University School of Biotechnology
Integrated B.Sc.-M.Sc. Ayurveda Biology

SEMESTER- I

Fundamentals of Sanskrit-I (BTAYB 101) 3 Credit

Course objective

This course aims to introduce students to the basics of Sanskrit language, including its script (Devanagari), pronunciation, simple grammar such as nouns, verbs, and sentence formation), and essential vocabulary, enabling them to read, write, and understand simple Sanskrit texts.

Course content

Unit I: Basic Sanskrit conversation

Introduction, Pronunciation, Changes in Gender, person, number and use of prepositions, Adjective and substantive, Conversational simple sentences

Unit II: Basic Sanskrit grammar and translation

Declensions - Śabdarūpāṇi – rāma, phala, latā, nadī, kavi, sadhu, pitṛ, sarva, yad, tad, idam, etad, kim, asmad, yuṣmad and numeral forms from eka to daśan, Verbal roots– Dhāturūpāṇi – paṭh, pac, bhū, kṛ, as, han, div, tan, tud, dā, śru, jñā, rudh, grah, cur,krī, sev (laṭ, loṭ, laṅ, vidhiliṅ, lṛṭ lakāreṣu) Indeclinables - Avyavāḥ - upari, pūrvam, adhastāt, purastāt, abhitaḥ purataḥ, agrataḥ, pṛṣṭhataḥ, prātaḥ, sāyam, diva, naktam, sadyaḥ, purā, nityaśaḥ, tadānīm, idānīm, adhunā, api, kati, vinā, prāyeṇa, kadācit, alam, mā, vā, khalu, bhṛśam, itaḥ, yataḥ, tataḥ, kutaḥ, sarvataḥ, prabhṛtiḥ, muhūrtam, saha, sākaṃ, sārdham, satvaram, atra, tatra, yatra, kurta, kim, adya, śvaḥ, yadā, Application of Kṛt suffixes – Pratyayāḥ - ktvā , lyap, tumun, śatṛ, śānac, tavyat, anīyar, ṇic, ktavatu, sandhiḥ, Ac sandhiḥ – dīrgha, guṇa, vṛddhi, yaṇ, ayādi, pūrvarūpa. Visarga sandhiḥ - satva, śatva, ṣatva, rutva, utva, lopa saṅkhyā

Unit III: Selections from Āyurvedic texts

Vaidyakīya-Subhāṣita-Sāhityam, Suśruta-Saṃhitā, Caraka-Saṃhiā, Aṣṭāṅga-Hṛdaya

Unit IV: Introduction to History and development of Linguistics as a modern discipline

India connection, India's tradition of linguistic sciences, Major areas of study under linguistics

RECOMMENDED READINGS

1. Apte, V.S., 2004, *The Students' Guide to Sanskrit Composition*, Chowkhamba Sanskrit Series, Varanasi.
2. Apte,V S., 1993, *Saṁskrtaracanā,* Varanasi: Chaukhamba Vidyabhavan.
3. Dwivedi K., 2009 *racanānuvādakaumudī,* Vishvavidyalaya Prakashan, Varanasi
4. Fromkin V., Rodman R., 1998, *An Introduction to Language*, Harcourt Brace College

Publishers, California
5. Kale, M.R. - *Higher Sanskrit Grammar*, MLBD, Delhi
6. Narendra, 2009, *chandolaṅkāraparicayaḥ,* Aurbindo Ashram, Pondicherry
7. Narendra, Vedalankar J., 2015, *saralasaṁskrtasaraṇiḥ* , Aurbindo Ashram, Pondicherry
8. Shastri A R, 2018, *saṁskrta śikṣaṇa saraṇī,* Delhi: Adinath Printers.
9. Shastri C., 2018, *Vyākaraṇa Candrodaya*, MLBD, Delhi
10. Varadaraja (auth), Shastri B.(tr) ,2005, *Laghusiddhāntakaumudī -bhaim§ vy¡khy¡* , Bhaimi Prakashan, Delhi.

Introduction to Ayurveda (BTAYB 103) 3 Credit

Course Objectives

The course aims to introduce the foundational principles of Āyurveda, fostering a holistic understanding of life and biological systems, while exploring the interconnection between philosophy and science in contemporary contexts.

Course Content

Unit I: Āyurveda basics

History and practice, aims and objectives of Āyurveda, Definition of Āyurveda- *hitāhitam sukham dukham- āyu*; *hitakara/ ahitakara*, *āyu- pramāṇam*, *Lakṣaṇa* of *āyu*, synonyms of *āyu,* Individual components of *āyu* with their definitions, *śarīra, indriya- jñāna/ karmendriya,sattva - mana, buddhi, citta, ahaṁkāra, ātmā, loka- puruṣa sāmya siddhānta, pañcamahābhūta siddhānta*

Unit II: Understanding Health and Disease

trisūtra Āyurveda- *hetu* (causes)- *liṅga* (features)- *auṣadha* (therapeutics)for *svastha,*(healthy) and *ātura* (diseased), *svāsthya lakṣaṇa*- dimensions of health corresponding to nature and definition of *āyu,*Three categories of causes of illness (*asātmya-indriyārtha-saṁyoga, prajñāparādha, pariṇāma),* derangement in harmony between internal and external environments,*doṣa*- three organising principles of *trisūtra,*Relation among *rasa, guṇa* and *tridoṣa,introduction to svāsthya-tri-upastambha*

Unit III: Pañcamahābhūta

Introduction to pañcamahābhūta Sāmānya- viśeṣa siddhānta, Sāmānya – dravya, guṇa, karma, Viśeṣa – dravya, guṇa, karma

Unit IV: Traditions of Learning in Āyurveda and documentation

Methods of learning- and its evaluation,Methods of research- *hetu pañcaka,*Methods of debate- *vāda mārga,*Ethics in education, research, clinical practices and documentation

SELECTIONS FROM ĀYURVEDIC TEXTS

RECOMMEDNED READINGS

1. Poddar H , P, 1970 (ed.), *Bhagvadgita*, Gita Press, Gorakhpur
2. Sharma C.D., 1991, *Indian philosophy*, MLBD, Delhi
3. Selected References: Caraka Sūtrasthāna- chapter1, chapter 30, A.Hr. & A.S.Sutra sthan chapter 1

History of Āyurveda (BTAYB105) 3 Credit

Course objective

The Course aims to provide a comprehensive overview of the historical evolution of Āyurveda, exploring its foundational texts, key scholars, and the socio-cultural influences that shaped its development, while highlighting its relevance in contemporary healthcare.

