

VANITA VISHRAM WOMEN'S UNIVERSITY

(Managed By: Vanita Vishram, Surat)

1st Women's University of Gujarat



VANITA VISHRAM
WOMEN'S UNIVERSITY

SURAT

SCHOOL OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF BIOTECHNOLOGY

B.SC. BIOTECHNOLOGY

SEMESTER 1

SYLLABUS
AS PER NEP-2020
W.E.F 2023-24



VANITA VISHRAM WOMEN'S UNIVERSITY, SURAT
SCHOOL OF SCIENCE AND TECHNOLOGY
Department of Biotechnology
BSc Biotechnology Program
FY B.Sc.
Semester I

BTM201- 1C: Cell Biology

Credit 3 + 1

Contact Hour per week 3+2

Outline of the Course:

Course type	Theory/Practical
Purpose of Course	Provide strong fundamentals of eukaryotic cell structures, their organization, division and the roles of organelles in various metabolic aspects of the cell.
Course Objective	CO 1. To demonstrate knowledge and understanding of the eukaryotic cells. CO 2. To make the students aware of structural organization of various cellular organelles and understanding of the roles of various organelles in cellular metabolism. CO 3. To demonstrate how the cell division progress and regulated inside the body.
Minimum weeks per Semester	15
Last Review / Revision	June 2023
Pre-requisite	Elementary knowledge of Biology.
Teaching Methodology	Class Room Teaching, Discussion and Assignment
Evaluation Method	Continuous And Comprehensive Evaluation (CCE) (50%) Semester End Evaluation (SEE) (50%)



Course Content

Units	Particulars	% Weightage of Unit	Minimum Nos. of Hours
1	<p>Introduction to Cell Biology</p> <ul style="list-style-type: none"> • Origin and Evolution of Cells • Endosymbiont Theory • Cell Diversity • Cell Theory • Basic Properties of cells <p>Structure and Function of Cell Components</p> <ul style="list-style-type: none"> • Eukaryotic cell wall • Plasma Membrane • Nucleus • Mitochondria • Chloroplast and other Plastids • Endoplasmic Reticulum • Golgi Complex 	45	20
2	<p>Structure and Function of Cell Components</p> <ul style="list-style-type: none"> • Lysosomes • Peroxisomes • Cytoskeleton • Microtubules • Intermediate Filaments • Microfilaments • Centrosomes 	33	15
3	<p>Extracellular Matrix and Cell Interactions</p> <ul style="list-style-type: none"> • ECM: (Matrix Structural Proteins, Polysaccharides, Adhesion Proteins) • Cell-matrix Interactions • Cell-cell Interactions (Adhesion Junctions, Tight Junctions, Gap Junctions, Plasmodesmata) <p>Cell Cycle, Regulation & Cell Division</p> <ul style="list-style-type: none"> • Cell cycle: Overview, Phases, Regulation & Control of cell cycle • Overview and basic steps of Mitosis • Overview and basic steps of Meiosis • Genetic recombination during Meiosis 	22	10
<p>List of References & Text Books:</p> <ul style="list-style-type: none"> • Karp, G. (2016). Cell and molecular biology: concepts and experiments. John Wiley & Sons, ISBN-978-1-118-88614-4 • Cooper, G. M., & Hausman, R. E. (2004). The cell: a molecular approach. ISBN-0878932143 			



- Verma, P. S., & Agarwal, V. K. (2004). Cell Biology, Genetics, Molecular Biology, Evolution and Ecology: Evolution and Ecology. S. Chand Publishing. ISBN-978-8121924429
- John P. Harley, Donald A. Klein, Microbiology- Lansing Prescott, 10th Edition, Mcgraw Hill Publication. ISBN-13-978-1259281594

Practicals:

1. To visualize animal and plant cell using methylene blue.
2. To study viability of cells using trypan blue/phenol red.
3. To perform Staining of DNA by Schiff's reagent using onion peel.
4. To study Lipid solubility of membranes using hypotonic solution and RBCs.
5. To study mitosis in onion root tips.
6. To observe Barr body from buccal smear.
7. To perform Giemsa staining of blood cells.
8. Demonstration of preparation of nuclear, mitochondrial and cytoplasmic fractions.

