching and Learning, Vol I*: Eds. Li Wei and Vivian Cook
*Discourse Analysis*: Gillian Brown, George Yule
*Discourse Analysis*: H.G. Widowson
*Discourse Analysis: Theory and Method*: J. P. Gee
*Electronic Lexicography*: Eds.Sylviane Granger, Magali Paquot
*Lexicography at a Crossroads*: Dictionaries and Encyclopedias Today: Sven Tarp
*Lexicography: An Introduction*: Howard Jackson
*Prayog Bhashabijnanar Ruprekha*: P. N. Duttabaruah
*Principles of Language Learning and Teaching*: H. Douglas Brown
*Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition:* Daniel Jurafsky and James H. Martin
*The Handbook of Computational Linguistics and Natural Language Processing*: Alexander Clark, Chris Fox, Shalom Lappin
*The Handbook of Discourse Analysis*: Deborah Tannen, Heidi E. Hamilton, Deborah Schiffrin
*The Oxford Handbook of Computational Linguistics*: Ruslan Mitkov
*The Oxford Handbook of Lexicography*: Eds. Philip Durkin
*Words in the Mind: An Introduction to the Mental Lexicon*: J. Aitchison

# ASM 4036
# Peripheral Genres of Assamese Literature
# (Elective Course)
# (Credits: 6)

**Unit– I:**

Trends of Assamese travelogues
Trends of Assamese biographies and autobiographies
Trends of literature for children in Assamese
Trends of Assamese science fictions

**Unit– II:**

Assamese travel-writings:
Hem Barua: *Ranga Karabir Phul*
Birinchi Kumar Barua: *Professor Baruar Chithi*

**Unit– III:**

Assamese biographies and autobiographies:
Abdus Sattar: *Krishnakanta Sandikoi*
Mahendra Bora: *Upala Nadir Dare*: Mahendra Bora

**Unit– IV:**

Literature for children in Assamese, and Assamese science fictions:
Navakanta Barua: 'Jnanar Sapon' (from *Morua Phul*)
Lakshminandan Borah: *Kayakalpa*
Dinesh Chandra Goswami: *Tritonor Abhiyan*

**References:**


*Asamiya Bijnan Sahitya: Atitor pora Bortomaoloi*: Ed. Kshiradhar Baruah
*Asamiya Bijnan Sahitya*: Ed. Dinesh Baishya
*Asamiya Sahityar Buranji, Vol VI*: Ed. Homen Borgohain
*Asamiya Shishu Sahitya Samiksha*: Santanu Tamuly
*Asamiya Shishu Sahityar Samkhipta Itihas*: Upendra Borkotoky
*Bijnan Sahitya: Asamiya Bijnan Sahityar Bibhinna Dhara*: Ed. Pramod Chandra Neog
*Bingsha Shatikar Asamiya Bijanan Sahitya*: Paramananda Mahanta
*Bingsha Shatikar Asamiya Sahitya*: Ed. Homen Borgohain
*Eminent Victorians*: Lytton Strachey
*Jivani aru Atmajivani*: Govinda Prasad Sarma
*Proceeding of a Seminar on the History, Problem and Prospect of Assamese Science Literature, Organized by Asam Science Society on 4th and 5th October 1980*
*Sahityar Abhibyakti*: Kamaluddin Ahmed
*The Definitive Guide to Travel Writing*: S. H. Lane
*The Everything Guide to Writing Children's Books*: Abrahams Gordon Wallin
*Travel Writing: The New Critical Idiom*: Carl Thompson
*Unnish Shataker Banglay Bijnan Sadhana*: Binoy Bhushan Rai

# ASM 4046
# Assamese Short Story: 1892-2015
# (Elective Course)
# (Credits: 6)

**Unit I:**

Trends of Assamese Short Stories.

Lakshminath Bezbaroa: 'Jayanti' (from *Adhunik Asamiya Galpa Sankalan,* ed. Trailokyanath Goswami)
Lakshidhar Sarma: 'Byarthatar Dan' (from *Asamiya Galpa Sankalan, Pratham Khanda,* ed. Homen Borgohain)
Syed Abdul Malik: 'Pran Powar Pichat' (from *Asamiya Galpa Sankalan, Dwitiya Khanda,* ed. Homen Borgohain)

**Unit II:**

Sourav Kumar Chaliha: 'Ehat Daba' (from *Asamiya Chutigalpar Prabah:* ed. Lilabati Saikia Bora)
Mohim Bora: 'Chakrabat' (from *Adhunik Asamiya Galpa Sankalan,* ed. Trailokyanath Goswami)
Nirupama Borgohain: 'Anthropologyr Saponar Pachat' (from *Galpamanjari*, ed. Sailen Bharali)
Bhabendranath Saikia: 'Grahan' (from *Asamiya Galpa Sankalan, Dwitiya Khanda*, ed. Homen Borgohain)

**Unit III:**

Nagen Saikia: 'Bandha Kothat Dhumuha' (from the aforementioned anthology)
Pranab Jyoti Deka: 'Bewaris Las' (from the aforementioned anthology)
Apurba Sarma: 'Baghe Tapur Rati' (from *Asamiya Galpa Sankalan, Tritiya Khanda*, ed. Homen Borgohain)

**Unit IV:**

Jehirul Hussain: 'Rang Kukurar Tupi' (from *Rang Kukurar Tupi)*
Manoj Kumar Goswami: 'Nirbandhav' (from *Aluminium-r Anguli*)

**References:**


*Adhunik Asomiya Galpa Sangrah*: Ed. Trailokyanath Goswami
*Adhunik Galpa Sahitya*: Trailokya Nath Goswami.
*Asamiya Chutigalpar Prabah*: Ed. Lilabati Saikia Bora
*Asamiya Chutigalpar Adhayan*: Prahlad Kumar Barua.
*Asamiya Galpa Guchchha*: Ed. Maheswar Neog
*Asamiya Galpa Sankalan, Dwitiya Khanda*: Ed. Homen Borgohain
*Asamiya Galpa Sankalan, Pratham Khanda*: Ed. Homen Borgohain
*Asamiya Galpa Sankalan, Tritiya Khanda*: Ed. Homen Borgohain
*Asamiya Galpa Sankalan*: Ed. Homen Borgohain.
*Asamiya Galpa Sankalan*: Ed. Nirmal Prabha Bordoloi
*Asamiya Sahityar Buranji, Vol. VI*: Ed. Homen Borgohain.
*Chutigalpa*: Uday Dutta.
*Galpamanjari*: Ed. Sailen Bharali
*Yuddhottar Yugar Asamiya Chuti Galpa*: Kumud Goswami.

# ASM 4056
# Comparative Studies of Indo-Aryan Languages
# (Elective Course)
# (Credits: 6)

**Unit I:**

Evolution of Indo-Aryan languages (Sanskrit to Pali Prakrit and Apabhramsa); Phonological aspects of MIA languages: Vowels and Consonants, Stress, Juncture.

**Unit II:**

Morphological aspects of MIA languages: Declension System: Number, Gender and Case; Conjugation: Verb System

**Unit III:**

Evolution of NIA languages; A general introduction to Pan-Magadhan languages, General Characteristics of Pan-Magadhan languages; Comparative Study of Assamese Phonology to any one of Pan-Magadhan Languages (Any of the following languages: Bengali, Oriya, Bhojpuri and Maithili).

**Unit IV:**

Comparative Study of Assamese Morphology to any one of Pan Magadhan Languages (Any of the following languages: Bengali, Oriya, Bhojpuri and Maithili).

**References:**


*A Controlled Historical Reconstruction of Oriya, Assamese, Bengali and Hindi*: D.P. Pattanayak
*A Reference Grammar of Maithili*: Ramawatar Yadav
*Adhunik Bharatiya Aryabhasha*: Ed. Dipti Phukan Patgiri
*Asamiya Bhashar Byakaran:* Upendra Nath Goswami
*Asamiya Bhashar Rupatatta:* Lilabati Saikia Bora
*Asamiya Bhashar Udbhav, Samridhi aru Bikash*: Upendra Nath Goswami
*Asamiya Byakaran aru Bhashatattva*: Kaliram Medhi
*Asamiya Byakaran Prabesh*: Golok Chandra Goswami
*Asamiya, Bangla aru Uriya Bhasha: Tulanamulak Adhyayan*: Dipti Phukan Patgiri
*Assamese: Its Formation and Development*: Banikanta Kakati
*Bhashabaijnanik Adhyayanat Tulana Prasanga:* Ed. Upen Rabha Hakacham and Pranita Devi
*Introduction to Assamese Phonology*: Golok Chandra Goswami
*Introduction to Prakrit:* A. C. Woolner
*Maithili Bhasha ka Bikash*: Govind Jha
*Origin and Development of Bhojpuri*: U.N. Tiwari
*Origin and Development of the Bengali Language*: S.K. Chatterjee
*Pali-Prakrit-Apabhramsa Bhasha aru Sahitya*: Nagen Thakur
*Sanskrit, Pali-Prakrit aru Asamiya Byakaran*: Lilabati Saikia Bora
*Seven Grammars of Dialects and Sub-dialects of Bihari Language*: G.A. Grierson
*Structure of Assamese:* Golok Chandra Goswami
*The Evolution of Oriya Language and Script*: K.B. Tripathi
*The Formation of Maithili Language*: Subhadra Jha
*The Indo-Aryan Languages*: C.P. Mesica
*The Structure and Development of Middle Indo Aryan Dialects*: Vit Bubenik
*Tulanamulak Vyakaran*: S.N. Goswami

# ASM 4066
# Language Acquisition
# (Elective Course)
# (Credits: 6)

**Unit I:**

Introduction: History and early studies of language acquisition; Parent-child Communication; Child-directed speech; Speech perception; Phonological Development

**Unit II:**

Stages of Acquisition: first words, vocabulary learning, semantics, morphology and early syntax, complex syntax, pragmatics; Culture and language development

**Unit III:**

Second Language Learning: difference and similarities between first and second language acquisition; Stages of second language acquisition; The role of different factors influencing second language acquisition such as age, transfer, linguistic and social environment.

**Unit IV:**

Project

**References:**


*Applied Cognitive Linguistics, Vol. I: Theory and Language Acquisition*: Eds. René Dirven Ronald W. Langacker and John R. Taylor
*Child Language: Acquisition and Growth*: Barbara C. Lust
*First and Second Language Acquisition*: Jürgen M. Meisel
*First Language Acquisition Method, Description, and Explanation*: David Ingram
*First Language Acquisition*: Eve V. Clark
*Introducing Second Language Acquisition*: Muriel Saville-Troike
*Language Acquisition: The State of the Art*: Ed. Eric Wanner and Lila R. Gleitman
*LanguageTransfer in Language Learning*: Eds. Harald Clahsen and William Rutherford
*Pragmatic Development in First Language Acquisition*: Ed. Danielle Matthews
*Second Language Acquisition: An Introduction Course*: Susan M. Gass and Larry Selinker
*Second Language Acquisition:* Rod Ellis
*Second Language Acquisition*: Wolfgang Klein
*Studies of Fossilization in Second Language Acquisition*: Eds. Zhao Hong Han and Terence Odlin
*The Acquisition of Language*: D. Mcneill
*Understanding Language Acquisition: The Framework of Learning*: Christina E. Erneling
*Understanding Second Language Acquisition:* Lourdes Ortega

# ASM 4076
# Aspects of Multilingualism
# (Elective Course)
# (Credits: 6)

**Unit I:**

Bilingualism and bilinguality, contrast with monolingualism and multilingualism, types of bilingualism, code switching and code mixing, factors promoting bilingualism: natural bilingualism in state border areas and among children born of cross community marriage, product of bilingual education.

**Unit II:**

Multilingualism and multilinguality; Factors: Social force, Business, National Education Policy, Multi-ethnic context; Impacts on multilingual individual and multilingual community; Multilingualism in Indian context.

**Unit III:**

Levels of proficiency in bilingualism and multilingualism; Factors: acquisition methods, age, attitude, interest and dedication.

**Unit IV:**

Project

**References**:


*Adhunik Bhasha Bijnan Parichay*: P.N. Duttabarua
*An Introduction to Evaluation Terminology*: Pon Subbiah
*Bhasha aru Samaj*: Sapon Duara
*Bilingual Europe: Latin and Vernacular Cultures*: Ed. Jan Bloemendal
*Bilingualism and Bilinguality*: Josiane F. Hamers and Michel H.A.Blanc
*Bilingualism in Development: Language, Literacy and Cognition*: Ellen Bialystok
*Bilingualism: A Social Approach*: Monica Hellar

# ASM 4086
# Western Literary Criticism
# (Elective Course)
# (Credits: 6)

**Unit I:**

Aristotle: *Poetics* (with emphases on tragedy, comedy and epic) (Recommended Translation: *Aristotle-r Kabyatattva* by Akhil Hazarika)

Longinus: *On the Sublime* (Recommended Translation: *Horace aru Longinus-r Kabyatattva* by Akhil Hazarika)

**Unit II:**

T. S. Eliot: 'Tradition and the Individual Talent' (from *The Sacred Wood*)

F. R. Leavis: 'The Great Tradition' (from *The Great Tradition*)

**Unit III:**

Harekrishna Deka: 'Adhunikatabad aru Asomiya Kabitat Adhunikotabadar Pratiphalan' (from *Adhunikatabad aru Anyanya Prabandha*)

Ananda Barmudoi: Uttar-Adhunikatabadi Upanyas' (from *Adhunikatabadar pora Uttar-Adhunikatabadaloi*)

**Unit IV:**

Madan Sarma: 'Sanjutibad' (from *Sahitya Samalochana Tattva*: ed. Anjan Kumar Oza)

Ranjit Kumar Dev Goswami: 'Nirgathan Abhimukhe' (from *Prabandha*)

Aparna Mahanta: 'Naribad' (from *Sahitya Samalochana Tattva*: ed. Anjan Kumar Oza)

**References:**


*A Glossary of Literary Terms*: M. H. Abrams
*Banikanta Kakatir pora Bhaben Barualoi*: Sailen Bharali
*Beginning TheoryAn Introduction to Literary and Cultural Theory:* Peter Barry
*Critical Approaches in Literature*: David Daiches
*English Critical Text*: Ed. D. G. Enright, Ernst De Chickera
*Feminism*: Margaret Walters
*Ferdinand de Saussure: Sadharan Bhashabijnanar Path:* Trans. Pona Mahanta
*Hiren Gohain Rachanavali, Vol. 1*: Hiren Gohain (eds. Shoneet Bijoy Das and Munin Bayan)
*History of Modern Criticism*: Rene Wellek
*Ingraji Samalochanar Dhara aru Asamiya Sahityat Iyar Prabhav*: Trailokya Nath Goswami
*Interdisciplinary Perspectives on Modernity*: ed. Sudha P. Pandey and Prafulla C. Kar
*Literary Criticism*: W. K. Wimsatt Jr. and Cleanth Brooks
*Literary Theory*: Jonathan Culler
*Literary Theory: The Basics*: Hans Bartens
*Modernism*: David Ayers
*Modernism*: Malcolm Bradbury and James Mcfarlane
*Modernism*: Steven Matthews
*Nandan Tattva: Prachya aru Pashcyatya*: Trailokya Nath Goswami
*Naribad aru Asamiya Upanyas*: Govinda Prasad Sarma
*Postmodernism*: Christopher Butler
*Poststructuralism*: Catherine Belsey
*Sahitya aru Sajna*: Prafulla Kataki
*Sahitya-Tattva aru Samalochana Tattva*: Nahendra Padun
*Samalochana Sahitya*: Trailokya Nath Goswami
*Structuralism and Semiotics*: Terence Hawkes

*The Bedford Glossary of Critical and Literary Terms*: eds. Ross C. Murfin and Supriya M. Ray
*The Making of Literature*: R. A. Scott-James
*The Penguin Dictionary of Literary Terms and Literary Theory*: J. A. Cuddon
*The Postmodern Condition*: J. F. Lyotard
*Tragedy Bichar*: Sailen Bharali

# ASM 4096
# Assamese Criticism
# (Elective Course)
# (Credits: 6)

**Unit I**

Trends of Assamese Criticism.
Banikanta Kakati: 'Dahikatara' (from *Banikanta Kakati Rachanavali*, ed. Maheswar Neog)
Tirthanath Sarma: 'Rahasyik Madhavadeva' (from *Panchapushpa*)

**Unit II**

Birinchi Kumar Barua: 'Preface' to *Ankiya Nat* (from *Ankia Nat)*
Satyendra Nath Sarma: 'Adhunik Kabyar Unmesh'

**Unit III**

Hiren Gohain: 'Aitihya aru Jibanar Batat' (from *Hiren Gohain Rachanawali, Pratham Khanda*, eds. Shoneet Bijoy Das and Munin Bayan)
Bhaben Barua: Discussion on Ajit Barua's 'Jengrai 1963' (from *Asamiya Kabita: Rupantarar Parba*)

**Unit IV:**

Ranjit Kumar Dev Goswami: 'Haramohanar Samajik Tatporya' (from *Prabandha*)
Pradip Acharya: 'Asamiya Kabitar Kurita Bachar' (from *Asamiya Sahityar Buranji, Shashtha Khanda*, ed. Homen Borgohain)
Govinda Prasad Sarma: 'Andre Maurois-r Ariel: Ekhan Natun Jivanir Rasaswadan' (from *Jivani aru Asamiya Jivani*)
Sailen Bharali: 'Samalochak Banikanta Kakati' (from *Madhab Kandalir Pora Mamoni Goswamiloi*)

**References:**


*Asamiya Kabita Rupantar Parba*: Bhaben Barua
*Asamiya Sahityar Buranji, Vol. VI (Enlarged Edition)*: ed. Homen Borgohain
*Asamiya Sahityar Buranji, Vol.V*: ed. Ranjit Kr Dev Goswami
*Asamiya Upanyasar Itiha*sh: Gobinda Prasad Sarma
*Banikanta Kakatir Pora Bhaben Barualoi*: Sailen Bharali
*Engraji Samaloconar Dhara*: Trailokya Nath Goswami
*Hiren Gohain Rachanavali, Vol I*: eds. Sonit Bijoy Das and Munin
*Kabitar Bichar aru Natun Samalochana*: Hiren Gohain
*Kabitar Juti Bichar*: Kabin Phukan
*Kabitar Katha*: Nalinidhar Bhattacharyya
*Literary Criticism: A Short History*: William K. Wimsatt, Jr. and Cleanth Brooks
*Modern Literary Theory*: ed. Philip Rice and Patricia Waugh
*Mor Prabandha*: Hirendra Nath Dutta
*Nirbacita Samalocona*: Hirendra Nath Dutta
*Prabandha*: Ranjit Kumar Dev Goswami
*The Norton Anthology of Theory and Criticism*: ed. Vincent B. L

# ASM 4106
# Trends in Linguistics
# (Elective Course)
# (Credits: 6)

**Unit I:**

Transformational Generative Grammar: The difference between traditional grammar and generative grammar; The history of Generative Grammar: Government and Binding theory; Casetheory, Minimalist Programme.