Course contents

Unit I: History and development of Āyurveda

Origin of Āyurveda, Oral traditions of Āyurveda, Textual tradition in Āyurveda, *saṁhitākāla, saṁgraha kāla, prakaraṇa* texts, Commentaries on *samhitās* and *saṁgraha* texts, Schools and traditions of Āyurveda, Āyurvedic education system in India including recent developments

Unit II: ***Introduction to Aṣṭāṅga Āyurveda***

Kāyachikitsā,kaumārabhṛtya, bhūta Vidyā, śālākya Tantra, śalya Tantra,agada Tantra, *rasāyana Tantra, vājīkaraṇa*

Unit III: Current Trends in Āyurvedic Disciplines

Medieval Āyurvedic studies, Contemporary Āyurvedic studies, Introduction to Āyurvedic research in auṣadhi and diagnosis, Newer developments in branches of Āyurvedic studies, Internationalization and promotion of Āyurvedic studies, Recognition of Āyurvedic practices by WHO and other international bodies

SELECTIONS FROM ĀYURVEDIC TEXTS

RECOMMENDED READINGS

1. Agniveśa, 1996, *Caraka Samhitā*. ed. (with Eng. Translation) P.V. Sharma. Varanasai : Chowkhambha Orientalia.
2. Agniveśa, 2014, *Caraka Samhitā*. (with Āyurveda-Dīpikā commentary of Cakrapāni Dutta), vol.I-IV, ed. (with Hindi Translation) Banwari Lal Gaur. Delhi : Motilal Banarasidas.
3. Suśruta, 2008, *Sushruta Saṁhitā* (with Ḍalhaṇa's commentary). ed. Yadavji Trikamji. Varanasi : Chowkambha Surbharti Prakashan.
4. Suśruta, 2015, *Sushruta Saṁhitā* . trans. Anant Ram Sharma. Varanasi : Chowkambha Surbharti Prakashan.
5. Vāgbhaṭa, 1939, *Aṣṭāṅgahṛdaya* (with Sarvāṅgasundar of Arunadatta and Āyurvrdarasāyana of Hemādri). ed. Hari Shastri Paradkar. Bombay : Pandurang Jiwaji.
6. Vāgbhaṭa, 2010, *Aṣṭāṅgahṛdaya*. trans. *Vishwavasu* Gaur, Chaukhambha Orientalia Varanasi.
7. Vāgbhaṭa, 2011, *Aṣṭāṅga Saṁgraha*, ed. Atridev Gupta, Chaukhambha Krishnadas

Academy, Varanasi.
8. Vāgbhaṭa, 2014, *Aṣṭāṅgahṛdaya* (with Sarvāṅgasundari of Arunadatta). ed. Lalchandra Vaidya. Delhi : Motilal Banarasidas.
9. Yadav, Deepak., 2013, *History of Āyurveda*, Chaukhambha Surbharati Prakashan, Varanasi.

Introductory Biology (BTAYB107) 3 Credit

Course objective

This course aims introduce the fundamental concepts of biology, including the structure, function, and interactions of living organisms. The learning outcome of the course is to familiarize students with fundamental concepts of living world, cell, tissue and their physiology for plants and animals.

Course content

Unit I: History and development of biological sciences in India

Ancient and medieval period, Contemporary times

Unit II: Living world

Definition and characters of living organisms, Diversity in the living world, binomial nomenclature, five kingdoms of life and basis of classification, salient features of monera, protista, fungi, animalia, plantae and viruses.

Unit III: Cell and Tissue

Central dogma of biology, Structure and functions of cell - plant and animal cell, Tissues, types of tissues, cell organelles, Cell division –mitosis and meiosis, Location and functions in plants and animals

Unit-IV: Morphology, anatomy and physiology of plants

Morphology anatomy and physiology of different plants – root, stem, inflorescence, flower, leaf, fruit, seed, General anatomy of root, stem, leaf of monocotyledons & dicotyledons.
Synthesis of metabolites (secondary metabolites, alkaloids etc.) in medicinal plants and use in Āyurveda
Morphology of different parts of flowering plants – root, stem, inflorescence, flower, leaf, fruit, seed, General anatomy of root, stem, leaf of monocotyledons & dicotyledons.

Unit V: Fundamentals of human physiology

Composition of blood, blood groups, coagulation of blood, composition and functions of lymph, human circulatory system, structure of human heart, cardiac cycle, cardiac output and ECG, Digestion and absorption - human alimentary canal and digestive glands, role of digestive enzymes, digestion, absorption and assimilation of digested food, human respiratory system, mechanism of breathing and its regulation, exchange of gases, transport of gases and regulation of respiration, Excretory products and their elimination - modes of excretion, human excretory system- structure and function, urine formation and reabsorption, Neural control and coordination - definition and classification of nervous system, structure of a neuron, generation and conduction of nerve impulse, structure of brain and spinal cord, functions of cerebrum, cerebellum, hypothalamus and medulla oblongata, Chemical coordination and regulation -

endocrine glands and their secretions, functions of hormones secreted by endocrine glands, Reproductive systems - parts of female and male reproductive system. Parts of male spermatogenesis and oogenesis

SELECTIONS FROM ĀYURVEDIC TEXTS PRACTICALS

i. Visit to research laboratories
ii. Basic experiments with autoclaving, laminar flow, pipet handling, electronic balance, colorimeter and spectrophotometer, Optical Density (O.D.) measurement, filtration, light and phase contrasting microcopy, anatomy of plant stems, roots and leaves, microtome handling and sectioning of intestine and liver tissues staining and microscopic observations.
iii. Visit to medicinal plant gardens