References & Textbooks for Practical

- Cell and Molecular Biology: A Lab Manual. K.V. Chaitanya, PHI Learning Private Ltd.

COURSE OUTCOMES:

CO 1.	Students will have gain knowledge about origin and evolution of cells and their important properties.
CO 2.	Students will achieve brief information and understanding about various components of cells, and their functional and structural analysis
CO 3.	Students will be able to study cell-cell interaction techniques, cell division and cell regulations

COURSE OUTCOMES MAPPING

Unit No.	Title of the Unit	Course Outcomes		
		CO 1	CO 2	CO 3
1	Introduction to cell Biology			
2	Structure and function of cell components			
3	Extracellular Matrix and Cell Interactions & Cell Cycle, Regulation & Cell Division			

COURSE ARTICULATE MATRIX

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1						
CO2						
CO3						



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Semester I

BTM202- 1C: Plant and Animal Sciences

Credit 3 + 1

Contact Hour per week 3+2

Outline of the Course:

Course type	Theory/Practical
Purpose of Course	<p>Provide strong fundamentals of plant sciences and its different branches that will create a platform and facilitate students to take-up successful careers in Botany or higher studies in various other branches of plant sciences.</p> <p>Also, this course will make students understand & know the fundamentals of animal taxonomy, animal body systems of both invertebrates & vertebrates, comparative anatomy which will be useful for the student to learn further advanced subjects like animal tissue culture, animal biotechnology & apply the information for research in future.</p>
Course Objective	<p>CO 1. Demonstrate knowledge and understanding of the plant and animal world.</p> <p>CO 2. Demonstrate knowledge and understanding of the principles that govern the structures living world</p> <p>CO 3. To develop the ability to think critically about plants and animals morphology and anatomy.</p> <p>CO 4. To provide basic knowledge about the different types of plants and animal and their special characters.</p>
Minimum weeks per Semester	15
Last Review / Revision	June 2023
Pre-requisite	Elementary knowledge of Biology.
Teaching Methodology	Class Room Teaching, Discussion and Assignment
Evaluation Method	Continuous And Comprehensive Evaluation (CCE) (50%) Semester End Evaluation (SEE) (50%)

**Course Content:**

Units	Particulars	% Weightage of Unit	Minimum Nos. of Hours
1	Plant kingdom and its diversity <ul style="list-style-type: none">• Plant Kingdom (Eichler system)- cryptogams and phanerogams, diversity in plant kingdom, position of plants in five kingdom system.• General characteristics, Classification, Morphology and life-cycles and economic importance of Algae: <i>Spirogyra</i>. Fungi: <i>Mucor</i>.• General characteristics, Morphology and economic importance of Lichens.• General characteristics and economic importance of Bryophytes, Pteridophytes, Gymnosperms and angiosperms.	25 %	10
2	Plant morphology and anatomy <ul style="list-style-type: none">• Basic structure, types and function of leaf, stem and roots.• Flower- Parts and functions, Fertilization• Basic structure, types and function of temporary and simple permanent tissue.• Complex tissue: structure and function• Types of vascular bundles• Primary internal structure of root, stem and leaf• Secondary growth in dicot stem.	25 %	11
3	Animal kingdom and its diversity <ul style="list-style-type: none">• General characters of invertebrates & non-chordates.• Phylum Protozoa – General characters, Locomotory Organelles in Protozoa• Phylum Porifera – General characters, Canal System in Sycon• Phylum Cnidaria - General characters, Polymorphism in Hydrozoa• Phylum Platyhelminthes - General characters• Phylum Nematoda – General Characters• Phylum Annelida – General Characters, Metamerism in Annelida• Phylum Arthropoda – General Characters, Mouth parts of Insect• Phylum Mollusca – General characters.	30 %	14



	<ul style="list-style-type: none">• Introduction and general character of Chordates, Vertebrates & Protochordates.		
4	General animal anatomy <ul style="list-style-type: none">• Brief account of Gills, lungs, air sacs and swim bladder.• Anatomy of skeletal muscle Fiber• Epithelial Tissue and Nervous Tissue.• Connective Tissue -I• Connective Tissue- I	20 %	10

List of References & Text Books:

- Vasishtha B.R. And Sinha A. K., 1st edition, Botany for degree students Part 1
- ALGAE; S. Chand & Company Ltd, , revised 2005, ISBN: 9788121935210
- Dutta, A.C.; A Class book of Botany; 15th edition; Calcutta: Oxford University Press,
- Gangulee, H.C., Das, K.S., Dutta C.T., College Botany Vol-I.; New Central Book Agency
- Sundar Rajan S., College Botany Vol-II, Himalaya Publishing House,
- Mukherjee S.K., College Botany Vol-III, New Central Book Agency, ISBN:
- Pandey B.P., Economic Botany, S. Chand Publication,
- Pandey B.P; A Text Book of Botany: Angiosperms.; S.Chand Publishers,
- Invertebrate Zoology by E L Jordan & Dr. P S Verma , S Chand pub.
- Modern Textbook of Zoology Invertebrates by RL Kotpal, Rastogi publications
- Chordate Zoology by E L Jordan & Dr. P S Verma, S Chand pub., 4th Edition
- Modern Textbook of Zoology Vertebrates by R L Kotpal, Rastogi publications, 4th Edition
- A manual of Practical Zoology Chordates by P S Verma, S Chand Pub.
- Principles of Anatomy & Physiology by Gerad J Tortora & Bryan H Derrickson, Wiley Pub

Practicals:

1. Study of morphology (vegetative and reproductive structures) of Spirogyra, Mucor, Funaria, Marsilea and Cycas using specimen/ permanent slides / Photographs.
2. Study of internal structure of dicot stem and roots by section cutting and mounting.
3. Study of morphology of lichens using specimen/ permanent slides / Photographs.
4. Study of different types of vascular bundles specimen/ permanent slides / Photographs.
5. Study of various floral parts and T. S. of ovary using suitable plant material.
6. Study of Animal Specimen – one from each invertebrate & chordate phylum/ class
7. Histology of Different Tissues with the help of Slides/ charts.
8. Study of gills, swim bladder, air sac by charts, slides/ specimen
9. An “animal album” containing photographs, cut outs, with appropriate write up about the above-mentioned taxa. Different taxa/ topics may be given to different sets of students for this purpose.

References & Textbooks for Practicals

- B.P Pandey, Modern Practical Botany-Vol. I, S Chand & Company, ISBN:
- B.P Pandey, Modern Practical Botany-Vol. II, 5th Edition, S Chand & Company,
- B.P Pandey, Modern Practical Botany-Vol. III, 2nd Edition, S Chand & Company,
- Practical Zoology: Vertebrates by S S Lal, Rastogi Publications
- Practical Zoology Volume III by S S Lal, Rastogi Publications

**COURSE OUTCOMES**

CO 1.	Students will understand basics about plant science in brief.
CO 2.	Course will also expedite about different structure and their functions of plants
CO 3.	Student will intake basic understanding about diversity of animal phylum
CO 4.	Students will gain knowledge about physiology and anatomy of animals

COURSE OUTCOMES MAPPING

Unit No.	Title of the Unit	Course Outcomes			
		CO 1	CO 2	CO 3	CO 4
1	Plant kingdom and its diversity				
2	Plant morphology and anatomy				
3	Animal kingdom and its diversity				
4	General animal anatomy				

COURSE ARTICULATE MATRIX

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1						
CO2						
CO3						
CO4						



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Semester I

BTE201- 1C: Introduction to Biotechnology

Credit 3 + 1

Contact Hour per week 3+2

Outline of the Course:

Course type	Theory/Practical
Purpose of Course	The Purpose of the course is to make students knowledgeable regarding the basics of Biotechnology, its applications and role in various fields, and current status of this field in India.
Course Objective	CO 1: To impart students with knowledge on what is Biotechnology, its various aspects and the scenario of Biotechnology field in India. CO 2: To expose students with various fields and scopes of biotechnology. CO 3: To make students understand regarding the roles and application of Biotechnology in field of healthcare.
Minimum weeks per Semester	15
Last Review / Revision	June 2023
Pre-requisite	Elementary knowledge of Biology.
Teaching Methodology	Class Room Teaching, Discussion and Assignment
Evaluation Method	Continuous And Comprehensive Evaluation (CCE) (50%) Semester End Evaluation (SEE) (50%)