**Unit II:**

Stylistics: Style and Stylistics; Stylistics as a multidiscipline subject; Methods of Stylistics; Stylistic analysis of a literary text: lexico-semantic level of language description

**Unit III:**

Semiotics: Introduction; Signs: Saussure and Pierce Models; Iconicity; Analysing structure; Paradigmatic and Syntagmatic analysis; Code

**Unit IV:**

Pragmatics: Interpretation in Context: Utterances and Speech Acts; Presuppositions and Projection; Contextual influences on reference; Indexicality and perspective; Pragmatic intrusion and conversational implicature

**References:**


*Asamiya Bhasha: Sankat aru Sambhavana*: Madan Sarma
*Aspects of the Theory of Syntax*: Noam Chomsky
*Bhashartha Bijnan*: Bhagaban Maral
*Bhashabijnanar Bhumika*: Ramesh Pathak
*Exploring the Language of Poems, Plays and Prose*: Mick Short
*Ferdinand de Saussure: Sadharan Bhashabijnanar Path:* Trans. Pona Mahanta
*Generative Grammar: Theory and History*: Robert Freidin
*Handbook of Semiotics*: Winfried Nöth
*Language in Literature: An Introduction to Stylistics*: Michael Tolan
*Pragmatics of Natural Language*: Y. Bar-Hillel
*Pragmatics: An Introduction*: Jacob.L. May
*Pragmatics*: Stephen C. Levinson
*Semiotics: An Introductory Anthology*: ed. Robert E. Innis
*Semiotics: The Basics*: Daniel Chandler
*Sign, Thought and Culture: A Basic Course in Semiotics*: Marcel Danesi
*SoiliBijnan*: Sapon Duara
*Stylistics:* R. Bradford
*Syntactic Structures*: Noam Chomsky
*The Pursuit of Signs*: J. Culler

# ASM 4116
# Tibeto-Burman Languages of Assam
# (Elective Course)
# (Credits: 6)

**Unit I:**

A general introduction to Tibeto-Burman Languages: Distribution and their status in North East

**Unit II:**

General characteristics of Tibeto- Burman languages in the context of Tibeto-Burman languages: Originality and changes in the Tibeto-Burman languages of Assam; Mutual impact of Assamese language and Tibeto-Burman languages

**Unit III:**

Phonological structure of Tibeto-Burmanlanguages (Any of the following languages: Bodo, Rabha, Karbi, Mishing and Garo)

**Unit IV:**

Morphological and Syntactic Structure of Tibeto-Burma languages (Any of the following languages: Bodo, Rabha, Karbi, Mishing and Garo)

**References:**


*A Descriptive Analysis of Bodo Language*: P.C. Bhattacharya
*Asamar Bhasha:* Bhimkanta Barua
*Asamiya aru Asamar Tibbat-Barmiya Bhasha*: Upen Rabha Hakasam
*Assamese and Boro: A Comparative and Contrastive Study*: Madhuram Bodo
*Bhashabaijnanik Adhyayanat Tulana Prasanga:* ed. Upen Rabha Hakacham and Pranita Devi
*Garo Bhashar Moulik Bichar*: Pranita Devi
*Garo Grammar*: R. Burling
*Karbi People and Their Language*: Arpana Konwar
*Languages of North-East*: ed. P.N. Dutta Baruah
*Linguistic Survey of India: Vol II Part II:* G.A. Grierson
*Mising Bhashar Parichay*: Nahendra Padun
*North East Indian Linguistics:* Stephen Morey and Mark Post
*Outline of the Tibeto- Burman Linguistic Morphology*: S.N. Wylfenden
*Rabha Bhasha aru Sahitya*: Upen Rabha Hakacham
*Sino- Tibetan: A Conspectus*: Paul.K. Benedict
*Structure of Garo*: Pranita Devi
*Studies in Sino-Tibetan Languages*: S.N. Goswami
*Tibbat Barmiya Bhashar Sambandhabasak Sabdar Adhyayan*: Pranita Devi

# ASM 4126
# Language Study in Assam
# (Elective Course)
# (Credits: 6)

**Unit I:**

Early Studies: Missionaries and others

**Unit II:**

Early Twentieth Century (Part I): Debananda Bharali, Kaliram Medhi, and Others

**Unit III:**

Early Twentieth Century (Part II): Banikanta Kakati

**Unit IV:**

Late Twentieth Century: Golok Chandra Goswami, Upendra Nath Goswami, Pramod Chandra Bhattacharyya etc

**References:**


*A Spelling Book and Vocabulary in English, Assamese, Singpho and Naga*: Miles Bronson
*Asamiya Bhashar Bhashabaijnanik Charcha*: Champakali Talukdar
*Asamiya Bhashar Itihas*: Ramesh Pathak
*Asamiya Bhashar Moulik Bichar*: Debananda Bharali
*Asamiya Bhasha: Sankat aru Sambhavana*: Madan Sarma
*Asamiya Bhashar Gathan: Aitihya aru Rupantar*: Upen Rabha Hakacham
*Asamiya Byakaran aru Bhashatattva*: Kaliram Medhi
*Asamiya Byakaranar Moulik Bichar*: Golok Chandra Goswami
*Assamese: Its Formation and Development*: Banikanta Kakati
*Grammatical Notices on the Assamese Language*: Nathan Brown
*Phrases in Assamese and English:* H.B.L Cutter
*Structure of Assamese*: Golok Chandra Goswami

# ASM 4136
# Culture Studies of North East India
# (Elective Course/ Elective Open Course)
# (Credits: 6)

**Unit I:**

Cultural Heritage of North East India: Ethnic- affinities, Sources and migration, present habitants and status, Social organization, matrilineal society, Impact of women
Culture in greater Assamese Society

**Unit II:**

Festival of North East India with special reference to Bihu Festival

**Unit III:**

Oral literature of North East India with special reference to Boro, Rabha, Tiwa, Garo, Karbi and Mishing (Any two will have to be studied)

**Unit IV:**

Material Culture and Performing Art: Tradition and Change with Special reference to Moran, Hajong, Sonowal-Kachari, Garo and Manipuri,

**References:**


*A Glimpse of Language and Culture of N.E. India*: ed. Umesh Deka
*Asam Deshar Sadhu*: ed. Prafulla Datta Goswami
*Asamar Janagosthiya Loka Sahitya*: Sabasana Mahanta *et. al*
*Asamar Janajati*: ed. Pramod Chandra Bhattacharya.
*Asamar Janajatiya Lok-Sahitya*: Kanak Chandra Saharia
*Asamar Janajatiya Sanskriti*: Upen Rabha Hakacham
*Asamar Lok-Utshav*: Pramod Chandra Bhattacharya
*Asamiya Sanskritiloi Janajatiya Barangoni*: Nahendra Padun.
*Bar Asamar Bihu Sanskriti*: Upen Rabha Hakacham
*Bihu: Springtime Festival of Assam*: Prafulla Dutta Goswami
*Boro-Kachari Samaj aru Sanskriti*: Bhaben Narji.
*Chiphung Gunggang*: ed. Birendra Nath Dutta
*Cultural Change in Two Garo Villages of Meghalaya's*: Dhirendra Narayan Mazumdar
*Foklore Materials of N.E. India*: ed. Birendra Nath Dutta, etal
*Folk Songs of Bodos*: ed. Mohini Mohan Brahma
*Folk Songs of Mishings*: ed. Birendra Nath Dutta
*Hena-Hucha: Asamiya Janajatiya Loka Sahityar Sankalan*: ed. Upen Rabha Hakacham
*Janajati aru Garo Janajati*: Bimal Mazumdar
*Janajati-Samaj-Sanskriti*: Padma patar
*Kirat-Jana-kirti*: Suniti Kumar Chatterjee
*Mishing Sanskritir Alekhya*: Bhrigumani Kagyung
*Oral Song of North East India*: Nabin Chandra Sarma
*Rabha Loka-Sanskriti*: Upen Rabha Hakacham
*The Garos*: M.A Ployfair.
*The Kacharies*: S Endle.
*The Mishings of Assam*: Jatin Mipun.
*The Rabha*: Rajen Rabha
*Tribes of Assam (Parts I, II, III)*: ed. B.N. Bordoloi
*Uchabar Bhogjara*: Atul Chandra Hazarika.

# M. SC. ZOOLOGY SYLLABUS
# (CBCS)

**DEPARTMENT OF ZOOLOGY**
**GAUHATI UNIVERSITY**
**Gopinath Bardoloi Nagar**
**Guwahati -781 014**
**Assam, India**

**M.Sc. Zoology Syllabus (CBCS)**
**Semester-1**

| Code | Course | Credit | Contact hour | Total marks | Type |
|---|---|---|---|---|---|
| ZOO-1014 | **Biosystematics and Biostatistics** | 4 | 54 | 40+10 | Core (Theory) |
| ZOO-1024 | **Bioinformatics and Instrumentation** | 4 | 54 | 40+10 | Core (Theory) |
| ZOO-1034 | **Evolution and Chronobiology** | 4 | 54 | 40+10 | Core (theory) |
| ZOO-1044 | **Genetics and Cytogenetics** | 4 | 54 | 40+10 | Core (Theory) |
| ZOO-1054 | **Ecology and Environmental biology** | 4 | 54 | 40+10 | Core (Theory) |
| ZOO-1064 | **Biochemistry** | 4 | 54 | 40+10 | Core (Theory) |
| ZOO-1072 | **Biosystematics, Biostatistics and Bioinformatics** | 2 | 54 | 20+5 | Practical |
| ZOO-1082 | **Genetics, Cytogenetics, Evolution and Chronobiology** | 2 | 54 | 20+5 | Practical |

**M.Sc. FIRST SEMESTER**

**PAPER ZOO-1014 (Total Marks 40): 4 Credits**
**(BIOSYSTEMATICS and BIOSTATISTICS)**

**UNIT 1: 2 Credits**

1. Concept of species: Species, Polytypic species, Importance of recognition of Polytypic species taxa.
2. Infraspecific categories, subspecies, temporal subspecies, race and cline
3. Population taxonomy, the new systematics and superspecies.
4. Speciation: Sympatric, Parapatric and allopatric speciation, Speciation in time, sibling species.
5. Taxonomic characters: Molecular, Behavioural, Ecological and geographical characters, weighing of characters, characters with low and high taxonomic weight.
6. Intrapopulation variations: Non-genetic and Genetic variations.
7. Interpretation and application of important rules.

**UNIT 2: 2 Credits**

1. Applications of Biostatistics, Sampling methods: Random sampling, Stratified sampling and Sub-sampling
2. Measurement of variations: Standard error, standard deviation and co-efficient of variation, Quartile and percentiles, probability and distribution, Binomial, poison and normal distributions.
3. Correlation and regression: Linear regression equation and line of best fit, Coefficient of correlation, Coefficient of regression
4. Chi-square test value of statistics, Confidence limit, t-test, Introduction to one way and two ways Anova and F-test.
5. Kruskal-Wallis test, Man-Whitney U test

**PAPER ZOO-1024 (Total Marks 40): 4 Credits**

**(BIOINFORMATICS AND INSTRUMENTATION)**

**UNIT 1: 2 Credits**

1. Theoretical aspects of sequence analysis. Needleman-Wunsch and Smith-Waterman methods of global and local alignments for a pair of sequences.
2. Molecular phylogeny and evolution: Properties and types of phylogenic trees; Tree building methods- Distance based: UPGMA (Unweighted pair group method using arithmetic mean), Neighbor-joining, minimum evolution and least square methods; Character-based: Maximum parsimony, maximum likehood.
3. Levels of protein structures and visualization: Protein secondary and tertiary structures prediction methods (Description of machine learning methods for secondary structures, homology/comparative modeling, fold recognition or threading and ab infitio methods for tertiary structure prediction)
4. Overview of protein-protein and protein-ligand interactions (use of Cluspro and Autodock)

   **Referred books**:

   1. Bioinformatics, Sequence and Genome analysis. Second Ed. By David W. Mount
   2. Bioinformatics and Functional genomics. Third Ed. By Jonathan Pevsner

**UNIT 2: 2 Credits**

1. Microscopy: Principles and applications of phase contrast, Fluorescence and confocal Microscopy.
2. Principles and application of tracer techniques- autoradiography and radio immunoassay.
3. Immunological techniques: Immunodiffusion, Immunoelectrophoresis, Enzyme linked Immuno-absorbant assay (ELISA)
4. Centrifugation: Density gradient and unit gravity centrifugation, tissue processing and separation of various sub-cellular organelles by centrifugation
5. Molecular separation Techniques: Ion-Exchange, Absorption, partition, gel filtration, and affinity chromatography, and HPLC.
   Electrophoresis- Principle and applications, Agarose, SDS, SDS-PAGE, Pulsed gel and Disc electrophoresis, determination of molecular weight by SDS-gel electrophoresis
6. Cryopreservation: Methods and applications
7. Southern, Northern and Western Blotting
8. Principle and application of Nick-translation, in situ-hybridization
9. Chromosome banding, FISH-chromosome painting technique

**PAPER ZOO-1034 (Total Marks 40): 4 Credits**

(**EVOLUTION AND CHRONOBIOLOGY**)

**UNIT 1: 2 Credits**

1. Theories of organic evolution, Prebiotic molecules (Amino acid and Nucleic acid bases).
2. Evolution of Prokaryotes and Eukaryotes.
3. Origin of life: Modern theories, Changes in hereditary instructions in relation to evolution.
4. Notion of selectively neutral mutations, evolutionary gene duplication, the founder principle, bottleneck effect of genetic drift.
5. Evolutionary history of natural integration, evolution of man.
6. Factors and forces of evolution: Mutation, Genetic variation, Isolation mechanisms and their role in speciation.
7. Emergence of the theory of Neo-Darwinism.
8. Molecular evolution : Concept of neutral evolution (Kimura), molecular divergence and molecular clock, molecular tools in phylogeny, classification and identification, Origin of new genes and proteins, gene duplication and divergence

**UNIT 2: 2 Credits**

1. Biological clocks
2. Significance of Biological time keeping
3. Biological rhythms: Types of rhythms- Circadian, Circatidal, Circalunar, Circannual; Centres of biological rhythms- Suprachiasmatic nuclei, Pineal gland, Optic lobes; Factors influencing biological rhythms- Environmental, Photoperiod, Temperature, Other Zeitgebers.
4. Methods of measurement: Entrainment, Re-entrainment, Phase angle difference, Free-run, Phase shift, Phase response curve, Arrhythmia.
5. Molecular bases of circadian rhythms: Clock genes: *Drosophila* and Mouse.
6. Applied Chronobiology: Human circadian rhythms, Application of circadian rhythms and principles; Jet-lag/shift work; Depression and sleep disorders; Chronopharmacology and Chronotherapy.

**Referred Books:-**

Nelson, R.J. (2000). An introduction to behavioural Endocrinology, 2nd edition.

Binkley, S. (1990). The clockwork sparrow: time, clocks and calendars in biological organisms.

Chadrashekaran, M.K. (1985). Biological rhythms. Madras science foundation, Chennai.

**PAPER ZOO-1044 (Total Marks 40): 4 Credits**

**(GENETICS AND CYTOGENETICS)**

**UNIT 1: 3 Credits**

1. Eukaryotic chromatin structure and chromosome organization: Classes of DNA Chromosomal proteins: histones and their modifications, non-histone proteins, scaffold/ matrix proteins, levels of chromatin condensation at interphase and metaphase stage.
2. Organization and functions of mitochondrial DNA
3. Microbial genetics: bacterial chromosomes, transformation, transduction, conjugation
4. Bacteriophage: Type, structure and morphology
5. Chromosome anomalies and diseases: chromosomal anomalies in maligancy(chronic myeloid leukemia, Burkitt's lymphoma, retinoblastoma and Wilm's tumor)
6. Genetics and cancer: oncogenes-tumour inducing retroviruses and viral oncogenes, chromosome rearrangements and cancer, tumour suppressor genes, cellular roles of tumour suppressor genes, $P^{RB}$, $P^{53}$, $P^{APC}$, genetic pathways to cancer.
7. History of organization, goals and values of human genome project, organization and distribution of human genes.
8. Gene action: from genotype to phenotypes- penetrance and expressivity, gene interaction, epistasis, pleiotropy.
9. Nature of gene and its function, fine structure of gene (r11 locus)
10. Methods of gene mapping: 3 point test cross in *Drosophila*, gene mapping in human by Linkage analyses in pedigrees.
11. Basic concept of molecular disorders and gene therapy.

**UNIT 2:-1 Credit**

1. Giant chromosome: models for studies on chromosome organization and gene expression.
2. Sex determination: Role of Y chromosome, sex mosaics, sex chromosome anomalies, sex influenced alleles, sex limited genes and hormonal influence.
3. Sex determination and dosage compensation gap of X-linked genes, hyperactivation of X linked genes in Drosophila, Inactivation of X-linked gene in female mammas, Hypoactivation of X-linked genes in *Caenorhabditis elegans*.
4. Human genetics: Karyotype and nomenclature of metaphase chromosome bands.

**PAPER ZOO-1054 (Total Marks 40): 4 Credits**
**(ECOLOGY AND ENVIRONMENTAL BIOLOGY)**

**UNIT 1: 2 Credits**

1. Structure of ecosystem-variations in physical environment and adaptations, Homeostasis, stability concept
2. Biodiversity of ecosystem – Salient features of aquatic and terrestrial ecosystem and their biotic communities
3. Biotic community concept and community analysis – organization, population density, relative abundance, frequency, dominance, carrying capacity, species richness and species diversity

4. Community development: Types of community changes, causes and examples of ecological succession, Climax community and stability
5. The Niche concept, ecological niche, niche overlap and separation
6. Population ecology- growth pattern, life tables & survivorship curve and density dependent & independent factors.
7. Life history strategies: K- or r-selection, Age and sex ratio.
8. Trophic structure, food chain and food webs, energy flow and Lindeman's trophic dynamics concept, Food web pattern and measurement in ecosystem energy flow model, concept of productivity and measurement of primary productivity.

**UNIT 2: 2 Credits**

1. Environmental issues, environmental regulations and biodiversity management approaches.
2. Environmental concerns–green house effect, global warming and environmental pollution.
3. Biogeochemical cycles- carbon, nitrogen and sulphur cycles; impact of human activity on nutrient cycles.
4. Human and Environment: Anthropogenic Impact on Environment, Environmental Impact assessment.
5. Environmental monitoring and documentation.
6. Major drivers of biodiversity changes in environment and principles of biodiversity Conservation.

**PAPER ZOO-1064 (THEORY) (Total Marks 40): 4 Credits**
**(BIOCHEMISTRY)**

**UNIT 1: 2 Credits**

1. Energy rich compound, role of ATP/ADP cycle in transfer of high energy phosphate
2. Important respiratory complex of ATP synthesis and oxidative phosphorylation, chemiosmotic hypothesis
3. Secondary structure: α-helix, β-pleated sheet & bends, Prediction of secondary structure, Ramachandran plot
4. Tertiary structure: Forces stabilizing tertiary structure, Domains and motifs, Quaternary Structure of proteins.
5. Enzyme kinetics, lowering of activation energy, Derivation of Michaelis-Menten equation and determination of $K_m$ and $V_{max}$ using MM & LB plots, Concepts of regulation of enzyme activity.
6. Concept of metabolic pathways, Glyolysis and Gluconeogenesis, Glycogenesis and Glycogenolysis; Kreb cycle.

**UNIT 2: 2 Credits**

1. Hexose monophosphate shunt pathway and its significance; β-oxidation of fats and synthesis of fatty acids.
2. Intermediary metabolism: inter-conversion between lipids, carbohydrate and proteins.
3. Amino acid: Structure and chemistry of amino acid, Amino acid catabolism:
4. Trasnsamination, Transdeamination and oxidative deamination, Urea cycle
5. Nucleic acids **:** Structure, folding motifs, conformational flexibility and supercoiling,
6. DNA replication, DNA polymerases, Origin of replication and formation of primosome,
7. Replication fork and replisome, Termination of replication, Transcription unit, split genes
8. 5. Mechanism of transcription: RNA polymerases , Formation of pre-initiation complex at
9. RNA pol II promoter, Capping , Poly (A) tailing ,Splicing Mechanism of translation: Role of ribosomes and tRNA, Formation of initiation complex.
10. Elongation and termination.

**PAPER ZOO -1072 (PRACTICAL)**
**(Total Marks 20): 2 Credits**
**(BIOSYSTEMATICS, BIOSTATISTICS AND BIOCHEMISTRY)**

1. Identification of invertebrates, larval forms of invertebrates, protista, and vertebrates.
2. Determination of biodiversity indices: Shannon-Weiner Index, Similarity and Dissimilarity index and association index.
3. Graphical representation of data.
4. Calculation of Standard error, standard deviation, analysis of variation, Coefficient of variation, t-test, chi-square test and two way ANOVA.
5. Extraction of biomolecules (carbohydrates, proteins, lipids) from fish liver.
6. Estimation of protein extracted from fish liver by Biuret/Lowry/Bradford method.
7. Estimation of glycogen extracted from fish liver by Anthrone reagent method.
8. Estimation of blood glucose by Folin-Wu method.
9. Effect of substrate concentration on enzyme activity and determination of $K_m$ and $V_{max}$ by plotting Michaelis-Menten and LB plot.
10. Estimation of DNA
11. Estimation of RNA
12. Determination of $P_{ka}$ & $P_I$ value of glycine using Titration method.
13. Determination of molecular mass of proteins by SDS-PAGE.