RECOMMENDED READINGS

1. Winternitz M., 1996, *History of Indian literature* vols I-III, MLBD, Delhi
2. Krishnamachariar, M.,2009, *History of Sanskrit Literature*, MLBD, Delhi
3. Campbell N A., Urry L A., Cain M. L., Wasserman S A, Minorsky P. V, Reece J B., 2016, *Biology*, Pearson Publications
4. Solomon E, Martin D, Berg L, Martin C, 2018, *Biology*, CENGAGE Learning Custom Publishing
5. Singh P K, 2015, *Remedial Biology*, S. Chand Publishing, Delhi
6. Dholpuria R, Sachdeva M, 2019, *A practical book of remedial biology*, Nirali Prakashan
7. Yadav D., 2013 *History of Āyurveda*, Chaukhambha Surbharati, Varanasi

Introductory Chemistry Lab (BTAYB 109) 2 Credit

Lab Practical:

1. Preparation of Buffers- Citrate /Phosphate/acetate
2. Acid-base titrations (standardization of HCl/NaOH)
3. Qualitative detection of functional groups (alcohol, aldehyde, ketone, carboxylic acid, amine, etc).
4. Determination of Melting point of organic compounds
5. Determination of Boiling point of organic compounds
6. Saponification of oil
7. Separation of amino acids by paper chromatography

6. Communicative English (EN105) 2 Credit

Course Objective:

To learn basics of English language for reading learning and writing

Course Content

Unit 1: Functional Grammar:

Form and Functions; Sentences: Simple, Complex, and Compound; Tense, Mood, an Aspect; Sub-Verb Agreement and Concord; Common Errors; Vocabulary Building: Inflection and Derivation; Conversions, Idioms and Phrases, Words in Context

Unit 2: Language Skills (LSRW):

Listening Skills: Activity based, Speaking Skills: Activity based, Introduction to IPA, Use of Dictionary, Word stress, Reading Skills: Skimming and Scanning, Reading Comprehension, Writing Skills: Paragraph, Précis and Compositions, Note Making and Note Taking, Logical Ordering of Ideas and Contents, Figures of Speech

Unit 3: Learning through thematic Texts:

♣ My Visions for India Dr. Abdul Kalam ♣ From In an Antique Land Amitav Ghosh ♣ The Gift of Magi O' Henry ♣ Master and Man Leo N. Tolstoy ♣ If Rudyard Kipling ♣ The Solitary Reaper William Wordsworth

RECOMMENDED READINGS

Suggested Books:

1. Word for Word, Pointon & Clark, Oxford University Press
2. Carter, Ronald; McCarthy, Michael (2006). Cambridge Grammar of English: A Comprehensive Guide. Cambridge University Press.
3. An English Pronouncing Dictionary, London: Dent, rpt in facsimile in Jones (2002). 17th edn, P. Roach, J. Hartman and J. Setter (eds), Cambridge: CUP, 2006.
4. Redman, Stuart. 2011 English Vocabulary I Use: Pre-intermediate and intermediate. Cambridge: CUP Cambridge Phrasal Verbs Dictionary Second edition, Cambridge University Press

6. Application of IT and E-resources in Ayurveda (BTAYB 111) 2 Credit

Course objectives

This course aims to introduce key aspects of Information Technology relevant to Āyurveda, Familiarize students with digital resources related to Āyurvedic texts, and Provide foundational knowledge of Java and databases to enable the development of basic applications for accessing and utilizing Āyurvedic literature.
The course assumes students have a basic understanding of computers from their prior school education.

Course contents

Unit I: Introduction to IT

Different kinds and capacities of Machines, Operating Systems, Document processing applications (MS Office, Open Office, Unicode text editors), Mobile Technologies and platforms, Internet, communication protocols, data transmission, IoT, Apps and Wearable gadgets, GIS (Geographic Information system), GPS (Global Positioning System)

Unit II: Python and its applications: Python, concept and applications, Artificial Intelligence, ML and Big data analytics, Intelligent computing - Computational Linguistics, NLP,

Unit III: Introduction to online resources and techniques for Āyurveda

Key texts of Āyurveda, *kośas* and *nighaṇṭus*, Online Āyurveda resources, digital libraries, searchable content, cross referencing, indexing, Text encoding standards, Unicode, fonts, converters, schemes, transliteration, HTML, XML, Javascript, Programming languages and Web servers, Unicode text editors for Indian languages – Baraha
Smart I/O mechanisms – Predictive keyboards, ASR-TTS, OCR, OLHWR

Unit III: Java and client-server technology

Fundamentals of Java/JSP programming, Introduction to web-servers – Apache Tomcat, Developing a text search application for Āyurveda,

Unit IV: Database techniques for Āyurvedic texts

Resource creation for Āyurvedic texts, data and metadata standards, Database concepts and techniques
Structured Query Language – SQL, Introduction to major database engines/platforms – MySQL, SQL server, Oracle

SELECTIONS FROM TEXTS

RECOMMENDED READINGS

1. Bharati A,1999, NL Processing: a Paninian Perspective, IIIT, Hyderabad
2. Jha G N (ed), 2010, Sanskrit Computational Linguistics, Springer Verlag, Germany
3. Jurafsky D., Martin J H, 2000, Speech and Natural Language Processing, Prentice Hall
4. Kumar M, Varsakiya J, 2018, Scope of Information Technology in Āyurveda prospective,
5. JETIR,5.11,Nov 2018
6. Liang Y D, 2003, An introduction to Java programming, Eastern Economy Series
7. Matoria R. K, Upadhyay P.K, Moni M. (2007), Automation and networking of public libraries in India using the e-Granthalaya software from the National Informatics
8. Centre, Program, Vol. 41 Issue: 1, pp.47-58.
9. Mitkov R (ed), 2005, Oxford handbook of computational linguistics, Oxford University Press
10. Mohan R.,1998, Information technology in Āyurveda, Apta. 5: 20-25.
11. Nair G H., 2009, Application of Information Technology in Āyurveda: A study, VDM Verlag M üller, Latvia
12. Shajahan, M.A.,1998, Computer and Āyurveda, Apta. 5 (1): 5-17.
13. Srinivasan K, Jacob C., Jose J., Jena S.,2004, Āyurveda and information technology: A preventive and curative approach to healthcare, Sajosps. 4 (2):141-144

7. Application of IT and e-resources in Ayurveda lab (BTAYB113) 2 Credit

Course objectives

Course Objectives

This course aims to equip students with the knowledge and skills to effectively use digital tools and platforms in Ayurveda Biology. It introduces structured databases, digital libraries, virtual herbariums, and simulation-based learning tools. Students will gain practical experience in navigating e-resources for medicinal plants, classical texts, and research articles. Additionally, it create awareness about ethical, legal, and regulatory considerations related to the digital use of traditional knowledge systems.