Course Content

Units	Particulars	% Weightage of Unit	Minimum Nos. of Hours
1	<p>Understanding Biotechnology</p> <ul style="list-style-type: none"> • Definitions of Biotechnology • History of Biotechnology • Traditional and Modern Biotechnology • Biotechnology-three component central role • Biotechnology-an Interdisciplinary Pursuit • Branches of Biotechnology; Plant, Animal Biotechnology, Marine Biotechnology, Agriculture, Healthcare, Industrial Biotechnology, Pharmaceutical Biotechnology, Environmental Biotechnology. <p>Biotechnology in India</p> <ul style="list-style-type: none"> • Biotechnology Research in India. • Biotechnology Institutions in India (Autonomous, Public and Private Sector) • Biotech Success Stories- Biocon, Sea6 Energy, Bharat Biotech • Biotech Policy Initiatives • Introduction to DBT and Other State Agencies (GSBTM) • BTIS-NET • ABLE & BIRAC • Biotechnology- Current status of industrial growth in India • Role of CSIR and ICAR in Biotechnology Research 	44%	20
2	<p>Applications of Biotechnology</p> <ul style="list-style-type: none"> • Recombinant DNA Technology and Genetic Engineering • Applications of Biotechnology in Agriculture: <ul style="list-style-type: none"> ◦ GM Tomato (Fungal and Viral Resistant plant) ◦ BT Crops (BT Cotton and BT Brinjal: Insect Resistant Plants: Pros and Cons) ◦ Golden Rice • Molecular Pharming • Biotechnological applications in enhancement of Food Quality • Biofertilizers • Biopesticides • Biofuels 	33.5%	15
3	<p>Biotechnology in healthcare</p>	22.5%	10



	<ul style="list-style-type: none">• Vaccines, Plant Based Vaccines,• DNA & RNA probes,• Monoclonal Antibodies• Autoantibodies,• Identification of gene causing genetic diseases,• Therapeutic molecules from recombinant and non-recombinant organisms (Insulin, human growth hormone, interferon, growth factors)• Gene Therapy		
<p>List of References & Text Books:</p> <ul style="list-style-type: none">• John Smith (2005) Biotechnology, 5th Edition.• Ratledge, C. & Kristiansen, B. (2006) Basic Biotechnology, Cambridge University Press.• Gupta, P. K. (2005) Elements of Biotechnology, Rastogi Publications.• William Thieman and Michael Palladino (2012). Introduction to Biotechnology (3rd Edition), Benjamin Cummings Publishing Company.• B. D. Singh, Biotechnology (2018), Kalyani publishers• R.C. Dubey, A Textbook Of Biotechnology (2016) 6th Edition, S Chand publications• U Satyanarayana, Biotechnology (2020), Publishers: Books & Allied Ltd• Biotechnology by Keshav Trehan• Biotechnology: The biological principles M. D. Trevan, S. Boffey, K. H. Goulding & P. Stanbury, Open University Press, Milton Keynes, 1987• Sobti and Pachauri (2009) Essential of Biotechnology, Ane Books Pvt. Ltd. ISBN-81- 8052-160-5• DBT website: http://dbtindia.gov.in.			
<p>Practicals:</p> <ol style="list-style-type: none">1. Biotechnology Good Laboratory Practices and Bio-safety.2. Study of Light Microscope3. To study the principle, operation, applications and care of important instruments (autoclave, incubator, hot air oven, light microscope, pH meter, laminar airflow, Centrifuge, Colorimeter, bacteriological filter assembly) used in the Biotechnology laboratory4. Working of Colorimeter.5. Case study on ethical issues of biotechnology6. Calibration, working and use of pH meter.7. Visualization of animal and plant cell using methylene blue8. Study of cell viability using phenol red / trypan blue9. Identification of different stages of mitosis in onion root tip10. Identification of different stages of meiosis using permanent slide.11. Study the effect of temperature and organic solvents on semi permeable membrane12. Study of plasmolysis and de-plasmolysis			
<p>References & Textbooks for Practicals</p> <ul style="list-style-type: none">• Patel, R. J., & Patel, R. K., (2015). Experimental Microbiology, Vol. 1, 9th ed., Aditya.• Cell and Molecular Biology: A Lab Manual. K.V. Chaitanya, PHI Learning Private Ltd.			