**PAPER ZOO-1082 (PRACTICAL)**
**(Total Marks 20): 2 Credits**
**(GENETICS, CYTOGENETICS, EVOLUTION, CHRONOBIOLOGY AND BIOINFORMATICS)**

1. Study of mutant phenotypes of Drosophila.
2. Study of sex chromatin in buccal smear and hair bud cells (Human).
3. Preparation and study of metaphase chromosomes from mouse bone marrow.
4. Chromosome banding (C- and G-banding).
5. Study the difference in number, shape and size of chromosomes in normal vs. tumor cells and normal vs. irradiated cells.
6. Preparation of human karyotype and study of chromosomal aberrations with respect to number, translocation, deletion etc from the pictures provided.
7. Study of Hardy-Weinberg equilibrium in human population by taking the example of blood group system (ABO).
8. Use of search engines like Scopus, Science Direct for reference material collection management.
9. Nucleic acid and protein sequence databases
10. Data mining for sequence analysis
11. Web based tools for sequence searches and homology screening
12. Construction for phylogenetic trees for proteins using UPGMA or Neighbor joining method(no software to be used)
13. Reproduction of the same phylogeny using MEGA software for the given set of sequences
14. Finding possible genes in a given nucleotide sequence(ORF finder)
15. Prediction and validation of protein structure using homology modeling (use of Swiss model)
16. Determination of binding modes of a given ligand in the active site of a protein(use of Autodock)

**Semester-2**

| Code | Course | Credit | Contact hour | Total marks | Type |
|---|---|---|---|---|---|
| ZOO-2014 | **Biodiversity** | 4 | 54 | 40+10 | Core (Theory) |
| ZOO-2024 | **Endocrinology** | 4 | 54 | 40+10 | Core (Theory) |
| ZOO-2034 | **Developmental Biology** | 4 | 54 | 40+10 | Core (Theory) |
| ZOO-2044 | **Animal cell Culture And Genetic Engineering** | 4 | 54 | 40+10 | Core (Theory) |
| ZOO-2054 | **Animal behavior** | 4 | 54 | 40+10 | Core (Theory) |
| ZOO-2064 | **Animal Physiology** | 4 | 54 | 40+10 | Core (Theory) |
| ZOO-2072 | **Biodiversity, Animal behavior, Developmental Biology** | 2 | 54 | 20+5 | Practical |
| ZOO-2082 | **Endocrinology, Animal Physiology, Animal cell Culture And Genetic Engineering** | 2 | 54 | 20+5 | Practical |

**M.Sc. 2nd SEMESTER**

**Paper-ZOO-2014 (BIODIVERSITY)**
**(Marks 40+10) Theory credit: 4 Credits**
**Unit-I**

1. Major elements of global diversity, Evolution and distribution
2. Biodiversity in different levels (Country, Global, Regional)
3. Components of Biodiversity (Genetic, Organismal and Ecological)
4. Magnitude and pattern of Biodiversity
5. Carrying capacity, land use and population pressure on Biodiversity
6. Impact of climate Change, Global health and diseases on Biodiversity

**Unit-II**

7. Value of Biodiversity (Species and Ecosystems), Utilization of Biodiversity
8. Methods and tools for biodiversity conservation (exsitu, insitu, Restoration and Rehabilitation, land use)
9. Priority setting: Criteria for conservation
10. Women, gender and biodiversity conservation
11. Legal instruments for Biological diversity conservation
12. Sustainability, Harnessing and benefit sharing

**Suggested Books:**


1. M.Kato (Ed) ; The Biology of Biodiversity: Springer-Verlag, 2000
2. Anne E. Magurran; Measuring Biological Diversity; Blackwell Publishing, 2004
3. K. C. Agrawal: Global Biodiversity, Nidhi Publishers(India), 2002
4. Kelvin J. Gaston & John I Spicer: Biodiversity An Introduction; 2nd Edn. Blackwell Publishing; 2004


**M.Sc. 2nd SEMESTER**
**Paper-ZOO-2024 (ENDOCRINOLOGY)**

**(Marks 40+10) Theory credit: 4 Credits**

**UNIT I:**

1. Hormone and target organs: hormone receptors and their characteristics. neurocrine endocrine and paracrine secretion of hormones, Hormonal signal transduction ,
2. Hypothalamus: Hypothalamic neurosecretory centres, Hypothalamic hormones, hormonal feedback.
3. Pituitary: Pituitary hormones and their functions.
4. Thyroid: Thyroid hormones biosynthesis and their functions
5. Comparative anatomy of adrenal glands in vertebrates, Biosysnthesis of adrenal hormones and their functions, Adrenal Medulla: Catecholamine biosynthesis, release and its physiological functions.
6. Parathyroid: Calcitonin and vitamin D in calcium Homeostasis
7. Endocrine Pancreas: Glucose homeostasis and physiological functions of Insulin and Glucagon

**UNIT II:**

8. Neurosecretory hormones in insets and crustaceans and their functions
9. Neuroendocrine system of Insect : Neurosecretory cells of brain and ventral nerve cord, synthesis and assemblage of neurohormones, neurohemal organs, release and transport of neurohormones to targets, long distance axonal transport, Hormones produced by Neurosecretory cells and their function
10. Prothoracicotropic hormone, Allatotropin, Allatostanin, Diapause hormone, Bursicon, Eclosion hormone, Proctolin, Diuretic hormone and Heart beat accelerating factor
11. Corpus cardiacum : Structure , Hormones produced by Corpus Cardiacum and their functions, Corpus allatum : structure and functions of JH, JH as a gonadotropin
12. Prothoracic gland and ring gland, ecdysone and its functions; Ovarian ecdysones-structure and function, synthesis of ecdysone. Role of Juvenile hormone analogues and ecdysteroids in pest control

**Suggested Books:**

1. Comparative Vertebrate Endocrinology, Bentley, P. J., Cambridge University Press, UK

2. Vertebrate Endocrinology, Norris D. O., Elsevier Academic Press,

3. Hand Book of Physiology, American Physiological Society, Oxford University Press, Section 7: Multiple volumes set.

4. The Insects: Structure and Function, Chapman, F.R., The English Language Book Society (ELBS) and The English Universities Press Ltd.

5. The Principles of Insect Physiology Wigglesworth, V. B., ELBS and Chapman and Hall.

6. Endocrinology (3 volumes set), *DeGroot* L. J. and Jameson J.L., Editors, (5th Ed., 2006), Saunders Elsevier Press, USA.

7. Molecular Biology of Steroid and Nuclear Hormone receptors, ed. Freedman L. P., (1998), Birkhauser, Boston, USA

8. Biochemical actions of hormones, ed. Litwack, G. (1985), Academic press, New York, USA
Brooks and Marshall: Essentials of Endocrinology, Blackwell Science. 1995

9. Turner and Bagnara: General Endocrinology, W. B. Saunders Company Philadelphia. 1984

10. Larson: Williams Text Book of Endocrinology, 10th edition. W. B. Saunders Company, Philadelphia. 2002.

**M.Sc. 2nd SEMESTER**
**Paper-ZOO-2034 (DEVELOPMENT BIOLOGY)**
**(Marks 40+10) Theory credit: 4 Credits**

**Unit-I**

1. Principles of experimental embryology: the developmental dynamics of cell specification stem cells and developmental commitment, totipotency and pluripotency.

2. Morphogenesis and cell adhesion-the thermodynamic model of cell interactions, concept of morphogen gradients and morphogenetic fields, cell adhesion molecules
3. Fertilization-pre and post fertilization events, activation of eggs, Gamete fusion and prevention of phylogeny
4. Nucleo cytoplasmic interaction in development of unicellular organisms and in early development and differentiations of multi cellular organisms, Importance and role of cytoplasm, hybridization experiments, nature of changes in nuclei, cell hybridization and nuclear transplantation experiments.
5. Cell to cell communications in development: Induction and competence, Reciprocal and sequential inductive events, Instructive and permissive interactions, Epithelial and mesenchymal interactions, Genetic specificity of induction, Paracrine Factors; the inducer molecules.

**Unit-II**

6. Role of maternal contribution in early embryogenic development in Drosophila: Maternal effect genes, gap genes, pair rule genes, segment polarity genes, homeotic genes and hox genes in development.
7. Organogenesis: vulva formation in *Caenorhapditis elegans*.
8. Regeneration: Epimorphic regeneration of Salamander limbs, Morphallactic regeneration in hydra, Compensatory regeneration in Mammalian liver.
9. Different types of stem cells and their applications ,,Regeneration therapy.
10. Role of environment in animal Development: Gravity and pressure, Developmental symbiosis ,Larval settlement. Diapause: suspended development.

**Suggested Books:**

1. Developmental Biology, Gilbert, (8th Ed., 2006) Sinauer Associates Inc., Massachusetts, USA.
2. Principles of Development, Wolpert, Beddington, Brockes, Jessell, Lawrence, Meyerowitz, (3rd Ed., 2006), Oxford University Press, New Delhi, INDIA.
3. Analysis of Biological Development, Kalthoff, (2nd Ed., 2000), McGraw-Hill Science, New Delhi, INDIA.

**M.Sc. 2nd SEMESTER**

**Paper-ZOO-2044 (ANIMAL CELL CULTURE, AND GENETIC ENGINEERING)**
**(Marks 40+10) Theory credit: 4 Credits**
**UNIT 1:**

1. Cell culture: Basic techniques of cell culture. Development of primary cell cultures; cell separation, harvesting and maintenance of cell lines; Transformation and differentiation of cell cultures, types of cell culture: monolayer, suspension, clonal and stem cell culture, cryopreservation cell lines.
2. Cell culture Media: Primary and established cell line cultures; Media supplements- their metabolic functions; Serum and protein-free defined media and their applications.
3. Measurement of viability and parameters of growth. Cell cycle analysis and synchronization of cultures; Assessment of cell culture contaminants, safety parameters.
4. Cell culture Bioassays: Cell proliferation assays

**UNIT-2**

5. Automated sequencing methods; Sanger's dideoxynucleotide method; Shotgun DNA DNA sequencing method; Polymerase chain reaction and its advantages.
6. DNA polymorphism: Basis of DNA typing/fingerprinting; Expressed sequence tags and their use for developing STSs, SSRs and SNPs
7. Basic biology of cloning vectors: plasmids, phages, single stranded DNA vectors, high capacity vectors, retroviral vectors, expression vectors, and other advanced vectors in use; genomic library and cDNA library
8. RNA interference: History, molecular mechanisms and applications of antisense RNA, microRNA, siRNA, and ribozymes.
9. Gene and somatic cloning techniques
10. Transgenic technology-animals as bioreactors

**Suggested Books**

1. Principle of Genome Analysis and Genomics, Primrose, S. B. and Twyman R. M., (7th Ed., 2006), Blackwell Publishing Company, Malden, USA
2. Genomes 3, Brown, T. A., Garland Science Publishing, London, UK
3. Cultures of animal cell. R. Freshny
4. Basic cell culture protocol. Cheryl D. Helgason
5. Animal cell culture essential methods. John M. Davis

**M.Sc. 2nd SEMESTER**
**Paper-ZOO-2054 (Animal Behaviour)**
**(Marks 40+10) Theory credit: 4 Credits**

**Unit-I**

1. Patterns of animal behavior
   a. Objectives and mechanism of behaviours.
   b. Types of reflexes, characteristics of reflexes and complex behaviour.
   c. Orientation: Primary and Secondary Orientation, Sum-Compass Orientation.
   d. Kinesis: Orthokinesis and Klinokinesis.
   e. Taxis: Different kind of taxis.
2. Development of behaviour: Genetic basis of behaviour, Hormone brain relationship
3. Neural basis of behaviour: Key stimuli, Stimulus filtering, Supernormal stimuli, Open and closed IRM, Biological rhythms.
4. Learning Definition, Types of learning, Neural mechanism of learning
5. Communication : Types of communications-Auditory communication ; Infrasound communication among Elephants and Whales; Sonar,Navigation,and communications;Vocalization in nonhuman primates;Ecolocation in Bats; Visual communication; Chemical signals;Functions of scent in vertebrates; Tactile communications.

**Unit-II**

6. Motivational system: Physiological basis of motivation, control of hunger drive and thirst drive in animals. Motivational conflict and decision making, displacement activity, models of motivation, measuring motivation, hormones and pheromones influencing behaviour of animals.
7. Sociobiology:Units of Sociobiology; major social behaviours; Alturism: Reciprocal altruism, group selection, kin selection and concept of inclusive fitness, cooperation , /reciprocation; Selfishness; Eusociality.
8. Reproductive strategies: Sexual selection, intrasexual selection (male rivalry), intersexual selection (female choice), infanticide, mate guarding.
9. Parental Behaviour:Care before birth;Care after birth; Early parental care;Types of parental care ;Factors affecting parental care; Care and attachment; Parent offspring conflict..

**Suggested Books:**

1. Mechanism of Animal Behaviour, Peter Marler and J. Hamilton; John Wiley & Sons, USA

2 Animal Behaviour, David McFarland, Pitman Publishing Limited, London, UK

3 Animal Behaviour, John Alcock, Sinauer Associate Inc., USA

4 Perspective on Animal Behaviour, Goodenough, McGuire and Wallace, John Wiley & Sons, USA

5 Exploring Animal Behaviour, Paul W. Sherman & John Alcock, Sinauer Associate Inc. ,Massachusetts, USA

6 An Introduction to Animal Behaviour, A. Manning and M.S Dawkins, Cambridge University Press, UK

7. Alcock : Animal Behaviour- An Evolutionary Approach. (7th ed.) Sinaur Associates, Inc. 2001.

8. Drickamer & Vessey: Animal Behaviour –Concepts, Processes and Methods (2nd ed.), Wadsworth, 1986.

9. Gadagkar: Survival Strategies-Cooperation and Conflict in Animal Societies. Universities Press,1998.

10. Grier : Biology of Animal Behaviour, Mosby, 1984.
11. Hallidy and Slater : Animal Behaviour(vols. I-3) Blackwell Scientific Publ., 1983.
12 Krebs & Davis : Behavioural Ecology. (3rd ed.) Blackwell, 1993.
13. Lehner : Hand Book of Ethological Methods.(2nd ed.) Garland, 1996.
14. Slater & Halliday : Behaviour and Evolution,(1st ed.) Cambridge Univ. Press, 1994.

**M.Sc. 2nd SEMESTER**
**Paper-ZOO-2064 (ANIMAL PHYSIOLOGY)**
**(Marks 40+10) Theory credit: 4 Credits**

**UNIT I:**

1. Body Fluid: Blood, Lymph, Hydrolymph, Hemolymph: Chemical compositions and Functions
2. Cardiac Cycle, Specialized conducting system of heart, generation and conduction of cardiac impulse, neurohomonal regulation of cardiac amplitude and frequency.
3. Respiratory system in vertebrate: Pulmonary ventilation, alveolar ventilation, diffusion and transport of gases, Basal metabolic rate. Respiratory centers: organization and function
4. Counter current mechanism of urine formation, RAS and hormonal regulation of urine formation. Acid-base balance and homeostasis
5. Nutrition: Gastro intestinal hormones and digestive enzymes: chemical nature and functions.

**UNIT II:**

6. **Nervous system:** Neurons and types of neurons, Types of synapses and synaptic knobs, Axonal transmission.
7. Membrane potential and generation of action potential. Sodium-potassium pump, Synaptic transmission, neuromuscular junction Excitatory and inhibitory post-synaptic potential, Chemical transmission, neurotransmitters (acetylcholine, or catecholamines, serotonin and GABA), Autonomic nervous system (Sympathetic and parasympathetic)
8. Special sensory system: Eye: Anatomical Organisation of retina, Photoreceptors: Processing of visual impulses Ear: Cochlea, basilar membrane, and organ of Corti. Generation of endochochlear potential. Processing of auditory impulses.
9. Muscle: Contractile proteins, Ultrastructure of skeletal muscles, Properties of muscle: muscle twist, summation, tetanus and fatigue, Sliding filament theory of muscle contraction and regulation.

**SUGGESTED BOOKS:**

1. Ganong: Review of Medical Physiology (21st Ed.), Lang Medical Publications, 2003
2. 2. Guyton and Hall: Text Book of Medical Physiology (10th Ed.), W.B. Saunders, 2001

3. Keel et al: Samson Wright's Applied Physiology (13th Ed.), Oxford Press, 1989
4. Murray et al: Harper's Illustrated Biochemistry (26th Ed.), Appleton & Lange, 2003
5. West: Best and Taylor's Physiological Basis of Medical Practice (11th Ed.), Williams and Wilkins,1981.

**M.Sc. 2nd SEMESTER**
**Paper-ZOO-2072 (BIODIVERSITY, ANIMAL BEHAVIOUR & DEVELOPMENTAL BIOLOGY) (PRACTICAL)**
**(Marks 20+5) Theory credit: 2 Credits**

1. Collection and identification of egg (at least six different types)
2. Study of life cycle of *Drosophila melanogaster*.
3. Dissection and study of larval pre pupal wing, leg, eye, and antennal imaginal disc in *D. melanogaster*.
4. Preparation and study of frog/mice sperm smear.
5. Detection of SH proteins during various stages in the early development of amphibian embryo.
6. Study of developmental stages of fish from egg to hatchling.
7. In vitro culture of chick embryo.
8. Study of chick embryo using vital staining.
9. Study of cell death during development.
10. Activity budgeting of bird/mammal
11. Effect of toxicant on opercular movement and surfacing in fish.
12. Effect of toxicant on movement of fish.

**Paper-ZOO-2082 (ENDOCRINOLOGY, ANIMAL PHYSIOLOGY, BIOTECHNOLOGY AND TISSUE CULTURE)**
**(Marks 20+5) Theory credit: 2 Credits**

1. Neuroendocrine system of cockroach – Dissection and display
2. Prothoracic gland of cockroach – Dissection, display and mounting
3. Mounting of prothoracic gland
4. Thyroid and parathyroid gland of mouse/chicken – dissection and display and slide preparation
5. Pituitary gland of mouse /fish – Dissection, display and permanent slide preparation using metachromatic stains.
6. Steroid and thyroid hormone assay by ELISA
7. Histological study of endocrine glands of vertebrates
8. Detection of uric acid in malpighian tubules
9. Hemocyte count and estimation of protein in hemolymph.
10. Total RBC and WBC count in human blood.
11. Isolation of genomic DNA from mammalian tissue.
12. Restriction-digestion of DNA sample and separation of fragments by performing agarose gel electrophoresis. Interpretation of the results by comparing with the standard digests.
13. MTT cell proliferation assay, cell viability assay.