Course Contents

1. Python Programming
2. Explore TKDL and AYUSH Portal; locate data on given diseases and formulations.
3. Explore TKDL and AYUSH Portal; locate data on different formulations.
4. Access manuscripts via AMAR; study digital versions of classical texts.
5. Use FRLHT, NMPB, MPNS to identify and study plant species.
6. Retrieve phytochemical info using PubChem and IMPPAT databases.
7. Perform guided literature search using, PUBMED, DHARA and Google Scholar.
8. Create and document a digital herbarium record.

E-Resources

a. TKDL – Traditional Knowledge Digital Library: https://tkdl.res.in
2. AYUSH Research Portal: https://ayushportal.nic.in
3. DHARA – Digital Helpline for Ayurveda Research Articles: http://www.dharaonline.org/
4. AMAR – Ayurveda Manuscript Advanced Repository: http://ccras.res.in/amar/
5. FRLHT-TDU: https://tdu.edu.in, https://www.frlht.org/
6. NMPB – National Medicinal Plants Board: https://nmpb.nic.in
7. e-CHARAK: https://echarak.ayush.gov.in/
8. MPNS – Medicinal Plant Names Services (Kew): https://mpns.science.kew.org/mpns-portal/version
9. POWO – Plants of the World Online: https://powo.science.kew.org
10. Journal of Ayurveda and Integrative Medicine (J-AIM): https://www.jaim.in
11. IMPPAT – Indian Medicinal Plants, Phytochemistry and Therapeutics: https://cb.imsc.res.in/imppat
12. PubChem – NCBI: https://pubchem.ncbi.nlm.nih.gov

Introductory Chemistry (BTAYB115) 3 Credit

Course objective

To provide a foundational understanding of chemical principles, including the structure of matter, chemical reactions, and basic laboratory techniques, essential for further study in the

physical and life sciences.

Course content

Unit-I: History and development of chemistry in India

Introduction to chemistry of ancient India, Contribution of Indian scientist in the field of chemistry.

Unit-II: Basic concepts of chemistry

Chemical bonding and structure: Introduction to theory of bonding: ionic, covalent, coordinate bonding, metallic and hydrogen bond, van der Waals interactions, Valence bond theory and orbital hybridization, Solutions: different types of solutions, concentration of solutions: mass percentage, volume percentage, mass by volume percentage, parts per million, mole fraction, molarity, molality, normality, determination of empirical formula and stoichiometric calculations, Acids and bases: Arrhenius concept of acids and bases, Bronsted-Lowry acid and bases, Lewis acids and bases, ionization constant of water, ionic product of water, the pH scale, strength of acids and bases, hardness and softness and buffer solutions, Redox reactions: Oxidation reactions, Reduction reactions, Types of redox reactions, Standard electrode potential

Unit-III: Classification of elements and periodicity

Significance of classification, brief history of periodic table, General introduction to s-block, p-block, d-block and f-block elements, coordination complexes, Classification of elements into metals, non metals and metalloids, periodic trends and anomalies, Application of metals in medicine, toxicity of metals.

Unit-IV: Basic organic chemistry

Synthesis, reactions and mechanisms of alkanes, alkenes, alkynes, arenes, alcohols, phenols, aldehydes, ketones, carboxylic acids and their derivatives, Halides, nitro compounds and amines
Organo-metallic compounds

Unit-V: Natural products

Alkaloids, steroids, flavonoids, Terpenes, phenols, Carbohydrates, amino acids, Phenylpropanoids, polyketides etc.

Unit-VI: Electromagnetic Radiation and Spectroscopy

Electromagnetic spectrum, definition of Electromagnetic Radiation (EMR), Energy of Light, emission spectra, absorption Spectra, basics of spectroscopy, UV - visible and fluorescence spectroscopy, bioluminescence

SELECTIONS FROM ĀYURVEDIC TEXTS PRACTICALS

i. Different analytical techniques for chemical analysis like volumetric analysis, Gravimetric analysis etc.,
ii. Thin Layer Chromatography (TLC),
iii. Distillation,
iv. Extractions of secondary metabolites

RECOMMENDED READINGS

1. Carey F. A., Sundberg R. J , 2004, *Advanced Organic Chemistry*, Parts A & B, Plenum: U.S
2. Cotton, F. A, Wilkinson G, Gaus P L, 1995, *Basic Inorganic Chemistry – Third Edition*, published by Wiley India Pvt. Ltd.
3. Elsair R, 2012, *Tricks in Chemistry - Fundamentals of Chemistry*, Romain Elsair & Ventus Publishing
4. Finar I. L., Finar A. L., 2002, *Organic Chemistry* Vol. 1 and Vol. 2. (6^{th} edn) Pearson Education.
5. Lee, C J. D, *Concise Inorganic Chemistry*,2008, 5 i. th Edn**,** John Wiley & Sons
6. Madan R. L., 2008, *Chemistry for Degree Students B.Sc. (first, second and third year),* S. Chand & Company Pvt. Ltd.
7. March J., 1992, *Advanced Organic Chemistry* John Wiley & Sons
8. Mendham J, 2009, Vogel's *Quantitative Chemical Analysis*, Pearson Education; 6^{th} Edn.
9. Ray P C, 2010, *A History of Hindu Chemistry: from the Earliest Times to the Middle of the Sixteenth Century (Vols 1& 2),* Cosmo publications, Delhi
10. Sarkar R. P. 2011, *General and Inorganic Chemistry:* Volume I, New Central Book Agency; 3^{rd} edition
11. Sarkar R. P. 2012, *General and Inorganic Chemistry:* Volume II, New Central Book Agency; 1^{st} edition.