- Introduction to practical Biochemistry, David Plummer, Tata McGraw Hill Publishing Company.

COURSE OUTCOMES

CO 1.	Students will understand concept of biotechnology and its available resources in India
CO 2.	Students will aware about role and significance of biotechnology in various field of sciences
CO 3.	Course will provide application of biotechnology in health science

COURSE OUTCOMES:

Unit No.	Title of the Unit	Course Outcomes		
		CO 1	CO 2	CO 3
1	Understanding Biotechnology			
2	Applications of Biotechnology			
3	Biotechnology in healthcare			

COURSE ARTICULATE MATRIX

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1						
CO2						
CO3						



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Semester I

MDC201-1C: Agricultural Techniques

Credit 4

Contact Hour per week 4

Outline of the Course:

Course type	Theory
Purpose of Course	To make female students well versed with the fundamental techniques of ornamental and kitchen gardening and maintaining them.
Course Objective	CO 1. To impart knowledge basics of gardening tools and techniques. CO 2. To impart knowledge of how to beautify the home interiors, terrace or roof and gardens with the help of ornamental plants. CO 3. To make students able to prepare their own nutrient gardens even within the small space. CO 4. To impart knowledge of bio based organic gardening.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2023
Pre-requisite	Elementary knowledge of plant cultivation and interest in so doing.
Teaching Methodology	Class Room Teaching, Discussion and Assignment
Evaluation Method	Continuous And Comprehensive Evaluation (CCE) (50%) Semester End Evaluation (SEE) (50%)

**Course Content**

Units	Particulars	% Weightage of Unit	Minimum Nos. of Hours
1	Gardening: Introduction <ul style="list-style-type: none">• Types of Gardens: Roof, Sunken, Vertical, Terrace, Water, Bog, Shade, Rock, Terrarium, Bottle & Dish Gardens• Home gardens: Importance, Characteristics, Important things to be considered, types of home gardens• Different production systems: Bed planting, Pit planting, Sack planting, Trellis growing, Vertical Growing, Multilayer Growing, Hydroponics• Ornamental gardening and Kitchen gardening• Tools & basic equipment used in gardening• Soil care: soil testing & amendments• Preparation of soil for gardening: Beds (raised bed, open bed, sheet mulch), Pots/Planters (Container tote method), Hanging/Vertical Garden• Working with the seedlings: differentiation between good and bad seeds, heirloom, hybrid and GMO seeds• Working with direct seeded crops• Various ways to propagate plants• Watering• Companion planting	25	15
2	Home Gardening: In door Out door <ul style="list-style-type: none">• Interior scaping: Significance, Environmental factors in indoor gardening (Light, Humidity), Selection of indoor plants, Management, Methods of indoor gardening (Hanging baskets and window boxes, terrariums)• Landscape design for a Home Garden: Introduction, Plan designing, Principal areas of a home garden, Points to be considered in designing home garden, processing of home garden, Garden plans for small areas, Trees suitable for small areas, Roof gardening & vertical gardening• Lawn: Introduction, Common grass species used for lawn making, its establishment and maintenance• Roof/terrace gardening: Construction of roof, Pot, containers, constructed bed or adoption of suitable horticulture roof, Sun loving plants and shade loving	25	15