**Semester-3**

| Code | Course | Credit | Contact hour | Total marks | Type |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| ZOO-3014 | **Cell Biology** | 4 | 54 | 40+10 | Core (Theory) |
| ZOO-3024 | **Immunology, Microbiology and Parasitology** | 4 | 54 | 40+10 | Core (Theory) |
| ZOO-3034 | **Reproductive Biology** | 4 | 54 | 40+10 | Core (Theory) |
| ZOO-3044 | **Entomology and Aquatic Biology** | 4 | 54 | 40+10 | Core (Theory) |
| ZOO-3056 (Open I) | **Integrative Biology** | 6 | 81 | 60+10 | Open |
| ZOO-3063 | **Cell Biology, Histology, Histochemistry, Immunology and Reproductive Biology** | 3 | 54 | 30+7.5 | Practical |
| ZOO-3073 | **Aquatic Biology, Fishery, Entomology, Parasitology** | 3 | 54 | 30+7.5 | Practical |

**Total-28 credits**

**M.Sc. 3rd SEMESTER**
**Paper-ZOO-3014 (CELL BIOLOGY)**
**(Marks 40+10) Theory credit: 4 Credits**

**1ST HALF**

1. Chemical complexity and organization : distinctive structural and molecular features of prokaryotic and eukaryotic cells
2. Models of plasma membrane structure , membrane lipids, proteins and carbohydrates, organizational and functional features of plasma membrane
3. Cytoskeleton, microfilament, microtubules and intermediate filaments – structure and dyanamics
4. Cell movement, intracellular transport, role of kinesin and dyenin, cilia and flagella-structure and function
5. Cell to cell adhesion : Ca++ dependent and CA++ independent homophilic cell-cell adhesion, Gap junctions and connexins, cell matrix adhesion – intrigrins, collagen
6. Cell cycle : cyclins and cyclin dependent kinases; regulation of cdk-cyclin activity,cell cycle checkpoints.

**2nd HALF**

1. Biogenesis of membrane bound organelle: Mitochondria and nucleus.
2. Protein import and mitochondrial assembly.
3. Peroxisomes,functions of peroxisomes. Peroxisome assembly.
4. Regulation of gene expression in prokaryotes and Eukaryotes, and RNA editing
5. Intracellular protein traffic: Protein synthesis on bound and free polysomes, membrane proteins, golgi sorting uptake into ER; Post-transcriptional modifications and trafficking mechanism.
6. Apoptosis: definition, mechanism and significance

**M.Sc. 3rd SEMESTER under revision**
**Paper-ZOO-3024 (IMMUNOLGY, MICROBIOLOGY AND PARASITOLOGY)**
**(Marks 40+10) Theory credit: 4 Credits**

**UNIT-1**

Innate and acquired immunity – components and characteristic features, primary and secondary responses

Cells of the immune system : Types of cells and their subsets responsible for immune response- WBC, macrophages, dendritic cells, B,T and NK cells; Basic concept of B and T cell antigen receptors and CD markers, Cell cooperation in immune response

Lymphoid organs – primary and secondary lymphoid organs and their functions, their micro and macro structures, vascular and lymphatic connections.

Immunoglobulins : Structure and domain of Ig molecule, Ig classes, subclasses and types; Myelema protein, monoclonal antibody, Ig superfamily

Antigen-antibody reaction: antibody affinity and avidity cross reactivity, agglutination reaction, precipitation reaction.

**UNIT-2**

Microbial diversity:Prokaryotic microbes-Bacterial and archea; Eukaryotic microbes-Anaerobic and aerobic Protozoa.

Microbial pathogenesis: Invasiveness and Toxigenicity; pure culture techniques of microbes.

Applied microbiology: Microbial products; Food microbiology; Biocontrol; Biological weapons; Wastewater treatment.

Parasitism: General consideration, Types of parasites, Types of Hosts, symbiosis and Commensalism

Distribution, habit and habitat, structure and life cycle of economically important helminth parasites of man and domesticated animals: *Echinococcus granulosus, Hymenolepis nana,, Scistosoma haematobium, Trichinella spiralis* and *Wuchereria bancrofti*

**M.Sc. 3rd SEMESTER**
**Paper-ZOO-3034 (REPRODUCTIVE BIOLOGY)**
**(Marks 40+10) Theory credit: 4 Credits**

**UNIT I**

1. Development of gonads and Disorder of gonadal development
2. Sexual differentiation within the gonads
   Anatomical organization of male and female reproductive system
3. Reproductive life cycle
4. Puberty and adolocence, role of hormones
5. Reproductive cycles in animals and human: Estrous and menstrual cycle
6. Ovarian Follicular development: Folliculogenesis, mechanism of ovulation
   In mammals
7. Testicular organization, seminiferous epithelium cycle, Spermatogenesis

**UNIT II**

8. Role of hormones in fertilization,
9. Placenta and Placental hormones
10. Implantation and role of hormones
11. Pregnancy and hormones of pregnancy.
12. Development of breast, Lactation and hormonal regulation
13. Parturition in mammals
14. Assisted reproductive Techniques: IVF-ET
    Environmental endocrine issue: environmental estrogens, endocrine disruptors

**M.Sc. 3rd SEMESTER**
**Paper-ZOO-3044 (AQUATIC BIOLOGY AND FISHERIES)**
**(Marks 40+10) Theory credit: 4 Credits**

**UNIT 1**

1. Classification of class of Insect up to Orders with salient features and common example.
2. Useful insects: Insects and Insect products, Pollinating insects, insect used as food and medicine.
3. Harmful insects: Insect pests, vectors of diseases.
4. Insect's role in ecosystem and nutrient cycle.
5. Insects as environmental indicator.
6. Concept of Pest management

**UNIT II**

7. Limnology: Introduction, Definition of limnology, Essential nature of limnology.
8. Aquatic Resources: Characteristic features of fresh water, brackish water and marine water environment.
9. Freshwater Environment: Extent and distribution of freshwater. Lotic environments, ideological classification of fresh water biota. Freshwater communities.
10. Rivers: Origin and characteristics of Rivers, Function and Biological productivity
11. Major threats to freshwater ecosystem including pollution and sand mining, impact of large dams.
12. Fish germplasm diversity of North East India — their prospects, problems & conservation strategy.
13. Ornamental fishes of North-East India and exotic ornamental fishes: their culture & breeding techniques.

**M.Sc 3rd SEMESTER**
**PAPER Z-3056 (OPEN I): 6 credits**
**INTEGRATIVE BIOLOGY**

Molecules and their interactions: Structures of atoms, molecules and chemical bonds, Stabilizing interactions (van der waal's, Electrostatic, Hydrogen bonding, Hydrophobic interactions, etc)

Growth, yield and Principles of catalysis, enzymes and enzyme kinetics, enzyme regulation, mechanism of enzyme catalysis, isozymes.

Conformation of Nucleic acids (A-, B-, Z- DNA), t-RNA and micro RNA.

Microbial Physiology: Growth, yield and characteristic, strategies of cell division, Stress response.

Cell signaling: Hormones and their receptors, signaling through G protein coupled receptors, signal transduction pathways, second messengers, and regulation of signaling pathways, bacterial chemotaxis and quorum sensing.

Cellular communication: Regulation of haematopoeisis, neurotransmission and its regulation

Gene mapping methods: Linkage maps, tetrad analysis, Mapping by using somatic somatic cell hybrids

Human genetics: Pedigree analysis, lod score for linkage testing, karyotypes, genetic disorders.

Quantitative genetics: Polygenic inheritance, heritability and its measurements.QTL mapping.

Recombination: Homologous and non-homologous recombination including transposition, site specific recombination.

Population genetics- population, gene pool, gene frequency; concepts and rate of change in gene frequency through natural selection.

**M.Sc. 3rd SEMESTER**
**Paper-ZOO-3063(CELL BIOLOGY, HISTOLOGY, HISTOCHEMISTRY, IMMUNOLOGY AND REPRODUCTIVE BIOLOGY)**

**(Marks 20+5) Theory credit: 3 Credits**
**PRACTICAL**

1. Isolation of mitochondria from mouse liver by differential centrifugation and staining.
2. Microtubules in vesicle transport in fish chromatophore.
3. Observation of DNA fragmentation in apoptotic cell
4. Dissection and histology of lymphoid organs in rat/mouse.
5. Differential WBC count in mammalian blood.
6. Isolation of B lymphocytes.
7. Cell viability and count using trypan blue stain from bone marrow and spleenocytes.
8. Detection of DNA, glycogen and protein using cytochemical technique.
9. Preparation of histological slides from testis and ovary.
10. Study of estrous cycle.

**M.Sc. 3rd SEMESTER**

**Paper-ZOO-3073 (AQUATIC BIOLOGY & FISHERIES, ENTOMOLOGY AND PARASITOLOGY)**

**(Marks 20+5) Theory credit: 3 Credits**
**PRACTICAL**

1. Estimation of soil parameters: pH, Organic Carbon, phosphate.
2. Estimation of primary productivity by LB-DB Method.
3. Collection and Identification of Plankton, Aquatic Insects, Aquatic Macrophytes.
4. Estimation of turbidity using Secchi-Disc method.
5. Identification of indigenous and exotic ornamental fishes under different families.
6. Identification of insects belonging to different orders.
7. Identification of different types of insect mouth parts, antennae and legs.
8. Salivary gland of honey bee — dissection and temporary mounting.
9. Dissection of sting apparatus in honey bee.
10. Study of prepared slides and museum specimens of selected parasites of representative groups of protozoans, parasites, helminthes and arthropods.
11. Preparation and identification of permanent slide of rectal ciliates in frog.
12. Culture and study of insect parasitoid on an insect host.

## Fourth Semester

### Elective 1: Animal physiology and Biochemistry

| Code | Course | Credit | Contact hour | Total marks | Type |
|---|---|---|---|---|---|
| Zoo-4014 | **Biochemistry and Proteomics** | 4 | 54 | 40+10 | Elective (Theory) |
| Zoo-4024 | **Enzymology and Recombinant Technology** | 4 | 54 | 40+10 | Elective (Theory) |
| Zoo-4034 | **Physiology and Adaptational Biology** | 4 | 54 | 40+10 | Elective (Theory) |
| Zoo-4044 | **Molecular Endocrinology and Reproductive Biology** | 4 | 54 | 40+10 | Elective (Theory) |
| Zoo-4054 | **Immunology** | 4 | 54 | 40+10 | Core (Theory) |
| Zoo-4064 * | **Dissertation** | 6 | 81 | 60+15 | Dissertation (Elective) |
| Zoo-4072 | **Practical 1 (Biochemistry and Enzymology)** | 2 | 54 | 20+5 | Practical |

**M.SC 4th SEMESTER (ANIMAL PHYSIOLOGY AND BIOHEMISTRY)**
**BIOCHEMISTRY AND PROTEOMICS**
**CODE: Zoo-4014**
**CREDIT: 04**
**UNIT I:BIOCHEMISTRY**

1. Biological standard state and free energy change in coupled reaction.Biological oxidation reduction reaction, redox potentials, relation between standard reduction potential and standard free energy change. High energy phosphate compound –introduction, phosphate group transfer, free energy of hydrolysis of ATP
2. Carbohydrates: Regulation of TCA cycle , Cori cycle, futile cycle and anapleortic reaction
3. Lipids :
   Cholesterol: Biosynthesis and degradation. Lipid transport and storage. Biosynthesis of eicosanoids: Prostaglandins, leucotrienes and thromboxanes. Biosynthesis and degradation of porphyrin and heme
4. Nucleotides : Biosynthesis and regulation of purine and pyrimidine nucleotides
   Catabolism of purines and pyrimidines
5. Eukaryotic Transcription :

   General introduction, characteristics of promoters and enhancer elements. Activators and repressors of transcription. Different DNA binding domains like zinc finger, helix-turn-helix, leucine zipper, helix-loop-helix. Properties of eukaryotic RNA polymerases and their mode of action, assembly of basal transcription apparatus at the promoter, initiation, elongation and termination of transcription.

6. Post-transcritional processing
   RNA binding proteins and RNA motifs. Transcription attenuation .Processing of pro- and eukaryotic rRNA and tRNAs . RNA targeting and mRNA stability

**UNIT II: PROTEOMICS:**

**1.** Protein chemistry

Levels of protein structure:
*Secondary structure*: H-bonding scheme, Diversity in alpha-helices, Helix capping, Beta-Stand and sheet, Turns and loops, Importance of loops. *Supersecondary structure*: Domains
and motifs.
*Tertiary structure*: General properties and characteristics, Protein Data Bank (PDB). *Quaternary structure*: Concept of subunits and protomers and their association, Importance of quaternary structure, Various examples.

2. Protein Folding

   Anfinsen's classical experiment; Folding curves and transitions;Types of protein folding and intermediates; Models of protein folding; Assisted protein folding (Chaperones).

3.Post-translational processing, targeting and turnover
4. Techniques to investigate protein structure and folding

*Spectroscopic methods* : Absorbance, Fluorescence, Circular dichroism;
*Structural methods* : NMR; X-ray crystallography.

5. Microarrary,2D-electrophoresis,protein sequencing,mass spectrometry.

**M.SC 4th SEMESTER (ANIMAL PHYSIOLOGY AND BIOHEMISTRY)**
**ENZYMOLOGY AND RECOMIBNANT TECHNOLOGY**
**CODE: Zoo-4024**
**CREDIT: 04**

**UNIT I: ENZYMOLOGY**

1. Kinetics:
   Single substrate reactions: Steady state and equilibrium kinetics, Michaelis-Menten equation and plot.Linear kinetic plots: Lineweaver Burk, Hanes Wolf, Edie Hofstee, Eadie Scatchard plot .Importance of Kcat/km, Kinetics of Zero and first order reaction, Calculations on enzyme kinetics,
2. Multi-substrate reactions:
   Random sequential, Ordered, Ping-pong (double reciprocal) mechanism
3. Allosteric enzyme
   Qualitative description of concerted and sequential model for allosteric enzyme
4. Enzyme Inhibition: Reversible inhibition and Irreversible inhibition
   Competitive; Non-competitive; Un-competitive and mixed, Determination of nature of inhibition and Ki by LB
5. Regulation: Allosterism, covalent modifications and regulation by proteolytic clevage

6. Protein ligand binding measurement, Hill and Satchard plot

**UNIT II: Recombinant Technology**

1. Restriction and Modification systems in *E. coli* and their use in recombinant library constructions.
2. Biology of filamentous phages, development of phage and phagemid vectors.
3. Biology of Bacteriophage lambda, Promoters and control circuits, phage assembly and *in vitro* packaging and development of vectors for different types of Libraries.

4. Vectors for cloning large fragments of DNA, (Cosmid, PAC, YAC and BAC) and strategies for cloning large DNA fragments. Strategies for constructing cDNA libraries and screening using Nucleic acid and antibody probes.

5. Introduction to next generation sequencing (NGS). Polymerase chain reaction and its application in research including cloning of PCR amplified fragments, mutagenesis and construction of Libraries. Real time/quantitative PCR.

6. Subtractive Libraries, Expression based strategies for cloning of functional genes.

**PHYSIOLOGY AND ADAPTATIONAL BIOLOGY**
**CODE: Zoo-4034**
**UNIT I : PHYSIOLOGY**

1. Gastrointestinal Hormones and digestive Enzymes,Regulation of Gastrointestinal secretions and functions, The enteric nervous system, Glucose homeostasis.

2. Mechanism of blood coagulation and hemostatis
3. Cardiac cycle events, regulation of cardiac amplitude and frequency
4. Counter current mechanism of urine formation
5. Physiology of movement and locomotion, Biochemistry of contractile proteins,Sources
   of energy for muscle contraction, Sliding filament theory Excitation of contraction and mechanism of regulation of contraction by calcium Mechanism of relaxation
6. Auditory and visual motion processing

**UNIT II:**

1. Physiology of neuronal system: Excitable membrane: a)Membranes potential b)Ions as current carriers-Protons,calcium,potassium,structure of cation-permeable channels and chloride channels Synaptic transmission: Electral transmission,chemical transmitters-Neuropeptide,FMRF-amide family
2. Respiration: Regulation of respiration, Respiratory functions of blood: Respiratory pigments, respiratory acidosis and alkalosis, Alkali reserve. Control and co-ordination of respiration, Respiratory adjustments , Hypoxia and oxygen therapy, Dyspnea, Periodic breathing, Respiratory buffering. High altitude: decreased pressure of gas, hypoxic effects, mountain sickness and acclimatization
3. **Adaptations to Stress**
   Environmental stress, acclimation, acclimatization, avoidance and tolerance, stress and hormones. Sensing the Environment- holoreception, chemoreception, mechanoreception, echolocation, Endogenous and exogenous biological rhythms,
4. Osmoregulation in aquatic and terrestrial environments.Thermoregulation - Heat balance in animals, Adaptations to temperature extremes, torpor, Aestivation and hibernation, Counter current heat exchangers.
5. Space Physiology: Physiological requirement of space travel

**MOLECULAR ENDOCRINOLOGY AND REPRODUCTIVE BIOLOGY**
**CODE: Zoo-4044**
**CREDIT: 04**

**UNIT I : MOLECULAR ENDOCRINOLOGY**

1. Hypothalmic releasing hormones: Regulation of hypothalamic hormone secretion.
2 Pituitary hormones and regulation of pituitary hormone secretion

3. Hormonal feedback
4. Hormone receptors and Hormonal signal transduction.

5. Neorosecretory hormones in insects and crustaceans and their function

6. Principle and procedure of RIA and radio receptor assays, ELISA,Cell culture bioassays: Ishikawa estrogen assay and recombinant yeast assay.

**UNIT II : Reproductive Biology**

1. Reproductive cycles:Regulation of reproductive cycle in female: menstrual cycle in human, estrous cycle in rat.

2. Early embryogenesis and biology implantation: Pre-implantation embryo development. Functional markers of embryo. Molecular basis of uterine-blastocyst interaction. Cellular and endocrine aspects of implantation. Types of implantation
3. Control of fertility and sterility: Male: Origin, cause and treatment of male sterility, Azoospermia, Oligozoospermia Asthenozoospermia and Varicocoele
4. Female: Origin, cause and treatment of female sterility
5. Mechanism of action of oral contraceptives, Surgical sterilization, with reference to tubectomy
6. Hormone Replacement Therapy (HRT), Ovulation Induction and Enhancement: Treatment of infertility,ZIFT,GIST,ICSI,Environmental estrogens,Endocrine disruptors.

**IMMUNOLOGY**
**CODE: Zoo-4054**
**CREDIT: 04**
**UNIT I**

1. Complement system: classical and alternate pathways of complement activation
2. Complement and inflammation, formation of membrane attack complex
2. Cytokine structure and function, cytokine receptor, Cytokine and immune response.
3. Genetic Basis of Ab Structure
4. Genetic organization of MHC, role of MHC in activation of T lymphocyte, Association of diseases with MHC haplotypes
5. The T Cell Receptor: Structure and Genetic Basis , Antibody-Mediated Reactions , Cell-
   Mediated Reactions

**UNIT II**

1 Immunology of HIV Infection
2 Infection and Immunity
3. Immune Regulation & Tolerance
4. Autoimmunity
5. Immunology of Cancer
6. Immunoprophylaxis (Vaccines) & Immunotherapy, Transplantation immunology,Modern
   Antibody therapy

**Paper-Zoo-4064**
**Dissertation**
**Credit=6, Contact Hour=81, Total Marks=60+15=75**

**M.SC 4th SEMESTER (ANIMAL PHYSIOLOGY AND BIOHEMISTRY)**
**(BIOCHEMISTRY, PROTEOMICS AND ENZYMOLOGY)**
**PRACTICAL CODE: Zoo-4072**
**CREDIT: 02**

1. Estimation of tissue protein by Bradford method.
2. Estimation of total free amino acid by using Ninhydrin reagent.
3. Determination of amylase activity and calculation of amylase number.
4. Study of effect of time on arginase activity by calorimetric method and assay of arginase enzyme by spectrophotometric method
5. To study the effect of temperature on arginase activity
6. To study the effect of $P^H$ on Arginase activity
7. To analyse the expression of beta actin mRNA by qPCR
8. Determination of inhibitor constant (ki) for L-Orinithine against Arginase enzyme by LB plot
9. Study of estrous cycle in rat/mice
10. Histological detection of a glucose-6phosphate
11. To study sperms count and motility in mice
12. Histologiccal study of testis, ovary,pancrease,pituitary,adrenal,thyroid and para-thyroid in mammals.
13. SDS-PAGE analysis of placental proteins.
14. Purification of IgG from plasma using Protein A Sepharose affinity chromatography.