BS101 (2 credit) Other School

Semester-II

Fundamentals of Sanskrit-II (BTAYB 102) 3 Credit

Course Objectives

This course is designed to introduce students to the foundational aspects of Sanskrit grammar, including the rules of Sanskrit meters (Chandas) and compound word formation (Samāsa). It aims to equip students with the necessary linguistic skills to read and comprehend Āyurvedic texts in their original form.

Course content

Unit I: Basic Sanskrit grammar and translation

Declensions: śabdarūpāṇi – go, mati, dhenu, vadhū, mātṛ, vāri, madhu, jagat, ātman, daṇḍin, vāk, sarit., Verbal roots: dhāturūpāṇi – paṭh, pac, bhū, kṛ, as, han, div, tan, tud, dā, śru, jñā, rudh, grah, cur, krī, sev (liṭ, luṭ, āśirliṅ, luṅ, lṛṅ lakāreṣu), Concept of voice: nature of active voice (kartṛ-vācya), passive voice (karma-vācya) and impersonal passive voice (bhāva-vācya), Rules of voice change and changing voice of simple sentences specially with reference to verbal terms: kṛtya-suffixes & niṣṭhā-suffixes. Application of kṛt suffixes: pratyayāḥ - ṇamul, ghañ, yat, ṇyat, kyap, ṇvul, kta, tṛc, aṇ, ac, lyuṭ, Application of taddhita suffixes –matvarthīya - matup, ini, ṭhan, apatyārthaka - aṇ, iñ, ṭhak, bhāvakarmārthaka - tva, tal, imanic, ṣyañ, others – tarap, tamap, īyasun, iṣṭhan, tasil, tral, sandhiḥ, hal sandhiḥ –ścutva, ṣṭutva, chatva, kutva, cartva, jaśtva, anusvāra, parasavarṇa, anunāsika, latva, ṇatva, Quantitative words - arimāṇavācīśabdāḥ, , Periodical words – kālabodhakapadāni, Prefixes:pra, parā, apa, sam, anu, ava, nis, nir, dus, dur, vi, āṅ, ni, adhi, api, ati, su, ut/ ud, abhi, prati, pari, upa., Meaning of the prefixes: Changing the meaning of the root after adding the prefixes, Addition of multiple prefixes to verb roots, Translation of passages and independent sentences with reference to the commentaries on Āyurvedic texts

Unit II : Readings from Āyurvedic texts

vaidyakīya-subhāṣita-sāhityam, Suśruta-saṃhitā, Caraka-saṃhiā

Unit - III: *Phonetics and Phonology in modern linguistics* (Comparison with Indian Linguistic tradition)

Introduction to phonetics – impact of Indian tradition on western phonetics, Introduction to phonology, Pāṇinian and generative traditions

SELECTIONS FROM ĀYURVEDIC TEXTS

RECOMMENDED READINGS

1. Apte, V.S., 2004, *The Students' Guide to Sanskrit Composition*, Chowkhamba Sanskrit Series, Varanasi.
2. Apte,V S., 1993, *Saṁskrtaracanā,* Varanasi: Chaukhamba Vidyabhavan.
3. Dwivedi K., 2009 *racanānuvādakaumudī,* Vishvavidyalaya Prakashan, Varanasi
4. Fromkin V., Rodman R., 1998, *An Introduction to Language*, Harcourt Brace College Publishers, California
5. Kale, M.R. - *Higher Sanskrit Grammar*, MLBD, Delhi

6. Narendra, 2009, *chandolaṅkāraparicayaḥ,* Aurbindo Ashram, Pondicherry
7. Narendra, Vedalankar J., 2015, *saralasaṁskrtasaraṇiḥ* , Aurbindo Ashram, Pondicherry
8. Nautiyal C., 2009, *Brhadanuvādacandrikā,* Delhi: Motilal Banarasidas.
9. Shastri A R, 2018, *saṁskrta śikṣaṇa saraṇī,* Delhi: Adinath Printers.
10. Shastri C., 2018, *Vyākaraṇa Candrodaya*, MLBD, Delhi

Preventive and Participatory medicine in Ayurveda (BTAYB 104) 3 Credit

Course Objective

To familiarize students with the principles and practices of preventive and participatory healthcare in Ayurveda, emphasizing lifestyle regulation (*Dinacharya, Ritucharya*), disease prevention, health promotion, and patient involvement in maintaining well-being. Besides personal health and hygiene, primary focus will be on community health and management of disease conditions with reference to diabetes, hypertension, depression, cardio-vascular, joint disorders etc.

Course content

Unit I: Personal health and hygiene (vaiyaktika svasthavṛtta)

Definition of *svāsthya,* health and *svasthavṛtta, dinacaryā* and *rātricarya, ṛtucaryā* (lifestyle adaptation according to circadian and seasonal rhythms), *āhara* (diet)*, upavāsa* (fasting)*, nidrā* (sleep), *brahmacarya* (living in harmony with nature), *vyāyāma* (exercise), *sadvṛtta* (social/moral conduct), *yoga*

Unit II: Treatment by natural methods (nisargopacāra)

jalacikitsā (hydrotherapy), *mṛttika cikitsā* (mud therapy), *sūryakiraṇa sevana* (heliotherapy), *mardana* (physiotherapy)

Unit III: Community health in Āyurveda

janapadodhvaṁśa - source of community diseases – contamination of *jala*, *vāyu*, *deśa*, *kāla, Community health – deśa-svāsthya, dhvani pradūṣaṇa* (noise pollution), *vikīraṇa* (radiation), *prakāśa, apadravya nirmūlana* (disposal of solid waste)

Unit IV: Contemporary Community health initiatives

Disaster management, occupational health, school health services, epidemiology, non-communicable disease epidemiology, Family welfare programs, Mother and Child Health (MCH) program, preventive geriatrics, World Health Organisation, International health agencies, health statistics, health administration, national health programmes, national nutritional programmes, Community health management initiatives – pollution control, noise pollution control

SELECTIONS FROM ĀYURVEDIC TEXTS PRACTICALS

i. Demonstration of Āyurvedic daily routines
ii. Visit to Āyurvedic institutions
iii. Community health survey

RECOMMENDED READINGS

1. Agniveśa, 1991, *Caraka Samhitā* (with Āyurveda-Dīpikā commentary of Cakrapāni Dutta and Jalpakalpataru Commentary of Gangadhar Roy). ed. K J Sengupta, Narendranath and Balai Chandra. Varanasai : Chowkhamba Orientalia
2. Agniveśa, 1996, *Caraka Samhitā*. ed. (with Eng. Translation) P.V. Sharma. Varanasai : Chowkhamba Orientalia
3. Bhāvamiśra, 2011, *Bhāvaprakāśa*. ed. K. R. Srikantha Murthy. Varanasi : Chaukhamba Krishnadas Academy
4. Bhela, 1921, *Bhelasaṁhitā*. ed. Ashutosh Mukherjee. Calcutta : University of Cacutta, 1921.

Charaka Saṁhitā –Purvard (BTAYB106) 3 credit

Course objectives

This course aims to introduce students to one of the foundational texts of Āyurveda — the *Caraka Saṁhitā* — presented in four sequential parts aligned with related subject areas. The *Caraka Saṁhitā*, a classical compendium on *Kāyacikitsā* (internal medicine), is organized into eight sections (*Sthānas*) comprising 120 chapters (*Adhyāyas*). Students will be systematically guided through the key sections of the text, fostering a comprehensive understanding of its structure and content.

Course Contents

UNIT I: Introduction to Caraka and Caraka-Saṁhitā

Tradition of *saṁhitā* texts, Brief note on Maharṣi Caraka, Textual history of Caraka-Saṁhitā

UNIT II: Bheṣaja and svastha catuṣka

Dīrghañjīvitīya, apāmārga taṇḍulīya, āragvadhīya, ṣadvirecana-śatāśritīya, mātrāśitīya, tasyaśitīya, na-vegadhāraṇiya, indriyopakramaṇīya

UNIT III: Nirdeśa and kalpanā catuṣka

khuddaka-catuṣpāda, mahācatuṣpāda, tisraiṣaṇīya, vātakalākalīya, snehādhyāya, svedādhyāya, upakalpaniya, cikitsāprabhṛtīya

UNIT IV: Yojanā and annapāna catuṣka

aṣtau nindatīya, laṅghanabṛhmaṇīya, santarpaṇīya, vidhiśoṇitīya, yajja puruṣīya, ātreyabhadrakāpyīya, annapānavidhi, vividhāśitapītīya

UNIT V: Saṅgraha and śarīra sthāna

daśaprāṇāyatanīya, arthedaśamahāmūlīya, katidhāpuruśīya, atulyagotrīya, khuḍḍikā garbhāvakrānti, mahatīgarbhāvakrānti, puruṣa vicaya, śarīra vicaya, śarīra saṅkhyā, jātisūtrīya

SELECTIONS FROM TEXT – CARAKA SAMHITĀ

PRACTICALS

i. Activity based learning
ii. Classification of diseases, drugs
iii. Glossary development and translation
iv. Dietary principles and practices - contemporary relevance
v. Clinical methods - comparison with contemporary sciences

RECOMMENDED READINGS

1. Acharya J, 1962, Caraka Evaṁ Suśruta Ke Dārśanika Viśaya Kā Adhyayana, Kolkata
2. : Sri Baidyanath Āyurveda Bhavan.
3. Caraka, 1991, Caraka Samhitā (with Āyurveda-Dīpikā commentary of Cakrapāni Dutta and Jalpakalpataru Commentary of Gangadhar Roy). ed. K J Sengupta, Narendranath and Balai Chandra. Varanasai : Chowkhambha Orientalia.
4. Caraka, 1991, Caraka Samhitā, (with Vidyotini Hindi commentary by K.N. Shastri & G.N. Chaturvedi). Varanasai : Chaukhamba Bharati Academy, Varanasi.
5. Caraka, 1996, Caraka Samhitā. ed. (with Eng. Translation) P.V. Sharma. Varanasai : Chowkhambha Orientalia.
6. Caraka, 2000, Caraka Saṁhitā (with Āyurveda-Dīpikā commentary of Cakrapāni Dutta), ed. Yadavji Trikamji Acharya, Varanasai : Chowkhamba Surabharati Prakashan.
7. Caraka, 2014, Caraka Samhitā. (with Āyurveda-Dīpikā commentary of Cakrapāni Dutta), vol.I-IV, ed. (with Hindi Translation), Banwari Lal Gaur. Delhi : Motilal Banarasidas.
8. Sharma P.V., 1981, Scientific History of Āyurveda, Chaukhambha Orientalia, Delhi
9. Yadav D., 2013, History of Āyurveda, Chaukhambha Surbharati Prakashan, Varanasi.
10. Devaraj, T.L, 1997, Āyurveda for Health and Family Welfare. Delhi : UBS Publishers
11. Ghanekar, B. G. and Ghanekar V. B., 2013, Svasthavṛtta Aura Sārvajanika Ārogya. Varanasi: Chaukhambha Bharati Academy
12. Mādhavakara, 2000, Mādhava Nidāna. ed. Kanjiv Lochan and Brahmanand Tripathi.
13. Śāraṅgadhara,2017, Śāraṅgadhara Darpaṇa. ed. Bhrigupati Pandey
14. Shastri, R. D., 2018, Svasthavṛttasamuccaya. Varanasi : Maheshwar Dutt Mishra

4. Scientific Concepts in Ayurveda (BTAYB 108) 3 Credit

Course objectives

To introduce students to the fundamental principles of Ayurveda and explore their scientific basis through modern biological and medical perspectives, fostering an integrative understanding of traditional and contemporary healthcare systems.