**SEMESTER-4**
**ELECTIVE 1: Animal Ecology and Wildlife Biology**

| Code | Course | Credits | Contact hours | Total Marks | Types |
|---|---|---|---|---|---|
| **Z-4014** | **Ecosystem Functions and** | **4** | **54** | **40+10=50** | **Elective(Theory)** |

| | | | | | |
|---|---|---|---|---|---|
| | **Stability** | | | | |
| **Z-4024** | **Wildlife and Wildlife Habitat Relations** | **4** | **54** | **40+10=50** | **Elective(Theory)** |
| **Z-4034** | **Wildlife Population Ecology and Methods** | **4** | **54** | **40+10=50** | **Elective(Theory)** |
| **Z-4044** | **Wildlife Conservation** | **4** | **54** | **40+10=50** | **Elective(Theory)** |
| **Z-4054** | **Wildlife Management** | **4** | **54** | **40+10=50** | **Elective(Theory)** |
| **Z-4066** | **Dissertation** | **6** | **81** | **60+15=75** | **Dissertation** |
| **Z-4072** | **Practical** | **2** | **54** | **20+5=25** | **Practical** |

**M. Sc. FOURTH SEMESTER**
**SPECIAL PAPER: ANIMAL ECOLOGY & WILDLIFE BIOLOGY**

**PAPER- Z-4014**

## ECOSYSTEM FUNCTIONS AND STABILITY

**Total credits: 4 Total Contact hours: 54 Total Marks: 40+10**

**Unit-I: Ecosystem Function (Credits 2) Total Contact hours: 27**

Ecosystem Productivity, Measurements of Primary and secondary productivity, food chain and trophic level, Functional rules and guilds, Keystone species, Nutrient cycling, Nutrient Pools and exchange, Phosphorous cycle, Energy flow Models, Nutrient cycles in forests, Ecosystem developments, Restoration ecology and its relevance to present context, Bioenergetics of ecosystem development, relevance of Ecosystem development theory to human ecology. Ecological efficiencies, Ecological Niche, Niche overlap, Niche separation, Niche Relationship and community structures, Ecological equivalents, Parallel niche, Competitive Displacement, Principles of co-existence.

**Unit-II: 2 Ecosystem Stability (Credits 2) Total contact hours: 27**

Meaning of Stability and Stability concept, Types of Stability; Resistance and resilience stability, Relationship of Species Diversity and Stability, Stability of Isolated Population, Stability of their steady state and Influence of random perturbations on population Stability, Ecosystem maturity and role of Natural selection, Natural and Artificial ecosystems, Theory of ecosystem succession, Climax concept and Significance of ecological succession, two views of community organizations. Ecological Principles of Management, Role of Ecologist in the management of Natural Ecosystem, Management Techniques, Significance of Planning of Ecosystem Management, Ecological Risk Assessment, Analytical methods for ecological risk assessment in terrestrial and Aquatic ecosystem and planning and strategies.

**SPECIAL PAPER: ANIMAL ECOLOGY & WILDLIFE BIOLOGY**

**PAPER- PAPER- Z-4024**
**WILDLIFE AND WILDLIFE HABITAT RELATIONS**
**Credits: 4 Total Contact Hours: 54 Total marks: (40+10) =50**

**UNIT-I: Wildlife Habitat (2 Credits) Total Contact hours: 27**

Characteristics, Compositions and distribution of Grassland Ecosystem in India and NE India; Wetland definition, Ramsar Convention and criteria for inclusion, wetland formation and types; Types of forest in NE Region, Dominance species composition in different Forest types (Tropical, Temperate and Alpine forest), Canopy openness, closed Canopy and Open canopy forests,. High altitudes habitat of wildlife and wildlife species compositions; Wildlife Habitat Assessment by Community Dominance Index (CDI), Canopy Area Coverage, Foliage Height Diversity (FHD), Similarity and Dissimilarity index and Association index, Changing patterns of environmental gradients of light, temperature and humidity in degraded forest and its impact on wildlife.

**Unit II: Wildlife Habitat Relations (2 Credits) Total Contact hours: 27**

Succession of Wildlife Habitat within the Wildlife Sanctuaries and National parks of Assam (KNP, ONP, NNP, MNP & PWLS), Implication of habitat Succession in wildlife, Forest fragmentation & wildlife Habitat loss, Gap formation and their impact on wildlife, Gap dynamics, impact of climate changes on wildlife species, Island Factor and its relationship with present day wildlife conservation networks, Habitat utilization pattern of Rhino, Elephant, Greater Adjutant Stork, Golden Langur and Tiger. Habitat selections, Evolution of habitat preferences, theory of habitat selections, Loss of wetland habitat and its relation to wildlife species. Ecological Role of Wetlands as a Wildlife Habitat, role of wetland ecosystem in Biodiversity conservation.

**M. Sc. FOURTH SEMESTER**
**SPECIAL PAPER: ANIMAL ECOLOGY & WILDLIFE BIOLOGY**

**PAPER- Z-4034**
**WILDLIFE POPULATION ECOLOGY AND METHODS**

**Total Credits: 4** **Total Contact Hours: 54** **Total marks: (40+10) =50**

**Unit-I: Wildlife Population Ecology (Credit 2)** **Total Contact Hours: 27**

Wildlife Population Characteristics, Carrying capacity of wildlife, Characteristics and types of Carrying capacity; Carrying capacity of wildlife habitat and wildlife population sizes, Sign of wildlife habitat carrying capacity and population health, Competition and its types, Competition for resources, Dispersal, three mode of dispersal; concepts of ecological density and crude density; Evolutionary advantages of dispersal, vital statistics: life table and life table preparations, reproductive value; Causes of Migration, Migratory routes of birds associated with NE India, study of bird migration and local movement pattern using mist nets and colour banding pattern and metallic rings; Home range: Importance of Home range in species conservation, Territoriality among Mammals and Birds.

**Unit-II: Wildlife Study Methods (Credit 2)** **Total Contract hours: 27**

Methods of Samplings & Sampling Design; Studies of terrestrial vegetation for Wildlife habitat, Why Sampling design has been prior to any study and its importance, differences between Random and stratified random sampling and systematic random sampling in wildlife habitat, Statistical analysis of wildlife data using computer software and circular statistics, Occupational survey methods and its necessity for the study of large vertebrates, research designed and statistical approach for hypothesis testing; Methods for Wildlife Population Survey, differences between population survey and census, Importance of Wildlife Census, Direct and Indirect methods of wildlife census, Mist netting techniques, Radio telemetry techniques, Modern Census Techniques of Rhino, Tiger, Elephant**,** Migratory and residential birds, terrestrial birds, Herpetofauna, butterflies, spiders & other invertebrates. Study of wildlife home range using modern and individual ID techniques.

**M. Sc. FOURTH SEMESTER**
**SPECIAL PAPER: ANIMAL ECOLOGY AND WILD LIFE BIOLOGY**

**PAPER- Z-4044:**
**WILDLIE CONSERVATION**
**Total Credit: 4 Total Contact Hours: 54 Total Marks: (40+10) =50**

**Unit-I: Wildlife Conservation (2 Credits) Total contact hours: 27**

Umbrella, Flagship species and edge species, Importance of Umbrella and flagship species and its species conservation; Contribution of Wildlife in GNP, Distribution of Large Cats, Elephant, Rhino, Swamp Deer, Asiatic Wild Buffalos, Hoolock Gibbon and Globally endangered birds of NE Region, Endemic animals and Restricted Ranges species, Conservation needs, Economics and Ecological issues, Ecological Basis of Wildlife management, Identifying land for Nature Reserve, SLOSS debate, Wildlife Corridors, conservation prospects of urban wildlife and strategies. Metapopulation and metapopulation dynamics, concept of Island biogeography, Mammalian biogeography of Assam and India.

**Unit-II: Conservation Practices (2 Credit) Total Contact hours: 27**

Wildlife Conservation Evaluation: Attributes, Criteria and Values; IUCN Criteria of Threatened Wildlife, Conservation and Preservation, Biodiversity and types of diversity, importance of biodiversity Conservation, prospects of biodiversity in economic development, biodiversity & human livelihood, Global biodiversity hot spots, DNA Finger Printing, Genetic Depression, Conservation Practices in NE Region, Reintroduction and Translocation, In- situ and Ex- situ conservation, Modern conservation tool: Camera trapping, Micro Chips, Radio Collar, PTT/ NTT, Scat/ Dung analysis.

**M. Sc. FOURTH SEMESTER**
**SPECIAL PAPER: ANIMAL ECOLOGY AND WILD LIFE BIOLOGY**

**PAPER- Z-4054**
**WILDLIFE MANAGEMENT & MANAGEMENT PRACTICES**

**Total Credit: 4 Total Contact Hours: 54 Total Marks: (40+10) =50**

**Unit I: Wildlife Management (Credits 2) Total contract hours: 27**

Wildlife Protection (Act) 1972, Wetland (Act) 2016, Biodiversity (Act) 2002, CITES, Wildlife Crime, Conservation Breeding and Economics, Breeding species in Captivity, Effective Population size, Genetic Management in Captivity, Cryopreservation, Importance of DNA bar coding, Molecular aspects of wildlife management, wildlife forensic, Role of Zoo in species Conservation, Wildlife conservation model and management objectives, management of wildlife based on habitat and species carrying capacity. The impact of human wildlife conflict on natural systems. Non-lethal techniques for reducing depredation. The impact of human-wildlife conflict on human lives and livelihoods. Techniques to reduce crop loss: human and technical dimensions in Africa. Bearing the cost of human-wildlife conflict: the challenges of compensation scheme. Increasing the values of wildlife through non-consumptive use? Deconstructing the myths of ecotourism and community-based tourism in the tropics.

**Unit II: Ecological Association & Wildlife Management (2 Credit) Contact ours: 27**

Reasons of wildlife Taxonomic Diversity in NE Region, Historical, Evidence of species colonization in NE India, Utilitarian Values of Wildlife and species management, Pivotal linkages, in ecosystems, Wild mammals group, Linkage of Primates in Tropical ecosystem functioning, Importance of Wetland and Forests of NE region as complementary Habitat for Birds and Mammals, Important wildlife species composition in Kaziranga and Manas, Dehang-Debang, Nokrek and Namdapha NP.
Extinction and Estimating the risk of extinction, Quantifying risk of extinction, colonization and species extinction.

**M. Sc. FOURTH SEMESTER**
**SPECIAL PAPER: ANIMAL ECOLOGY AND WILD LIFE BIOLOGY**
**PAPER- Z-4066**
**DISSERTATION**
**Total Credits: 6 Total Contact Hours: 81 Total Marks: (60+15) =75**

| | | | |
|---|---|---|---|
| **1.** | Preparation of dissertation (**4 credits**) | 40 | marks |
| | 2. Presentations and Viva voce (**1 credits**) | | 10 Marks |
| | 3. Field visits (**1 credits**) | 10 Marks | |

**M. Sc. FOURTH SEMESTER**
**SPECIAL PAPER: ANIMAL ECOLOGY AND WILD LIFE BIOLOGY**

**PAPER- Z-4072**
**PRACTICAL**
**Total Credit: 2 Total Contact Hours: 54 Total Marks: (20+5) =25**

**1. Community Analysis**
Measurements of species diversity and use of software; **(a)** Shannon Winner Index (H´), **(b)** Evenness Index, **(c)** Equitability Index **(E), (d)** Community Dominance Index (CDI), **(e)** Canopy area coverage, **(f)** Foliage Height Diversity (FHD).Association Index, Similarity & Dissimilarity index, Habitat classification, Point and Line transact techniques for wildlife and wildlife habitat data collection.

2. **Wildlife Census Techniques**
(**A**) Direct method (i) Line transact (ii) point transact (iii) Quadrate method (iv) Stratified & Random Sampling (**B**) Indirect Methods (i) Pellet Group counting methods/rate of defecation, scat/dung analysis (ii) Camera Trapping Method (iii) Pugmark Census and Analysis. Field base/ laboratory base studies of Bird, butterfly and herpetofauna; census techniques and species identification of birds & Butterfly.
**3. Wildlife Behavior**
(**A**) **Mammal's** (i) Scan animal sampling (**B**) **Bird's** (i) Time and Activity budgeting (ii) Foraging efficiency (iii) Habitat use pattern of wildlife species using Radio Telemetry, GPS, Compass bearing & GIS techniques, Identification of important food plant species of birds and mammals. Study of Edge index.

**4. Statistical Analysis of Wildlife Data**
ANOVA, t- test using equal variance assuming, Paired sample t- test; Principal, Component analysis (PCA) and Circular distribution of wildlife data (Circular Statistics),

**5**. **Viva voce** & Practical note book.

**Elective:3 Fish biology & Fishery Science**

**Specialization: Fish Biology & Fishery Science**

| Code | Course | Credit | Contact hour | Total marks | Type |
|---|---|---|---|---|---|
| Z-4014 | Fish Taxonomy & Study of Fish Growth & Population | 4 | 54 | 40+10 | Core (Theory) |
| Z-4024 | Fish Physiology & Fish Genetics | 4 | 54 | 40+10 | Core (Theory) |
| Z-4034 | Capture Fisheries & Ecosystem management | 4 | 54 | 40+10 | Core (Theory) |
| Z-4044 | Aquaculture & Fish Biotechnology | 4 | 54 | 40+10 | Core (Theory) |
| Z-4054 | Fish Pathology & Post harvest technology | 4 | 54 | 40+10 | Core (Theory) |
| Z-4066 | Dissertation | 6 | 54 | 60+15 | Dissertation |
| Z-4072 | Practical paper-I (Taxonomy, Fish Biology & Aquaculture) | 2 | 54 | 20+5 | Practical |

**M. Sc. FOURTH SEMESTER**
**FISH BIOLOGY & FISHERY SCIENCE**
**PAPER-Z -4014 (Total Marks 40) 4 Credit**
**(Fish Taxonomy and Study of Fish Growth & Population**)

**Unit-1: FISH TAXONOMY: 2 Credits (20 Marks)**

1. Taxonomic characterization: taxonomic keys; Taxonomic methods for identification of fresh water fishes.
2. Methods employed for phylogenetic studies and fish identification.
3. Modern Trends in Fish Taxonomy; Fish Barcoding.
4. Fish skeleton as a tool for identification of fresh water fishes.
5. Biogeographic units of Freshwater Biodiversity: Status and distribution of freshwater fish diversity in North East India.

**Unit-2: STUDY OF FISH GROWTH AND POPULATION: 2 Credits (20 Marks)**

1. Study of Growth curve: Absolute and relative Growth, Length-weight relationships, Condition factor, Relative condition factor — their significance.
2. Hepatosomatic index, Gonadosomatic index, Index of fullness, Ponderal index, Index of propagation — their estimation.
3. Growth rate and ageing.
4. Study of Species Diversity Indices, Fish Species Richness, Relative abundance.
5. Concept of Index of Biotic Integrity (IBI); Jaccard index.
6. Stock assessment and management — Stock composition analysis, fecundity analysis.
7. Natural markers — morphological analysis, environmental signals, genetic analysis.
8. Applied Markers — marking and tagging.

**M. Sc. FOURTH SEMESTER**
**FISH BIOLOGY & FISHERY SCIENCE**
**PAPER-Z -4024 (Total Marks 40) 4 Credit**
**(Fish Physiology and Fish Genetics**)

**Unit-1: FISH PHYSIOLOGY: 3 credits (30 marks)**

1. Physiology of digestion in teleost — Digestive system: anatomical differentiation and modifications. Feeding behavior and feeding adaptation in fishes.
2. Respiratory system in Fishes — Gill structure, Mechanism of respiration, Counter-current principle, Exchange of gases. Accessory respiratory organs and respiratory epithelium, Physiological adaptation in air breathing fishes.
3. Forms and Functions of swim bladder and Weberian ossicles in teleosts.

4. Excretion in fishes — Excretion of nitrogenous wastes, Urea cycle.
5. Principles of osmoregulation in Freshwater and Marine Teleosts — Processes and functional aspects.
6. Endocrine system in Fish — Hypothalamo-hypophysial system; Neurosecretory system and Neuro-hypophysial hormones; Functional morphology of Pituitary gland; structure and function of Thyroid and Pancreas.

**Unit-2: FISH GENETICS: 1 credit (10 marks)**

1. Population Genetics: Individual *vs.* population; genetic structure of random mating populations.
2. Hardy-Weinberg principle: Test of equilibrium, application and properties of equilibrium populations.
3. Selection: Scope, application, role of genetics in fish selection and breeding; National and International scenario of selective breeding programmes in fish.
4. Stock improvement: sex-reversal, Hybridization, Gynogenesis, Polyploidy, hybrid vigour, introgression.

**M. Sc. FOURTH SEMESTER**
**FISH BIOLOGY & FISHERY SCIENCE**
**PAPER-Z -4034 (Total Marks 40) 4 Credit**
(**Capture Fisheries & Post-harvest Technology**)

**Unit:-1 CAPTURE FISHERIES: 3 credits (30 marks)**

1. Types of capture fisheries resources.
2. Fishery resources of the major river systems of India; Fish and Fisheries of River Brahmaputra.
3. Coldwater Fish & fisheries of India; Hill stream fisheries of North East India; Mahseer fisheries: prospects and problems with special reference to NE India.
4. Floodplain wetland (*beel*) fisheries: Fish resources, problems and management approaches.
5. Coastal fisheries of India (Sardine & Mackerel fisheries).

6. Fishing crafts and gears used in inland capture fisheries. Destructive fishing—its impact on fish diversity.

7. Estuarine fisheries (estuarine fisheries resources, problems confronting brackish water capture fisheries).

**Unit-2:- POST-HARVEST TECHNOLOGY: 1 credits (10 marks)**

1. Principles of preservation, handling and packaging of fish for marketing.
2. Importance and methods of Fish preservation (Refrigeration and freezing, Drying, Salting, Smoking, Canning, Pickling, pasting and spicing, Fermentation).
3. Fishery bi-products, their production and utilization (liver oils, Body oils, Fish meal, Fish flour, Fish Silage, Fish protein, Fish guano, Bone meal).

**M. Sc. FOURTH SEMESTER**
**FISH BIOLOGY & FISHERY SCIENCE**
**PAPER-Z -4044 (Total Marks 40) 4 Credits**
(**Aquaculture**)
**Unit:-1 AQUACULTURE TECHNOLOGY: 2 Credits (20 marks)**

1. Aquaculture systems — Extensive, semi-intensive, intensive and super intensive culture of fish; Pen and Cage culture in lentic and lotic water bodies; Monoculture vs. Composite fish culture.

2. Fish Breeding Technology — Brood stock management, nutritional requirements, captive rearing, and maturation; induced breeding techniques: physical and chemical inducing agents.

3. Breeding and Culture of Air breathing fishes.

4. Non-conventional methods of fish farming — sewage fed fisheries, integrated fish farming.

5. Aquarium keeping — Design and construction of tanks; species-wise tank size requirement; heating, lighting, aeration and filtration arrangements; decorations used; common aquarium plants and their propagation.

**Unit:-2 AQUACULTURE NUTRITION: 2 credits (20 marks)**

6. Nutritional requirements in aquaculture — Protein, carbohydrate, fats, vitamins and minerals.
7. Feed formulation — General principles, different steps of feed formulation, classification of feed ingredients.
8. Maintenance of Natural Color of fishes in Aquarium.
9. Larval nutrition — Importance of live feed and artificial feed, Different types of feed available for larvae.
10. Aquaculture Management — Feed, health and water quality management; prophylaxes; quarantine measures.

**M. Sc. FOURTH SEMESTER**
**FISH BIOLOGY & FISHERY SCIENCE**
**PAPER-Z -4054 (Total Marks 40) 4 Credits**
**(Fish Pathology, Ecosystem management and Fish Biotechnology)**
**Unit: -1 FISH PATHOLOGY: 2 credits (20 marks)**

1. Fish disease — Types; symptoms; and prophylaxes.
2. Disease diagnostics tools: Histopathological methods; Immunoassay; Biochemical assay; Serological techniques.
3. Techniques for isolation and identification of fungi; Basics of mycological and virological techniques.
4. Isolation and culture of different types of bacteria.