Course contents

Unit-1 History and survey

Philosophy of science & technology, documented and undocumented knowledge, origin and development of scientific ideas in India and the world

Unit II: Documented science and technology

Schools and traditions of Indian thought -1 and 2

Unit III: Āyurveda – an integrated approach to science and health

Interfacing concepts of Āyurveda and science, Defining each from the perspective of the other undocumented knowledge systems, Unreported community methods and practices, Āyurveda and Yoga

Unit IV: Project in major areas of Science & Technology

Vedangas, Āyurveda, Yoga, Philosophical systems, Computer Sciences, Mathematics, Natural sciences

SELECTIONS FROM ĀYURVEDIC TEXTS

RECOMMENDED READINGS:

1. Manohar, C. M., 2005, *Āyurveda for All*, Pushtak Mahal, Delhi
2. Singh, B. R., Jha, G. N., Singh, U. K. and Mishra, D. (eds), 2012, *Science and Technology in Ancient Indian Texts*, DKPW, New Delhi, India
3. Arnold, David, 2004, *The New Cambridge History of India: Science, Technology and Medicine in Colonial India*, Cambridge University Press, Cambridge.
4. Baber, Zaheer,1996, *The Science of Empire: Scientific Knowledge, Civilization, and Colonial Rule in India*, State University of New York Press, New York.
5. Balasubramaniam, R.,2002, *Delhi Iron Pillar: New Insights*, Indian Institute of Advanced Studies
6. Keith A.B,1993, *A history of Sanskrit literature*. Motilal Banarsidass, Delhi
7. Cooke, Roger, 2005, *The History of Mathematics: A Brief Course*, Wiley- Interscience, New Jersey.
8. Jha, G N (ed), 2010, *Sanskrit Computational Linguistics*, Springer Verlag Germany
9. Jha, V.N., 1991, *Navya Nyaya Contribution to Indian Thought Structure*, Menon Lecture

Series, Calicut Univ
10. Joseph, G. G.,2000, *The Crest of the Peacock: The Non-European Roots of Mathematics*, Princeton University Press
11. Kak S., 2002, History of Indian Sciences
12. Santiago, J. R., *Kriya Yoga: The Science of Self-Realization*, Book Faith India, 1999.
13. Singh, B. R.(ed), 2014, *Exploring Science in Ancient Indian Texts*, DKPW Publishers, New Delhi, India.
14. Singh B R et al. (ed), 2011, *Science and Technology in Ancient Indian Texts*, DK Printworld, Delhi
15. Trefil, J. J. , Hazen, R., 2000, *The Sciences: An Integrated Approach* Wiley and Sons, 2000.
16. Teresi, Dick et al., 2002,, *Lost Discoveries: The Ancient Roots of Modern Science—from the Babylonians to the Maya*, Simon & Schuster
17. Wenk, Hans-Rudolf et al.,2003, *Minerals: Their Constitution and Origin*, Cambridge University Press
18. White, Lynn Townsend, Jr.,1960, *Tibet, India, and Malaya as Sources of Western Medieval Technology*, The American Historical Review 65 (3): 522-
19. 526.

5. Introductory Physics lab (BTAYB 110) 2 Credit

PRACTICALS

i. Estimation of focal length of concave mirrors and convex lenses
ii. Determination of Young's modulus of a material.
iii. Determination of acceleration due to gravity using compound pendulum.
iv. Determination of dispersive power of material of a prism.
v. Determination of viscosity of a liquid.
vi. Determination of surface tension of a liquid.

6. Fundamentals of Mathematics and Statistics (BTAYB 112) 2 Credit

Course objectives

This course aims to acquaint students with fundamentals of mathematics and statistics which will have applications in subsequent courses in the entire program.

Course contents

Unit I: Mathematics and statistics in India and other civilizations

History and evolution of Mathematical sciences in India, Developments in other traditions, Mathematical sciences in medieval India, Contribution of India to Mathematical sciences

Unit II: Basic Linear Algebra

Matrices and vectors, rank of a matrix, matrix addition and scalar multiplication, matrix multiplication, matrix algebra, inverses, powers of a matrix, transpose and symmetric matrices., Determinants, results on determinants, matrix inverse using cofactors, solutions of linear equations, Basic idea of field, vector spaces and basis, tensors

Unit III: Basic Calculus

Differentiation: Intuitive idea of limits, continuity and differentiability, Derivatives of all elementary functions, Rules of differentiation: Derivative of sum, Difference, product rule, Quotient rule, Derivatives of composite functions-chain rule. Maxima and minima, Integration: Fundamental laws of integration, integration by parts, multiple integration techniques, calculation of area and volume, Differential Equations: Definition, order and degree, general and particular solutions of a differential equation. Solution of differential equations by method of separation of variables, solutions of homogeneous differential equations of first order and first degree, exact differential equation

Unit IV: Coordinate Geometry and Statistics

Straight line, Circle, ellipse, Parabola, hyperbola, Coordinate plane, Basic Statistics: Measures of Central Tendency- mean, median, mode, Measures of dispersion- range, mean deviation, variance and standard deviation of ungrouped / grouped data, Moments, skewness and kurtosis, correlation, linear regression

Unit V: Probability

Permutation and combination, the axioms of probability, conditional probability, multiplication theorem on probability, independent events, total probability, Baye's theorem and independence

Discrete and continuous random variable, mean and variance of random variable, , Probability distributions- binomial distribution, Gaussian distribution, uniform distribution.

Unit VI: Vedic Mathematics

Textual tradition in Vedic mathematics, 16 sutras of Vedic mathematics, Topics under Vedic mathematics, Arithmetical computations, Application in problem solving, Computers and Vedic mathematics

SELECTIONS FROM TEXTS

Recommended readings:

1. Anton H., Bivens I., Davis S., 2002, *Calculus* (7th edn.), John Wiley and sons (Asia), Pvt Ltd., Singapore
2. Batschelet E., 1975, *Introduction to Mathematics for Life Scientists*, International Student Edition, Narosa Publishing House, New Delhi
3. Dutt V.B, Singh A, N, 1956, *Hindu Ganit Shastra Ka itihas*, Hindi Samiti, Uttar Pradesh
4. Dwivedi S, 1910, *A History of Hindu Mathematics*, Varanasi
5. Kreyszig E., 2014, *Advanced Engineering Mathematics*, 10th Edn, John Wiley & Sons, New York
6. Lay D. C., 2007, *Linear Algebra and its Applications* (3rd Edition), Pearson Education Asia, Indian Reprint
7. Lipschutz, S., Lipson, M., 2001, *Schaum's outline of theory and problems of linear algebra*. McGraw Hill, NY
8. Narain S., Mittal N., 1942, *Differential calculus*, S Chand and Co., Delhi
9. Narain S., Mittal, N., 1942, *Integral calculus*, S Chand and Co., Delhi