**Unit:-2 ECOSYSTEM MANAGEMENT: 1 credits (10 marks)**

5. Impact of environment on aquaculture: Raw water source, physical and chemical characteristics, contaminants and pollutants (algae, pathogens, heavy metals, pesticides) and their effect on productivity.
6. Biological indicators and indices of water quality.
7. Sanitation in aquaculture systems
8. Algal blooms and environmental microflora.

9. Microbial toxins.

**Unit:-3 BIOTECHNOLOGY: 1Credit (10 Marks)**

10. Food biotechnology: Probiotics, single cell proteins, Nutraceuticals.
11. Cell lines and cell culture; DNA markers and MAS.
12. Application of biotechnological tools: Recombinant DNA, Development of hybridoma and production of monoclonal antibodies; Collection, handling and observation of gametes of finfish and shellfish.
13. Cryopreservation technology; Transfer of gene and transgenic species formation.

**M. Sc. FOURTH SEMESTER**
**FISH BIOLOGY & FISHERY SCIENCE**
**PAPER - Z-4072 (Total Marks 20) 2 Credit**
**(Fish Taxonomy, Fish Biology & Aquaculture — Practical)**

1. Identification of commercially important fresh water fish species — Indigenous and exotic food and ornamental fishes.
2. Comparative biometric assessment (Morphometry and Meristics) of representative freshwater fish species (carp/catfish/murrel/perch/loach) following proper Taxonomic Keys and tools for their identification.
3. Fish osteology — Alizarin preparation of fish skeleton.
4. Dissection — Comparative digestive system in herbivorous, carnivorous and omnivorous fish; nervous system (brain and cranial nerves - V, VII, IX, X); Urino-genital system (male/female); Weberian ossicle.
5. Gut-content analysis in locally available freshwater fish species.
6. Determination of gonadosomatic index (GSI), hepatosomatic index (HSI), condition factor (CF), and fecundity.
7. Water chemistry — Estimation of DO, TA, TH, Ca and Mg in pond/river water.
8. Histopathological examination; Bacterial colony count.
9. Haematological studies — DLC
10. Induced breeding and larval rearing of IMC.
11. Viva-Voce

**Elective 4: Cell and Molecular Biology**

| Code | Course | Credit | Contact hour | Total marks | Type |
|---|---|---|---|---|---|
| Zoo-4014 | Molecular cell Biology | 4 | 54 | 40+10 | Elective (Theory) |
| Zoo-4024 | Membrane Biology | 4 | 54 | 40+10 | Elective (Theory) |
| Zoo-4034 | Molecular Biology | 4 | 54 | 40+10 | Elective (Theory) |
| Zoo-4044 | Genomics and Proteomics | 4 | 54 | 40+10 | Elective (Theory) |
| Zoo-4054 | Immunology | 4 | 54 | 40+10 | Elective (Theory) |
| Zoo-4064 | Dissertation | 6 | 81 | 60+15 | Dissertation (Elective) |
| Zoo-4072 | Practical 1 (Molecular cell Biology) | 2 | 54 | 20+5 | Practical |

**M.Sc 4th semester**
**Paper Zoo -4014**
**(Molecular cell biology)**
**(Marks 40+10) Theory credit: 4 Credits**

1. Nuclear structure and transport between the nucleus and cytoplasm.

2. Molecular structures of genes and chromosomes: molecular definition of a gene; chromosomal organisation of genes and non coding DNA; mobile DNA; organizing cellular DNA into chromosomes.

3. Chromatins and chromosomes; centromere and telomere

4. Genetics of cell cycle: genetic regulation of cell division in yeasts and eukaryotes; molecular basis of cellular checkpoints.

5. Somatic cell genetics: cell fusion and hybrids- agents and mechanisms of fusions: heterokaryons and selective hybrids.

6. Cancer : monoclonal origin; differences between normal and cancer cell; cell transformation and factors for cell proliferation; concepts of oncogenes and their role in cancer, tumour suppressor and apoptotic genes; chromosomal basis of cancer.

7. Ageing : cellular basis of aging ; causes of aging; oxidative damage; genetic instability ; mitochondrial genome damage; genetic aging programme.

**M.Sc 4th semester**
**Paper Zoo -4024**
**(Membrane Biology)**

**(Marks 40+10) Theory credit: 4 Credits**

1. Biomembranes: structural organisation and basic concepts.
2. Transport across cell membranes: diffusion of small molecules across phospholipid bilayer; facilitated diffusion; Active transport by ATP powered pumps; co-transport;coupling active transport to existing ion gradients; uniports, symports and antiports; co-transport by symporters and uniporters; transport across epithelia, osmosis , water channels and the regulation of cell volume.
3. Membrane potential and nerve impulses.
4. Role of cyto-membrane in health and diseases with special reference to lipid peroxidation
5. Membrane associated receptor proteins: cell surface receptors, endocytosis and ligand formation.
6. An overview of the endomembrane system.

**M.Sc 4th semester**
**Paper Zoo -4034**
**(Molecular biology)**
**(Marks 40+10) Theory credit: 4 Credits**

1. DNA replication: Basic idea of prokaryotic and eukaryotic DNA replication- mechanics of DNA replication, enzymes and accessory proteins involved in DNA replication.
2. DNA repair system: Excision repair, Mismatch repair, DNA breaks repair, Bypassing of DNA damage. Homologous recombination and Site specific recombination.
3. Gene expression: From Transcription to Translation. An overview of transcription in prokaryotic and eukaryotic cells. Synthesis and processing of ribosomal RNA, transfer RNA and messenger RNA. Transcriptional and post-transcriptional gene silencing.
4. Post –transcriptional modification in RNA : 5' cap formation and 3' end processing and polyadenylation, Splicing-editing, Nucleus export of m-RNA stability.
5. Translation: Genetic code, Wobble hypothesis, Prokaryotic and Eukaryotic translation including mechanism of initiation, Elongation and Termination. Co and post transcriptional modification of proteins.
6. Transcriptional and post transcriptional control of Gene expression.

**M.Sc 4th semester**
**Paper Zoo -4044**
**(Genomics and Proteomics)**
**(Marks 40+10) Theory credit: 4 Credits**

1. Proteins and proteome: protein structure; the four levels of protein structure; 3D structure of proteins; Transcriptome: the link between the transcriptome and the proteome; protein interaction network; convergent and divergent evolution of protein structure and functions.
2. Genome organisation: The complexity of genome; Nuclear genomes; genetic features of nuclear genomes.
3. Sequencing of genomes: methodology of DNA sequencing; Contiguous DNA sequence; Strategies of sequencing; recognition of coding and non coding regions and annotation of genes; quality of genome sequence database calling and sequence accuracy.
4. DNA libraries: Genomic library; C DNA libraries.
5. Genome information reserves and DNA sequence analysis using softwares.
6. Metagenomics: Introduction- from genomics to metagenomics; next generation of DNA sequencing technologies and potential challenges.

**IMMUNOLOGY**
**CODE: Zoo-4054**
**CREDIT: 04**
**UNIT I**

1. Complement system: classical and alternate pathways of complement

activation

2. Complement and inflammation, formation of membrane attack comple
3. Cytokine structure and function, cytokine receptor, Cytokine and immune response.
4. Genetic Basis of Ab Structure
5. Genetic organization of MHC, role of MHC in activation of T lymphocyte, Association of diseases with MHC haplotypes
6. The T Cell Receptor: Structure and Genetic Basis , Antibody-Mediated Reactions , Cell- Mediated Reactions

**UNIT II**

1 Immunology of HIV Infection

2 Infection and Immunity

3. Immune Regulation & Tolerance
4. Autoimmunity
5. Immunology of Cancer
6. Immunoprophylaxis (Vaccines) & Immunotherapy, Transplantation immunology,Modern Antibody therapy

**M.Sc 4th semester**
**Paper Zoo -4064**
**(Dissertation/Field report)**
**(Marks 60+15) , credit: 6 Credits**

1. **Dissertation**
2. **Field repor**

**M.Sc 4th semester**
**Paper Z -4074**
**(Molecular cell biology)**
**(Marks 20+5) Theory credit: 2 Credits**

1. Supravital staining of living cells, blood cells, living protozoa.
2. Staining of certain organelles in situ using specific stains (mitochondria, golgi etc).
3. Cell viability and count using trypan blue stain from splenocytes.
4. Study of heat shock puffing activity in polytene chromosomes.
5. Study of Euchromatin and Heterochromatin C banding.
6. Mitotic chromosome preparation and chromosome banding from lymphocyte culture.

7. Meiotic chromosome preparation from rat or mice.
8. Isolation of genomic DNA from Mammalian Tissue.
9. Separation of DNA by Agarose Gel Electrophoresis.
10. Amplification of DNA by PCR.
11. Viva-voce.

**Semester-4**
**Elective 5: Entomology**

| Code | Course | Credit | Contact hour | Total marks | Type |
|---|---|---|---|---|---|
| Zoo-4014 | Insect structure and function | 4 | 54 | 40+10 | Elective (Theory) |
| Zoo-4024 | Insect Ecology | 4 | 54 | 40+10 | Elective (Theory) |
| Zoo-4034 | Insect Physiology | 4 | 54 | 40+10 | Elective (Theory) |
| Zoo-4044 | Agricuture and Forest entomology | 4 | 54 | 40+10 | Elective (Theory) |
| Zoo-4054 | Pest and pest control, Medical and Forensic entomology | 4 | 54 | 40+10 | Elective (Theory) |
| Zoo-4066 | Dissertation | 6 | 81 | 60+15 | Dissertation |
| Zoo-4072 | Practical (Insect Ecology, Insect physiology) | 2 | 54 | 20+5 | Practical |

**Paper-Zoo-4014: Insect Structure & Function**
**Credit=4, Contact Hour=54, Total Marks=40+10=50**

**1.** Structure of insect head, thorax and abdomen, insect integument
2. Type of mouthparts, antennae, legs and their modifications & function
3. Wings, wing structure, venations and wing coupling.
4. Insect eye:-structure & function.
5. Receptor organs in insects (Chemo receptors, mechanoreceptors and Photoreceptors)

6. Sound and light producing organs in insects.
7. Insect –plant interactions, plant resistance to insects,

**Paper-Zoo-4024: Insect Ecology**
**Credit=4, Contact Hour=54, Total Marks=40+10=50**

1. **Dynamics of insect life system-determinants of insect abundance, population change, birth rate, Death rate, Movements,**
2. **Effect of environment on insect development-- effect of light, temperature & humidity, Regulation of insect populations,**
3. **Basic concept of surveillance and sampling of insect**
4. Adaptation of insects- Aquatic, Terrestrial, soil,
5. **Insect biodiversity, threats to insect biodiversity, impact of climate change on insect communities**
6. **Insect behavior: chemotropism, thigmotropism, hydrotropism, rheotropism, anemotropism, phototropism, thermotropism, geotropism, instinct. Protective behavior: mimicry. Crypsis, warning coloration. Behavioural defence, chemical defence. Breeding behavior.**
7. **Insect associations: Passive insect association, active associations, estivating aggregation, protective aggregation, swarming aggregation, sleeping aggregation, dissociation, social aggregations**

**Paper-Zoo-4034: Insect Physiology**
**Credit=4, Contact Hour=54, Total Marks=40+10=50**

1. **Digestive System** : Different parts of alimentary canal their origin and histology, salivary glands, physiology of digestion and absorption
2. **Respiratory system** : General organization of respiratory system, classification of respiratory system, Respiration in terrestrial insects - different types of spiracles and their structure, opening and closing mechanism of spiracles, trachea and tracheoles, air sacs, ventilation of tracheal system, mechanism of gaseous exchange, Respiration in aquatic insects, physiology of gill and plastron respiration,, respiration in parasitic insects
3. **Circulatory system** : Diaphragms and sinuses, doral vessel, accessory pulsatory organs, blood circulation, chemical composition of haemolymph, different type of haemocytes and their functions
4. **Nervous system** : Structure and type of neurons, Central nervous system-basic plan, gross anatomy and microanatomy of brain and ganglion, sympathetic nervous system, nerve impulse transmission
5. **Reproductive system**: male and female reproductive system, spermatogenesis, oogenesis. Hormonal control of reproduction in male and female insects, types of reproduction
6. **Excretory system** : basic and cryptonephredial system, Malpighian tubules-anatomy and histology, accessory organs of excretion, metabolic pathways of formnation of uric acid and ammonia, elimination of uric acid by malpighian tubules.
7. **Diapause, Growth and metamorphosis of insects**.

**Paper-Zoo-4044: Agricultural and Forest Entomology and Pest Control**
**Credit=4, Contact Hour=54, Total Marks=40+10=50**

**Unit I : Credits-II**

1. Major pests of rice, vegetables, tea, jute and pulses – classification upto family, life history, nature and damage and control (two each)
2. **Stored grain pests** : Sitophilus oryzae, Tribolium castaneum, Trogoderma granarium, Sitotroga cerellela, Callobruchus chinensis, life history and control
3. **Forest insects**: defoliators, borers and suckers of Teak, Sal, Gamari, classification upto family, life history and control (two each), Insect damage and Sign categories of forest insects

4. **Primary control measures**: Physical, Mechanical, Cultural and Legislative measures. Chemical control: Classification and mode of action of important insecticides, **insecticide toxicity to humans**, drawbacks of chemical control, Insect resistance to pesticides, Fumigants-application and operational precautions, **insecticide laws and regulations** Pheromonal control.
5. **Biological and Genetic control** : use of parasites, parasitoids, predators and pathogenic organisms, sterile insect technique, lethal mutations, inherited sterility, cytoplasmic incompatibility
6. **Pest management: Economic decision levels for pest populations- Concept of economic injury level, Economic threshold, Crop susceptibility to injury, Pre-insecticide era, insecticide era, concept of integrated pest management.**
7. **IPM and a case study.**

**Paper-Z-4054: Medical, Veterinary and Forensic Entomology**
**Credit=4, Contact Hour=54, Total Marks=40+10=50**

1. **Hematophagy, Evolution of the blood sucking habit, Host choice, Host location, anti-haemostatic and anti-pain factors in saliva, phagostimulants, gonotrophic concordance**
2. **Mosquito(Aedes, Culex, Anopheles, Toxorynchus ) Taxonomy, Biology and Behaviour . Major vector born diseases**

3. **Vector-parasite relationship, Parasite strategies for contacting a vector, Vector immune mechanisms**
4. **Public health importance of Mites, Ticks**
5. **Myiasis and myasis causing flies**
6. **Veterinary pests** : Horsefly, stable fly, screw worm, nose fly, cattle blood sucking louse, life history and control

7. **Forensic entomology**:- Lifecycles of Calliphora and Sarcophaga, determination of date and causes of death

**Paper-Zoo-4064**

**Dissertation**

**Credit=6, Contact Hour=81, Total Marks=60 +15=75**

**Paper-Zoo-4072**

**Practical**

**Credit=2, Contact Hour=54, Total Marks=20+05=25**

1. Male reproductive system of cockroach
2. Alimentary canal of house fly with crop
3. Bacterial chamber of termite
4. Pharyngeal, labial and thoracic salivary glands of Honey bee
5. Detection of chitin in insect cuticle
6. Estimation of protein from haemolymph of insect.
7. Histological study of foregut, midgut and hindgut of insect.
8. Study of insect collection and preservation
9. Study of different types of mouth parts
10. Study of different types of antenna
11. Study of different types of legs
12. Preparation of arolium, empodium and pollen basket
13. Identification of Aquatic, terrestrial and boring insects with specific adaptive characteristics.
14. Collection and identification of economically important insects and various stages of their life history.

15. Practical record
16. Viva Voce : 5
    Marks

Suggested Reading:


i. General Entomology by S.W. Frost. Narendra Publishing House, New Delhi.
ii. General Textbook of Entomologyby Walter Scott Patton and Alwen M. Evans. Akashdeep Publishing House, Delhi.
iii. Entomology & Pest Management by L.P. Pedigo. Pearson Education (Singapore) Pre.Ltd.
iv. Medical and Veterinary Entomology By G. Mullen & L. Durden (Edt.). Academic Press.
v. Insect Biochemistry and Physiology by J.L. Nation. CRC Press.
vi. The Insects Structure and Function by R.F. Chapman. Cambridge University Press. Unted Kingdom.
vii. Modern Entomology by D.B.Tembhare. Himalaya Publishing House. Mumbai.
viii. A handbook for the Identification of Insects of Medical Importance by J. Smart, K. Jordon and R.J. Whittick. Biotech Books, Delhi.
ix. Insect Behaviour by M. Prakash. Discovery Publishing House Pvt. Ltd. New Delhi.
x. IMM'S General Textbook of Entomology by O.W.Richards and R.G. Davies. Vol – I & VOL II
xi. Toxicology of Inseticides by F.Matsumura. Plenum Press, New York and London.
xii. The Biology of Blood-sucking in insects by M.Lehane. Cambridge University Press, UK.
xiii. Insect Ecology, Behaviour, Populations & Communities by P.W. Price; R.F. Denno; M.D. Eubanks; D.L.Finke & I.Kaplan. Cambridge University Press.
xiv. A Textbook of Forest Entomology by T.V.Sathe. Daya Publishing House, Delhi.
xv. The Ecology and Control of the Forest Insects of India and the neighbouring countries by C.F.C. Beeson. Shiva Offset Press, Dehra Dun.
xvi. The Insects An Outline of Entomology by P.J. Gullan & P.S. Cranston. Blackwell Publishing.

**Name of the Programme (Programmes Outcomes)**
**M.Sc. in Zoology**

1. Students will be able to identify the major groups of organisms with an emphasis on animals and be able to classify them within a phylogenetic framework also using bioinformatics tools. Students will be able to compare and contrast the characteristics of animals that differentiate them from other forms of life
2. Students will be able to use the evidence of comparative biology to explain how the theory of evolution offers the only scientific explanation for the unity and diversity of life on earth. They will be able to use specific examples to ex plicate how descent with modification has shaped animal morphology, physiology, life history, and behavior.
3. Students will be able to explain how organisms function at the level of the gene, genome, cell, tissue, organ and organ -system. Drawing upon this knowledge, they will be able to give specific examples of the physiological adaptations, development, reproduction and behavior of different forms of life
4. Students will be able to explicate the ecological interconnectedness of life on earth by tracing energy and nutrient flows through the environment. They will be able to relate the physical features of the environment to the structure of populations, communities, and ecosystems
5. Students will be able to demonstrate proficiency in the experimental techniques and methods of analysis appropriate for their area of specialization within biology
6. Students will be able to demonstrate proficiency aquaculture management practices, induced breeding, insect culture etc
7. Students will use current biochemical and molecular techniques to plan and carry out experiments. They will generate and test hypotheses, analyze data using statistical methods where appropriate, and appreciate the limitations of conclusions drawn from experimental data. Trouble-shooting will be stressed in classes and labs

**Course Outcomes**
**ZOO- 1014 (Biosystematics and Biostatistics)**

Students have acquired knowledge:

- To identify the major groups of organisms with an emphasis on animals and be able to classify them within a phylogenetic framework also using bioinformatics tools. Students can compare and contrast the characteristics of animals that differentiate them from other forms of life.
- To use the evidence of comparative biology to explain how the theory of evolution offers the only scientific explanation for the unity and diversity of life on earth. They can use specific examples to ex plicate how descent with modification has shaped animal morphology, physiology, life history, and behavior.
- To explain how organisms function at the level of gene, genome, cell, tissue, organs and organ-systems. Drawing upon this knowledge, they can provide specific examples of the physiological adaptations, development, reproduction and behavior of different forms of life
- To explicate the ecological interconnectedness of life on earth by tracing energy and nutrient flows through the environment. They will be able to relate the physical features of the environment to the structure of populations, communities, and ecosystems
- To demonstrate proficiency in the experimental techniques and methods of analysis appropriate for their area of specialization within biology
- To demonstrate proficiency aquaculture management practices, induced breeding, insect culture etc

- To use current biochemical and molecular techniques to plan and carry out experiments. They can generate and test hypotheses, analyze data using statistical methods where appropriate, and appreciate the limitations of conclusions drawn from experimental data.

**Z-1024 (Bioinformatics and Instrumentation)**

Students have acquired knowledge to:

- Explain which type of data is available from the most common protein sequence and structure databases (UniProt, GenBank, Protein Data Bank, CATH).
- Explain the theories underlying the most common methods for sequence searches and sequence alignments, and in particular knows the principle and main steps for pairwise and multiple sequence alignments;
- Explain and is able to apply the main steps of dynamic programming for simple alignments of short sequences;
- List methods to uncover structure-function relationship in proteins and knows their underlying principles;
- Explain the principles of computational methods for the prediction of secondary structure elements from protein sequence, prediction and modeling of three-dimensional protein structures (homology modeling, threading and ab initio methods).
- Select and apply the most appropriate method for aligning sequences, visualizing and analyzing protein structures, predicting secondary structure elements and modeling protein structures from sequence.
- Understand the principle and uses of the instrument in the analysis of different biological samples
- Implement the knowledge of instrument in analyzing the sample.

**Z-10134 (Evolution and chronobiology)**

Students have acquired knowledge to:

- Understand the biological evolution of the organisms that inhabit the Earth today are different from those that inhabited it in the past.
- Understand that natural selection is one of the several processes that can bring about evolution, although it can also promote stability rather than change
- Understand that the four propositions underlying Darwin's theory of evolution through natural selection are: (1) more individuals are produced than can survive; (2) there is therefore a struggle for existence; (3) individuals within a species show variation; and (4) offspring tend to inherit their parents' characters.
- Understand that the three necessary and sufficient conditions for natural selection to occur are: (1) a struggle for existence; (2) variation; and (3) inheritance.
- Handle chronobiological terminology.
- Critically study the chronobiological publications.
- Adequately summarize and present chronobiological information.
- Apply chronobiological principles in biological and medical-biological science.

**Z-1044 (Genetics and Cytogenetics)**

Students have acquired knowledge to

- Get a broad understanding of core molecular genetics concepts including molecular biology, genetics.
- Acquire working knowledge in a defined skill set of molecular biology and biotechnology protocols, including PCR, genetic mapping, gene isolation and cloning, DNA sequencing, and sequence analysis.

- Set key concepts of genome organization and manipulation in depth, such as assembly of physical maps of genomes, sequencing methods and strategies, genome annotation and bioinformatics, comparative genomics, global gene expression profiling.

**Z-1054 (Ecology and Environment Biology)**

Students have acquired knowledge

- To understand how individuals interact with members of their own species and with organisms of another species
- To explain how populations of a species grow, change and are distributed across the range of their suitable habitats
- To appreciate how communities of species are assembled and how they interact on an ecosystem level, across short and geological time-scales
- To apply the underlying theory and basic principles of ecology learned throughout the course to understand the changes that are occurring as a result of human activity
- To demonstrate that understanding biological and ecological principles can be used to solve real-world problems that we are facing

**Z-1064 (Biochemistry)**

Students will acquire knowledge

- On the synthesis of proteins, lipids, nucleic acids, and carbohydrates and their role in metabolic pathways along with their regulation at the epigenetic, transcriptional, translational, and post-translational levels including RNA and protein folding, modification, and degradation. Regulation by non-coding RNAs will be tied to the developmental and physiological functioning of the organism.
- To understand the mechanism of Enzyme acrtion and their regulation in biochemical pathway.
- To understand the thermydynamic principle of biological systems and bioenergetics.

**Z-1072 (Biosystematics, Biostatistics and Biochemistry)**

•Acquire practical knowledge and get the hands on practice in the subject of biosystematics, biostatics and bioinformatics

**Z-1082 (Genetics, Cytogenetics, Evolution and Chronobiology)**

- Acquire practical knowledge and get the hands on practice in the subject of genetics, cytogenetics, bioinformatics

**Z-2014 (Biodiversity)**

Students have acquired knowledge to

- Understand the concepts and theory in biodiversity science and management from interdisciplinary perspectives and at an advanced level;
- Assess the modes through which conservation builds and extends power and describe in detail the factors that explain the emergence and performance of different governance modes;
- Appreciate the role of ethics, values and norms in producing culturally attuned and effective conservation interventions;
- Understand new technological forces for the future of biodiversity science and management;
- Link theory, hypothesis, methods, data and field work so as to identify and develop advanced research questions and design dissertation research that is identifiable with a professional research approach

**Z-2024 (Endocrinology)**

Students have acquired knowledge to

- Understand the role, metabolic function of various endocrines, its specific secretions and also the disorder and pathophysiology.
- Understand the mechanism of hormone action, signal transduction system
- Understand the role and function of neurosecretory hormones of insects and crustacean

**Z-2034 (Developmental biology)**

Students have acquired knowledge to

- Understand and master basic concepts of developmental biology
- Understand how fertilization and cleavage occur
- Understand the process and consequence of gastrulation
- Understand mesoderm induction and neural induction
- Understand basic concepts of organogenesis
- Understand basic concepts of growth, regeneration and aging
- Understand basic concepts of gene expression and regulation

**Z-2044 (Animal cell culture and Genetic engineering)**

Students are able to:

- Understand theoretical concept to maintain cultures of animal cells and established cell lines with good viability, minimal contamination and appropriate documentation.
- Understand the episodic tasks relevant to cell culture, including preparation and evaluation of media, cryopreservation and recovery, and assessment of cell growth/health.
- Able to recognize and troubleshoot problems common to routine cell culture.
- Understand the importance of plasmids and viruses to genetic engineering.
- Know the natural function of restriction endonucleases and how a normal bacterial cell protects its DNA from their activity.
- Understand how “sticky ends” are formed and their importance to gene technology.
- Describe how a chimeric genome is constructed.
- Explain the four steps of genetic engineering experiments.
- Distinguish between the techniques of selection and screening of clones.
- Explain how to screen for clones that contain a desired gene fragment.
- Understand the value of and the processes involved with the polymerase chain reaction (PCR).
- Describe techniques used to characterize DNA.
- Discuss the different applications of gene technology.

**Z-2054 (Animal Behavior)**

- By the completion of this course, students set a comprehensive understanding of the behavior of animals. They will understand the proximate controls of behavior including the role of hormones, the animal’s genotype and the animal’s environment in the development of behavior. Much of our work will take an evolutionary approach, consequently, students will have a comprehensive understanding of the adaptive significance of behavior, emphasizing animal communication, social behavior, territoriality, sexual selection and mating systems.

**Z-2064 (Animal Physiology)**

Student sets knowledge on:

- Cellular mechanisms of solute and water transport used by animals living in different environments

- The different energy requirements of an animal at rest and during exercise, and how this is reflected in the functioning of the oxygen transporting systems
- How the cardiovascular and respiratory systems are integrated and controlled
- How animals use aerobic and anaerobic forms of metabolism for ATP production.
- How animals move with muscles and navigate their movement by the neural control. The basic control processes of the nervous and endocrine systems
- How animals have adapted to their environment with different ways of urine formation to excrete nitrogen wastes and water
- Carry out physiological studies in the laboratory
- Interpret physiological data and phenomena critically

**Z-2072 (Biodiversity, Animal behavior, Developmental Biology)**

1. Acquire the practical knowledge and get the hands on practice in the subject of biodiversity, Animal behavior and developmental biology

**Z-2082 (Endocrinology, Animal Physiology, Animal Cell Culture and Genetic Engineering)**

1. Acquire practical knowledge and get the hands on practice in the subject of endocrinology, animal cell culture and genetic engineering.

**Z-3014 (Cell Biology)**

- This course help to understand the biology of cells of prokaryote and higher organisms: The structure, function, and biosynthesis of cellular membranes and organelles; cell growth and oncogenic transformation; transport, receptors, and cell signaling; the cytoskeleton, the extracellular matrix, and cell movements; chromatin structure, cell cycle, regulation of cell cycle, apoptosis, regulation of gene expression in prokaryotes and eukaryotes and RNA editing.

**Z-3024 (Immunology, microbiology and parasitology)**

- Understand the structural features of the components of the immune system as well as their functions, lymphoid organs, monoclonal antibody , structure of antibody, antigen antibody interaction
- Understand the microbial diversity, microbial pathogeneses and applied microbiology
- Understand the concept of parasitism, life cycle of economically important parasites of man and domesticated

**Z-3034 (Reproductive biology)**

- Understand the comparative structure and function of the male and female reproductive systems
- Understand the physiology of gametogenesis, embryogenesis, pregnancy, parturition and lactation
- Understand the endocrine, neuro-endocrine and environmental factors regulate reproduction
- strategies for the management of reproduction and fertility in animals; including the application of assisted reproductive technologies

**Z-3044 (Entomology and Aquatic Biology)**

- Understand the economic importance of insects
- Insect vectors, pest
- Role of insects in ecosystem.
- Concept of pest management.
- Understand the limnology, aquatic resources of North East India, major threats of fresh water ecosystem, fish germplasm diversity of North East India.

**Z-3056 (Integrative Biology) (Open Programme) (OP)**

- Understand the concept NET/SLET and Gate oriented question and approach to tackle the question and their concepts.

**Z-3062 ( Cell biology, Histology, Histochemistry, Immunology and Reproductive Biology)**

- Acquire practical knowledge and get the hands on practice in the subject of aquatic biology, entomology and parasitology.

**Z-4014 (Biochemistry and Proteomics) (Optional Course) (OP)**

- Students understand the advanced level of Biochemistry, proteomics and their applications deals with a rapidly evolving scientific area that introduces students into genomes, proteomes and databases that store various data about genes, proteins, genomes and proteomes.

**Z-4024(Enzymology and Recombinant Technology)**

- the major classes of enzyme and their functions in the cell
- role of co enzyme co factor in enzyme catalyzed reaction;
- Differentiate between equilibrium and steady state kinetics and analyzed simple kinetic data and estimate important parameter (Km, Vmax, Kcat etc)
- Define and describe the properties of enzymes in and regulates biochemical pathways (inhibition, Allosteric)
- Understand the basis of current molecular biologic and genomic technologies and be able to contrast the structures of eukaryotic and prokaryotic genes and genomes,
- Understand the complex nature of protein molecules including antibodies and the inherent issues that need to be considered when attempting to produce them in recombinant form, describe the events involved in generating recombinant DNA molecules, to include cDNA generation, expression vectors and the choice of host cell, discuss protein engineering, including protein tagging and mutagenesis-based strategies for generating recombinant proteins with modified properties

**Z-4034 (Physiology and Adaptational Biology)**

- Understand the advanced level physiology of animals and their system a comparative account.
- Also able to understand the adaptation physiology of human and animal

**Z-4044 (Molecular Endocrinology and Reproductive Biology)**

- Able to understand the molecular mechanism of endocrinology mechanisms and about the various events and mechanism of reproductive system.

**Z-4054 (Immunology)**

- Understand advanced knowledge of the underlying principles of immunology and its application in solving problems in biological systems.
- Have an awareness of some current research activities in the field and possible applications of this knowledge.

**Z-4066 (Dissertation)**

Acquire the practical knowledge and get the hands on practice in the subject of biochemistry, physiology, reproductive biology and immunology.

**Z-4014 (CMB)**

This course help to understand the molecular structure of chromatin, chromosome, genes and nucleus: Understand the genetic basis of cell cycle, somatic cell hybridization and cancer.

Understand the cellular basis of aging,oxidative damage, genetic stability, mitochondrial genome damage and genetic aging programme.

**Z- 4024 (CMB)**

This course help to understand the structural organization and basic concepts of Biomembranes.

Transport across cell membranes, facilitated diffusion, active transport by ATP powered pumps, symports, antiports, transport across epithelia, osmosis, water channels and the regulation of cell volume, membrane potential and nerve impulse, role of cyto-membrane in health and diseases, membrane associated receptor proteins and overview of the endomembrane system.

**Z-4034 (CMB)**

This course help to understand the molecular basis of DNA replication in both prokaryotes and eukaryotes, DNA repair system, gene expression from transcription to translation, post-transcriptional modification in RNA and translation.

**Z- 4044 (CMB)**

This course help to understand the advanced level of genomics and proteomics: protein structure, 3D structure of proteins, transcriptome, protein interaction network, convergent and divergent evolution of protein structure and functions.

Complexity of genome organization, nuclear genomes and genetic features of nuclear genomes.

Sequencing of genomes, genomic library, cDNA library, metagenomics, NGS and genome information reserves and DNA sequence analysis using softwares.

Z- 4054 (CMB)

Understand advanced knowledge of the underlying principles of immunology and its application in solving problems in biological systems.

Have an awareness of some current research activities in the field and possible applications of this knowledge.

Z-4066 (CMB)

Students will learn how to do research work, Study design, data collection, Sampling design, Statistical design etc. Preparation of Research hypothesis and testing of research hypothesis. Also learn how to write research findings and how discussions are written on what point is important for discussions etc. Students also learn about writings of research conclusions and Reference citing within the text and reference writing at the end of report

**Z-4014 (Insect Structure and function)**

- Students understand details of insect morphology, origin, locomotion and molecular phylogeny.

**Z-4024 (Insect Ecology)**

Students set knowledge to

- Apply the basics of insect ecology to the development of the research
- Identify insect specimen up to their order and able to use identification keys for further to more detail levels.

**Z-4034 (Insect physiology)**

- Able to describe the influence of the exoskeleton on physiological functions of insects.
- Able to describe the hormonal and neuronal regulatory systems.
- Able to describe the communication and sensory system of insects.
- Use the acquired knowledge gained in the course for designing experiments in insects.

**Z-4044 (Agriculture and Forest entomology)**

- At the end of the course, the student knows the bases of the insect morphology and anatomy and the biology and behaviour of the most harmful insects for different plant species.
- Can understand the agro-forestry environment in the view of the management of the insect populations and plant protection.

**Z-4054 (Pest and pest control, Medical and Forensic entomology)**

- Students learn to identify and understand the life cycles, morphology, and behavior of mosquitoes, ticks, mites, lice, flea s, and other disease vectors. Students also learn about major arthropod-transmitted disease cycles, including malaria, Lyme disease, leishmaniasis. The interaction between the disease-causing pathogen and the arthropod vector discovered, including biological and mechanical transmission of pathogens as well as the mechanical damage that a parasite inflicts on its host.

**Z-4066 (Dissertation)**

- Acquire practical knowledge and get the hands on practice in the various aspects of insect biology and entomology as a whole.

**Z-4014(Fish Taxonomy & Fish growth & population)**

- This paper will develop the students' knowledge on the identification of major groups of freshwater fish species with special reference to NE India; their interrelationships, phylogeny, diversity through morphological, anatomical, ecological and molecular approaches
- This paper will provide an elementary knowledge on fish stock assessments with specific techniques, and knowledge on growth analysis and designing well-being of naturally available fish populations.

**Z-4024 (Fish Physiology and Fish Genetics)**

- This paper will help a student to understand fish as a physiological and genetic unit; by giving stress on the detailed physiology of a fish and the scope of genetics in fish breeding programmes for stock enhancement in fisheries.

**Z-2034 (Capture Fisheries & Post-harvest technology)**

- This paper will provide students with an idea on the fisheries resources of India, the scopes these can offer, various fish harvesting techniques, management of sustainable fisheries, and the principle and processes of post-harvest technologies.

**Z-2044 (Aquaculture technology & Aquaculture nutrition)**

- This paper will present the students with a plan on responsible fish farming, the scientific management of different species in aquaculture, aquarium keeping, and fish nutrition and health management.

**Z-2054 (Fish Pathology, Ecosystem management and Biotechnology)**

- This paper will help the students to diagnose various fish diseases, their prophylaxes, and probable cure through updated scientific techniques.
- The paper will provide the students with an overview on the impact of environment on aquaculture.
- The paper will also provide an overview on emerging biotechnological tools and techniques to get improved fish varieties and better outputs in aquaculture systems.

**Z- 4066 (Dissertation)**

- The students will have hands-on-practice in various disciplines of choice under Fish Biology and Fishery Science.

**Z-4072 (Practical)**

- The students will acquire practical knowledge on various aspects of Fish Biology and Fishery Science.

**Z-4014 (Ecosystem Function and Stability)**

- Sets general knowledge about ecological sustainability, resilience and human utilization of nature and natural resources to secure well-being and security.
- Knowledge about environmental policy and sustainable development.
- Specific knowledge for applying knowledge on ecological sustainability, planetary biophysical boundaries, ecosystems services and values associated to technology.
- Specific knowledge about national and global environmental status connected to biodiversity, climate, pollution, environmental toxins, land use, resource economy, and distribution of species and organisms.
- Specific knowledge about global initiatives, models and indicator systems for integration of ecological knowledge, driving forces, governance and green production systems.

**Z-4024(Wildlife and Wildlife Habitat Relations)**

- Acquire knowledge in the characteristics and habitat requirements of wildlife species normally associated with forested ecosystems. Gather information of common forest wildlife species and their associated habitat requirements. Also acquire knowledge in the conservation practices, program guides, and technical guidance tools that aid in the planning for these species.

**Z- 4034 (Wildlife population Ecology and Methods)**

- Have a thorough understanding of various models of population dynamics

- Become familiar with the application of concepts and models in population ecology to conservation and management of wildlife populations
- Become familiar with concepts and models of species interaction, population regulation and population cycles

**Z-4044 (Wildlife Conservation)**

Students have acquired knowledge

- To apply knowledge to solve problems related to wildlife conservation and management.
- On how wildlife conservation and management relates to the economy and environment, both currently and in the future.
- To find detailed information on a topic from print as well as online information sources.
- To critically evaluate current events and public information related to wildlife conservation and management as being scientifically-based or opinion-based and contribute to the knowledge base of information.
- To work with others to coordinate activities that achieves group/team objectives.
- To write in a style appropriate for technical or informative publications for various audiences related to wildlife conservation and management.

**Z-4066(Dissertation)**

The student is able to:

- Find, analyze, evaluate, select and integrate information using various sources, from fields of knowledge and from critical judgments for planning his own studies.
- Formulate research questions and hypotheses, and operate them. Can create a research plan adequate to the research question.
- Present research questions with statistical concepts and translates them to hypotheses, which he then verifies using appropriate methods of statistical inference.
- Advance research skills encompassing construction of research tools and conducting experiments,
- Use computer programs: statistical packages, calculation spreadsheets, text editors, to perform calculations and describe results from empirical studies.
- Determine the ethical value of his own research and scientific pursuits.

Conduct substantive argumentation, utilizing personal views that are based on critical analysis of works from various fields of knowledge, and can create synthetic summaries on their basis.

**Z-4072 (Practical)**

- Acquire the practical knowledge and get the hands on practice in the various aspect of Wildlife science and its management.

MSc in Wildlife Science WLS-1014 Fundamental Ecology and Functional Ecology

- Students have developed their knowledge on ecosystem concepts, Structure and types of ecosystems, adaptations of the organism in different ecological factors.
- Limiting factors of organisms in the environments, ecological modelling and ecological system analysis.
- Evolution and ecology, adaptations and speciation.
- Functional attributes of ecosystems, Quantitative study of biogeochemical cycles, Fundamental concepts of energy nutrient cycling in different ecosystems, global cycling of CO2 , Cycling of H2O, Trophic dynamic and niche concepts. Energy partitioning and optimizations etc.

# Gauhati University
# Post Graduate Diploma in Computer Application

Preferably students having Mathematics at the Higher Secondary level and obtaining minimum pass mark in the subject be admitted to the course OR a special bridge course may be designed by the Colleges for students not having Mathematics at the Higher Secondary level.