10. Pingree D, 1970, *Census of the Exact Sciences in Sanskrit* (5 vols.), American Philosophical Society, Philadelphia
11. Ross S.L., 2004, *Differential Equations* 3rd Edition, John Wiley and Sons, India
12. Spiegel M. R., Schiller J. J., Srinivasan R. A., 2008, *Probability and Statistics* (3rd edn) , Schaum's Outlines, McGraw Hill, NY
13. Spiegel M. R., Stephens L. J., 2018, *Statistics* (6th edn), Schaum's Outlines, McGraw Hills, NY
14. Strauss M. J., Bradley G. L. and K. J. Smith,2007, *Calculus* (3rd edn), Dorling Kindersley (India) Pvt. Ltd., Pearson Education, Delhi
15. Tirtha B. K.,1992, *Vedic Mathematics* (ed. B S. Agrawala) , MLBD, Delhi

7. Fundamentals of Mathematics and Statistics lab (BTAYB 114) 2 Credit

Course Content

PRACTICALS

1. Based on graphical Representation
2. Based on measures of Central Tendency & Dispersion
3. Based on Distributions Binomial Poisson Normal
4. Based on t, f, z and Chi-square
5. Basics of MATLAB

8. Environmental Science 2 Credit

9.Living with Stress (BTBSc 218) Credit: 3

Course Objectives:

To understand the concept, types and causes of stress, biological and psychological responses of stress.

To leam different management techniques. Students should be able to explain the concept, causes and types of stress, Develop the understanding of biological and psychological responses of stress, Use the coping skills related to stress management and emotional wellbeing.

Unit-I: Stress:

Introduction Stress: concept and definition, Theories of stress, Types of stress Causes of stress

Unit 2: : Physical and psychological aspects of stress:

Biological basis of stress, Psychological basis of stress, Effects of stress on Physical, psychological and emotional well being.

Unit 3: Managing Stress:

Emotional wellbeing: Positive and negative Emotions
Emotional Intelligence: concept and models of emotional intelligence self-awareness, self-regulation, self-motivation, empathy, social skills Emotion- focused coping: adaptive and maladaptive coping, Stress management techniques

References

1. Baumgardner, S. R., & Crothers, M. K. (2009). *Positive psychology*. Pearson Education India.
2. Carter, S., & Cecily, A. (2019). *Wellbeing in educational context* (Chapter 2). University of Southern Queensland.
3. Greenberg, J. S. (2017). *Comprehensive stress management* (14th ed.). McGraw-Hill. ISBN: 9781259848247.
4. Kabat-Zinn, J. (1990). *Full catastrophe living: Using the wisdom of your body and mind to face stress, pain and illness*. Dell.
5. Knox, P. L. (1975). *Social well-being: A spatial perspective*. Paper Back Publication.
6. Lehrer, P. M., Woolfolk, R. L., & Sime, W. E. (2007). *Principles and practice of stress management* (3rd ed.). Guilford Press.
7. Neiten, W., & Lloyd, M. A. (2007). *Psychology applied to modern life*. Thomson DetmarLearning.
8. Snyder, C. R., Lopez, S. J., & Pedrotti, J. T. (2010). *Positive psychology: The scientific and practical explorations of human strengths* (2nd ed.). Sage Publications India

10. Introductory Physics (BTAYB220) 3 Credit

Course objectives

To provide a foundational understanding of the core principles of physics, including mechanics, energy, motion, and electromagnetism, and to develop problem-solving skills through conceptual learning and quantitative analysis.This course aims to acquaint students in the fundamentals of theories and practices of physics while highlighting the achievements in ancient India.

Course contents

Unit I. History and development of Physics in India

Relationship of Physics and Āyurveda, Studies in physical sciences in ancient India, Physics in medieval and contemporary times

Unit II. Classical Mechanics

Physical units, dimensions and quantities, Newton's laws of motion, Forces, work, kinetic energy, potential energy and energy conservation, Momentum, universal gravitation force and acceleration due to gravity.

Unit-III. Electricity and Magnetism

Electric field, Gauss's law, electric potential, capacitance and dielectrics, Direct current, alternating current, Magnetic field, Lorentz force, Faraday's law of induction.

Unit-IV. Thermal and General Properties of Matter

Thermodynamics: internal energy, concept of entropy and disorder, laws of thermodynamics, enthalpy, free energy, Elastic behavior of solids: strain and stress, Hooke's Law, elastic limits, Young's modulus, shear modulus, bulk modulus and Poisson's ratio, Fluid mechanics: compressibility, viscosity, Pascal's law, streamline and turbulent flow, equation of continuity, Bernoulli's theorem and its application to biological system, Surface tension, surface energy, angle of contact, capillary action,Magnetic materials: diamagnetic, paramagnetic and ferromagnetic substances, Semiconductors: n-type and p-type semiconductors, p-n junction diode, depletion width and potential barrier, Zener diode, I-V characteristics, transistors, Basics of superconductivity

Unit V: Modern Physics

Interference, diffraction and diffraction grating, refractive index, polarization, de Broglie hypothesis, wave-particle duality, matter waves and de-Broglie wavelength, photoelectric effect, Compton effect, uncertainty principle, introduction to Schrodinger equation, Raman Effect, X-ray and its use, Rutherford scattering and concept of nucleus, Nuclear reactions, fission, fusion., Radioactivity, radiation hazards, radio-safety laws, ultrasonic waves, concept of LASER

SELECTIONS FROM ĀYURVEDIC TEXTS

RECOMMENDED READINGS

1. Bieser A., 1994, *Concept of Modern Physics* (6^{th} edn.), McGraw-Hill Higher Education, USA

2. Ghatak A., 2009, *Optics* (4th edn), Tata McGraw-Hill Education, USA
3. Feynman R, Leighton R., Sands M, 1963. *The Feynman Lectures on Physics* (Vols. 1 and 2), Addison–Wesley, USA
4. Halliday D., Resnick R., Walker J., 2018 *Fundamentals of Physics* (11th edn), John Wiley & Sons, Inc., USA
5. Nelson P., 2020, *Biological Physics*, W.H. Freeman Publishers, USA
6. Verma, H.C., 1993, *Concept of Physics – Vol1 and II*, Bharti Bhawan, Patna