Number of hours/day - 4 hours
Number of days/week - 4 days

**Semester I**

| Sl No. | Subject Code | Name of the Subject | Hours | | Marks(%) | |
|---|---|---|---|---|---|---|
| | | | Theory | Practical | Theory | Practical |
| 1 | PGDCAP1 | ICT Hardware | 25 | 36 | 50 | 50 |
| 2 | PGDCAP2 | Programming in C | 30 | 32 | 70 | 30 |
| 3 | PGDCAP3 | Overview of Operating System (DOS, Windows, UNIX / Linux and Shell Programming) | 16 | 38 | 30 | 70 |
| 4 | PGDCAP4 | Introduction to Office Automation | 12 | 50 | 20 | 80 |
| 5 | PGDCAP5 | Database Management System | 36 | 26 | 70 | 30 |

**Semester II**

| Sl. No. | Subject Code | Name of the Subject | Hours | | Marks(%) | |
|---|---|---|---|---|---|---|
| | | | Theory | Practical | Theory | Practical |
| 1 | PGDCAP6 | Data Structure through C language | 36 | 20 | 70 | 30 |
| 2 | PGDCAP7 | Internet and Web Technology | 25 | 30 | 50 | 50 |
| 3 | PGDCAEL1 | GUI Application Programming | 25 | 30 | 50 | 50 |
| | PGDCAEL2 | Computer Oriented Numerical Methods | 36 | 20 | 70 | 30 |
| | PGDCAEL3 | Computer Graphics | 36 | 20 | 70 | 30 |
| | PGDCAEL4 | Object Oriented Programming with C++ | 36 | 20 | 70 | 30 |
| 4 | | Project | 100 marks | | | |

## PGDCAP1 ICT Hardware

**UNIT I** Fundamentals: Block Diagram of a Computer, CPU, Memory (Primary/Secondary), RAM, ROM, Hardware, Software, Representation of Information, Number Systems-binary, octal, hexadecimal, ASCII, EBDIC, Gray codes.

**UNIT II:** Evolution of computer system, Modern computer, Classification of computer, Personal Computer hardware: Monitor, Keyboard, Mouse, Scanner, printer, speaker

**UNIT III:** Hard Disk Drive: logical structure and file system, FAT, NTFS. Hard disk tools: Disk cleanup, error checking, de fragmentation, scanning for virus, formatting, installing additional HDD. New trends in HDD. Floppy Disk Drive

**UNIT IV**: Optical Media, CDROM, theory of operation, drive speed, buffer, cache, CD-

r, CD-RW, DVD ROM, DVD technology, preventive maintenance for DVD and CD

drives, New Technologies. Driver installation, Writing and cleaning Cd and DVD.

**UNIT V**: Processor: Intel processor family. Latest trends in processor, Motherboard, Sockets and slots, power connectors. Peripheral connectors. Bus slots, USB, pin connectors. Different kinds of motherboards. RAM, different kinds of RAM. RAM up gradation**.** Cache and Virtual Memory concept.

**UNIT VI:** SMPS. BIOS. Network Interface Card, network cabling, I/O Box, Switches, RJ 45 connectors, Patch panel, Patch cord, racks, IP address.

**IT PRACTICAL WORK SHOP:**

**Objectives:**

The Practical introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like Windows OS, LINUX OS, device drivers. Basic system administration in Linux which includes: Basic Linux commands in bash, Create hard and symbolic links, Text processing, using wildcards In addition hardware and software level troubleshooting process, tips and tricks would be covered.

Different ways of hooking the PC on to the network and internet from home and workplace and effectively usage of the internet. Configuring the TCP/IP setting. Usage of web browsers, email, newsgroups and discussion forums would be covered. In addition, awareness of cyber hygiene, i.e., protecting the personal computer from getting infected with the viruses, worms and other cyber attacks would be introduced.

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva.

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Task 5: Basic commands in Linux

Task 6: Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva

Task 7: Software Troubleshooting: Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.

Task 8: The test consists of various systems with Hardware / Software related troubles, Formatted disks without operating systems. Installation of anti virus software, configure their personal firewall and windows update on their computer. Then they need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

**BOOKS RECOMMENDED :**

**1.** Vikas Gupta; Comdex' Hardware and Networking Course Kit; DreamTech press.

**2.** Ron Gilster; PC hardware: A beginners Guide; Tata McGraw Hill. (First edition).

## PGDCAP2 Programming in C

Basic concepts of Computing:
Introduction to Programming
Concept of computing: Algorithm, Flowchart
Programming Languages (Machine language, Assembly language, High Level Language)
Translators (Assembly, Compiler, Interpreter)
Algorithm for Problem Solving
Introduction to C Language Data types, Operators, Conditional Statements & Loops Function, parameter passing,
Arrays, Pointers(programs using array and pointers like sum, average, minimum, maximum of numbers of an array, add and delete an element of an array, merge two sorted arrays ,string manipulation, programs like addition and their combination, sum of rows, columns and diagonal elements of matrix, transpose of matrix)
Structures (Declaration and use, structure member resolution, structure pointer resolution) and union
File Processing (file in C-opening, closing, reading and writing of files)

**BOOKS RECOMMENDED:**


**1.** R.G.Dromey; How to solve it by Computer; Prentice Hall of India, 1992; (First Edition).

**2.** Cooper, Mullish; The Spirit of C, Jaico Publishing House; New Delhi, 1987. (Fourth Edition).

**3.** B. Gottfried; Programming in C; Tata McGraw Hill, New Delhi; (Second Edition).

**4.** B.W. Kernighan, D. M. Ritchie; The C Programming Language; Prentice Hall of India, 1989. (Second Edition).

## PGDCAP3 Overview of Operating System

What is operating system? Types of operating system, ( Batch, multiprogramming, time sharing, real time system) Functions of OS, Operating system as resource manager.

**Disk operating system**: main files, DOS Commands-Internal Commands & External Commands. Batch files.Config.sys and Autoexec.bat file.

**Windows OS**-An overview of different versions of windows, Basic windows elements. File management through windows. Widows accessories, windows Explorer, Entertainment system tools, Understanding OLE.

**Linux OS** : Introduction to Linux, Files and directories, architecture(kernel, shells, utilities) and various Linux commands. File manipulations, redirection and filters , editors( vi, ed etc.) Concept of process, System administration: File system, system administration commands.

**BOOKS RECOMMENDED :**


**1.** Rajiv Mathur; Learning Windows 98 Step-By-Step; BPB Publication.

**2.** Crawford; Window 98 - No Experience Required; BPB Publications.

**3.** Sumitabha Das; UNIX concepts & applications; Tata McGraw Hill, New Delhi; (fourth Edition).

**4.** A.S. Tanenbaum; Modern Operating Systems; Prentice Hall of India, New Delhi, 1995; (Third Edition).

# PGDCAP4 Introduction to Office Automation

**Word Processing**
Introduction to Word Processing , Features , Learning document window, Creating , Saving & Closing a document, Opening an Existing document , Editing a Document , Formatting Features ( Paragraph Formats, Aligning text & paragraph, Border and Shading, Header & Footers, Bullet & Numbering ) , Inserting & Editing a Table , Inserting Picture, Checking & Spelling Correction, Page Setup , Print Preview , Printing a document , Mail Merge , Document Template & Wizards.

**Spreadsheet**
Introduction to Spreadsheet, creating, saving and editing a workbook, Inserting, deleting Worksheets, Opening & Moving around in an existing worksheets, Working with Formula
& Cell referencing. Functions, Working with ranges - creating, editing and selecting ranges. Format Feature :: AutoFormat Feature, Changing alignment, Character styles, Date Format, Border & Colors etc. Previewing & Printing a worksheet, Creating Charts & Graphs. Database in worksheet, macro, linking and embedding

**Presentation Tools**
Creating & saving Presentations , Opening an existing Presentation, Working in different views, Working with slides, Adding and Formatting Text, Formatting Paragraphs, Checking Spelling and correcting typing mistakes , Adding clip art and other pictures, Inserting Animation, Designing slide shows, Running and controlling slide show, Printing Presentation.

**Portable Document Format**: storing, creation, conversion.

**DTP Software**
Local language pack in Office Packages: installation and use.

Document design using any DTP package. Graphics design and manipulation using any currently available package.

**BOOKS RECOMMENDED :**


**1.** Rajiv Mathur; Learning Word 97 for Windows Step-By-Step; BPB Publication. Publication

**2.** Rajiv Mathur; Learning Excel 97 for Windows Step-by-Step; BPB publication.

**3.** Lonnie E. Moseley and David M. Boodey; Mastering Office 97, BPB Publications.

**4.** Microsoft Office 97 –Unleashed; Techmedia.

**5.** Perry; Teach Yourself Office 97 in 24 Hours – Techmedia.

**6.** Hart; ABC of Office 97 Professional; BPB Publications.

## PGDCAP5 Database Management System

Overview of Database Management
Definition of Database, characteristics of database approach Advantages of DBMS
E-R model as a tool for conceptual design- entities, attributes and relationships, weak entity and strong entity, Relational Models
Relational DBMS, RDBMS terminology, primary key and foreign key Relational database design Integrity constraints, functional dependencies, Normal forms (1NF, 2NF, 3NF, BCNF)
Introduction to SQL, Advantages of SQL, Data types & literals, Creating tables & Inserting, Deleting and Updating Records, Types of SQL commands, SQL Operators and their precedence. Queries and sub queries, Use of Built-in functions, Aggregate Queries, Join Operations in SQL. Application Programming Interfaces and integration of front end and back end.

**BOOKS RECOMMENDED**


**1.** R. Elmasri, S, Navathe; Fundamentals of Database Systems, Benjamin Cummings, 1994; (Second Edition).

**2.** H. Korth, A.Silberschatz; Database System Concepts; McGraw-Hill, 1991; (Second Edition).

**3.** A K Majumdar, P Bhattacharyya; Database Management Systems; Tata McGraw-Hill, 1996. (First Edition).

## PGDCAP6 Data Structure through C Language

**Introduction to data structure**
Basic concept, Abstract data types, Fundamental and derived data types. Representation, primitive data structures.
**Arrays**
Single and multidimensional arrays. Address calculation using column and row major ordering. Various operations on Arrays. Matrix multiplication.
**Stack and queues**
Resprestation of stacks and queue using arrays and linked-list. Circular queues.
**Applications of stacks**
Conversion from infix to postfix and prefix expressions, postfix evaluation algorithm
**Linked lists**
Singly linked list; operations on Linked-list . Circluar linked lists, Doubly linked lists.
**Trees**
Basic terminology, Binary tree traversal methods - Preorder, Inorder and Postorder . Application of binary tree, Binary search tree, insertion and search operations on binary search tree.
S**earching and sorting**
Searching: Sequential and binary searches.
Sorting - Insertion, selection, bubble, quick, merge, radix.
**Graphs**
Definition of Graph, Graph terminology, Directed, Undirected & Weighted graphs. Graph representation: Adjacency matrix, Adjacency lists.

**BOOKS RECOMMENDED :**


1. Robert L. Kruse; Data Structures and Program Design; Prentice Hall, 1987. (Second Edition).

2. A. S. Tanenbaum; Data Structure using C; PHI.

3. H. Sahani; Fundamentals of Data Structure in C; Orient Publications. (Second Edition).

## PGDCAP7 Internet and Web Technology

**Introduction to internet**
Internet, Growth of internet, Anatomy of internet , History of WWW and basic internet terminologies ., Browsers , Electronic mail .
Internet Applications : Commerce on the internet , Governance on the internet , Impact of internet on society .

**Internet technology and protocols**
What is networks ? Need of computer networks. Characteristics of LAN, MAN, WAN .
A brief idea of OSI reference model and TCP/IP . Difference between OSI and TCP/IP.
Physical topologies ( Bus , Ring , Tree , Star , Hybrid etc ..)
Logical topologies (protocols) A brief description of Ethernet, FDDI , ATM , Token ring .

**File transfer protocol**
Introduction to FTP & terminologies, FTP servers and authentication, GUI based FTP clients, Browser based FTP clients.

**Internet management security concepts:**
Overview of internet security, Firewalls. Internet security management concepts & information. Privacy & copyright issues.

**HTML:**
Introduction to HTML, basics & elements of HTML, attributes, headings, paragraphs, links, Images, Lists, Tables, Forms, Frames

**Client side scripting:** Introduction to JavaScript & its basics, data types, variables operators, functions looping, objects, arrays, strings.

**Server side scripting:** Introduction to PHP, basic programming principles & database connectivity.
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**BOOKS RECOMMENDED :**


**1.** HTML & XML an Introduction. PHI .

**2.** A. S. Godbole, A. Kahate; Web Technologies; Tata McGrew-hill;

**3.** Andrew S. Tanenbaum; Computer Network; PHI; (Fourth Edition);

## PGDCAEL1 GUI Application Programming

***Theory: 50 Marks***

**Introduction:**

Basic idea of GUI based applications, advantages, IDE and its use; User Interface design principles, Event Driven Programming.

**Review of Data Types Control Statements:**

Data Types, Variables & Constant, Arrays, Procedures, Methods, Arguments Passing, Functions Return Values. Control Flow Statements: - If-then, if-then-else, select case; Looping Statements- For, While, Do-while; and Nested Control Structure.

Multiple Document interface – Parent & child forms & method

**Working With Forms & Standard Controls:**

Form designing; adding controls to forms: Text Box, Command Button, Combo Box, List Box, Radio buttons, Check boxes, Pull-down and Pop-up Menus, File list, other Controls.

Error Handling: - Types of errors, Error handling methods and Functions.

**Graphics Controls:**

Graphics Controls, Image Handling, Coordinate System, Graphic methods- Text Drawing, Lines & Shape, Filling Shapes, and Grid Methods.

**Database Connectivity:**

Connecting to databases; addition, retrieval, deletion, and updation of data into database tables; adding data controls in applications;

**Practical: 50 Marks**

Practical application development using either .NET or Java.
At least 20 Practical assignments covering each of the topics mentioned in the theory part. Emphasis must be on developing full-fledged applications containing multiple forms and database connectivity.

**BOOKS RECOMMENDED:**


**1.** J. Weber; Special Edition Using Java 2 Platform; PHI.

**2.** M. P. Bhave, S. A. Patekar; Programming with Java; Pearson education.

**3.** Joshua Bloch; Effective Java: Programming Language Guide; Sun Microsystems.

## PGDCAEL2 Computer Oriented Numerical Methods

**Computer Arithmetic :** Floating point representation, single and double precision, arithmetic operations using normalised floating point numbers and their consequences, errors in number representation.

**Solution of non-linear equations**:
Bisection method & Newton's method, Regular falsi algorithm.

**Solution of simultaneous linear equations**:
Gauss elimination, Gauss-Jordan algorithm, Gauss Seidel method, pivoting strategy.

**Ordinary differential equations**:
Euler's method & Runge-Kutta method ($2^{nd}$ and $4^{th}$ order).

**Numerical Integration**:
Trapezoidal rule & Simpsons rule.

**Interpolation and approximation:**
Polynomial interpolation, difference table and Calculus of differences, Lagrange's interpolation formula, least square approximation.

**Linear Programming:**
Formulation and solving linear programming problems, graphical method, Simplex method.

**BOOKS RECOMMENDED**


**1.** B S Grewal; Numerical Methods; Khanna Publication; (Second Edition);

**2.** Veerarjan Ramachandran; Numerical Methods; Tata MacGraw Hill.(Second edition);

**3.** N K Jain , S R K Iyengar, R K Jain; Numerical methods for science and engineering Computation; New Age International (P) Ltd. (Fifth Edition);

**4.** A K Jaiswal, Anju Khandelwal; Computer Based Numerical and Statistical Techniques; New Age International; (First Edition).

## PGDCAEL3 Computer Graphics

Introduction : Types and Applications of computer graphics
Graphic Devices.
Input devices - Keyboard, Mouse, Trackball and Space ball, Joysticks, Data Glove, Digitizers, Image scanners, Touch Panels, Light pens.
Output devices - Raster Scan displays, Refresh CRT, Video Controller, Raster Scan display, Processor Digital frame buffer.
Penetration CRT, Color look-Up tables.
Flat panel displays
VGA and SVGA resolutions.
Output primitives and 2-d transformation
Line Driving Algorithms: DDA algorithms Bresenhan's Line Algorithm
Matrix representations and use of homogeneous coordinate systems. Translation, rotation, scaling, mirror reflection.
Rotation and scaling about an arbitrary point, composite transformation, Zooming and panning
Segmented curve and smooth curve drawing algorithm
Window and clipping
Clipping operations and algorithm
Filling
Concept of 3-D graphics
Hidden Surface removal
Introduction to Multimedia

**BOOKS RECOMMENDED:**


**1.** D. Hearn, P. M. Baker; Computer Graphics; Prentice Hall of India, 1995; (2nd Edition);

**2.** D. F. Rogers; Procedural elements for Computer Graphics, McGraw Hill International.

**3.** Rogers, Adams; Mathematical Elements for Computer Graphics, McGraw Hill International

**4.** S. Harrington; Computer Graphics – A Programming; McGraw Hill Approach International; (Second Edition);

# PGDCAEL4 Object Oriented Programming and C++

## 1.Principles of Object Oriented Programming

1.1 Basic concept of OOP,
1.2 Procedural programming vs OOP
1.3 Advantages of OOP, OOP languages
1.4 Concept of Class, Objects, Concept of Inheritance and encapsulation,
1.5 Operator overloading, Dynamic Binding.
1.6 Overview of OPP using C++,
1.7 Basic program construction.

## 2.Elements of C++ Language

2.1 Keywords and Identifiers in C++
2.2 Variables and Constants,
2.3 Declaration and Initialization of Variables,
2.4 Concept of Dynamic Initialization of variables, Enumerated variables,
2.5 Basic Data Types,
2.6 Arrays and Strings, User Defined Data types,
2.7 Arithmetic, Relational, Logical Operators and Operator Precedence
2.8 Manipulators, Type Conversions and type cast operators
2.9 Console I/O: cin, cout functions.
2.10 Control Statements.-if; if-else; else….if; switch statements
2.11 Loops: for, while, do-while, Break, continue, go to

## 3.Functions

3.1 Syntax of a Function.
3.2 Function Prototype, Calling function, Function definition
3.3 Passing arguments and returning values.
3.4 Pass by value, pass by reference.
3.5 Passing and returning structure variables
3.6 Inline and overloaded function
3.7 Default arguments, returning by reference.

## 4.Classes and Objects

4.1 Definition and Declaration of a Class
4.2 Declaration of members.
4.3 Declaration of objects
4.4 Objects as function arguments.
4.5 Array of objects.
4.6 Returning objects from function.
4.7 Structures and classes.

## 5. Constructors and Destructors

5.1 Concept of constructors. Types of constructors. Parameterized constructor, Constructor with default arguments, Copy constructors
5.2 Dynamic Initialization of Objects .
5.3 Concept of Destructors.

**6 Operator Overloading**

6.1Concept of Operator Overloading
6.2 Unary and Binary Operators.
6.3 Overloading of unary and binary operators.

**7. Derived Classes and Inheritance**

7.1 Concept of inheritance
7.2 Derived and Base Class- Definition and Declaration.
7.3 Types of Inheritance.
7.4 Public, Private and Protected Access
7.5 Constructors in Derives Classes

**8. Pointers**

8.1. Pointer Basics.
8.2. Address Operator and Pointer Variables.
8.3. Pointer Arithmetic.
8.4. New And Delete Operator
8.5. Null Pointer.
8.6. Reference and Constant pointer.
8.7. Array of Pointers.
8.8. Pointers to Object and Pointers to Pointer.

**9. Virtual Function & Polymorphism**

9.1 Pointers to Derived Objects and Virtual Functions.
9.2 Early binding vs. Late binding.
9.3 Abstract Classes and Pure Virtual Function.

**BOOKS RECOMMENDED**:


1. Robert Laffore; Object Oriented Programming in Turbo C++; Galgotia Publication,1996; (Fourth Edition).
2. E. Balaguruswamy; Object Oriented Programming with C++;Tata McGrahill, 1997; (Third Edition) ;
3. Yashavant Kanitkar; Visual C++ Programming; BPB Publications,1998.
4. S.B. Lippman; C++ Primer; Addison Wesely, 1995 ; (Third Edition).
5. Stastroup; The Elements of C++ Programming; Addison Weiley Publication, 1995.