	plants (use of agro-shade net and UV stabilized polythene), Lawn in roof garden		
3	<p>Kitchen Garden</p> <ul style="list-style-type: none"> • Introduction to kitchen garden: • Importance & Benefits of kitchen garden • Principles & components of kitchen gardening: Site selection, selection of plants, garden design & layout, containers/site preparation, protection, seed sowing & transplanting, water management, nutrient management, extraction & storage of vegetable seeds • Cropping system suitable for kitchen garden: crop rotation, inter-planting, mixed planting, relay planting, succession planting, edge planting • Advantages & disadvantages of kitchen gardens • Ganga Ma Mandal Model for House hold Nutrition • Microgreens: an ultimate superfood, nutritional composition, indoor outdoor cultivation, harvesting and packaging of microgreens 	25	15
4	<p>Organic Farming</p> <ul style="list-style-type: none"> • Introduction, concept, ethics, objectives and characteristics of organic farming • Compost: Principles of composting, Methods of composting • Green manuring: Types & Advantages • Vermicomposting: preparation, Benefits, Uses, Origin, Basic characteristics of earthworms suitable for vermicomposting, maintenance of base cultures and Methods of vermicomposting • Recycling of Organic residues • Biofertilizers: Importance & Benefits • Organic weed management • Soil Improvement & soil amendments • Water management: Rain water harvesting, Importance of reuse and recycling of water, Drip irrigation • Biopesticides/Pest control methods: Home remedies for Pest and Plant Diseases 	25	15
<p>List of References & Text Books:</p> <ul style="list-style-type: none"> • http://ecoursesonline.iasri.res.in/ • Kalpana Yadav, “Microgreens: An ultimate superfood”.Indian Horticulture May-June 2021 • Hasiru Dala, “Organic Terrace Gardening Training: Growing Your Own Food” • Ministry of Human Resource Development, Department of School Education & Literacy, “School Nutrition (Kitchen) Gardens Guidelines. 			



- Kartik Pramanik, Priyadarshini Mohapatra, “Construction of kitchen garden”
- S S Reddy, Siddartha Naik, Biswajit Pramanik, “ganga ma mandal model: a nutri-garden model for household nutrition”
- **Thunam Srikanth, Dr. K. Venkata laxmi and Mrs. Gadde. Jyothi, “Terrace Gardening”.**
- Mugisa, I.O., Molly, A., Muyinda, M., Gafabusa, R., Kituuka, G., Kyampeire, B., Atim, J., Nampeera, M., Nafula. R., Sseruwu, G., Kabanyoro, R., and Akello, B.O. 2016. A farmers’ guide to home gardening: how to establish and manage home gardens. NARO- Mukono Zonal Agricultural Research and Development Institute, Uganda.
- Bidyuth K. Mahalder, FAO; Md. Moksed Ali, FAO; Saimunnahar Ritu, FAO, “HOMESTEAD GARDENING GUIDELINES: Vegetable production for household consumption using minimal space in Rohingya c amps and host communities”

Practicals/Assignment:

1. Nutrient garden model preparation for Gujarat
2. Preparation of Ganga Ma Mandal Model

COURSE OUTCOMES

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

CO 1	Understand how the home garden are to be constructed, their benefits, requirements for construction, etc.
CO 2	Understand how the ornamental plants can be cultivated both in door and our door.
CO 3	Understand how the vegetables can be cultivated in small space.
CO 4	Understand the usage and manufacturing of biological fertilizers, composts, pesticides at home, water management, etc.

COURSE OUTCOMES MAPPING

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Gardening: Introduction					
2	Home Gardening: In door Out door					
3	Kitchen Garden					
4	Organic Farming					

COURSE ARTICULATION MATRIX

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1							
CO2							
CO3							



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Department of Biotechnology

BSc Biotechnology Program

FY B.Sc.

Semester I

IKS201-1C: Indian Knowledge System

Credit 2

Contact Hour per week 2

Outline of the Course:

Course type	Theory
Purpose of Course	The course is intended to provide undergraduates with a foundational guide to the history, culture and philosophy of India and introduce them to the main themes and debates relating to that history.
Course Objective	CO 1. To provide a general introduction to Indian Knowledge System (IKS) and sensitize the students to the contributions made by ancient Indians in the field of Science, Philosophy and related applications and concepts. CO 2. Understanding the scientific value of the traditional knowledge of Bharata CO 3. Promoting the youths to do research in the various fields of Bhartiya knowledge system CO 4. Converting the Bhartiya wisdom into the applied aspect of the modern scientific paradigm
Minimum weeks per Semester	15
Last Review / Revision	June 2023
Pre-requisite	Eagerness to learn our ancient culture, our tradition.
Teaching Methodology	Class Room Teaching, Discussion and Assignment
Evaluation Method	Continuous And Comprehensive Evaluation (CCE) (50%) Semester End Evaluation (SEE) (50%)

**Course Content**

Units	Particulars	% Weightage of Unit	Minimum Nos. of Hours
1	Indian Knowledge System <ul style="list-style-type: none">• Definition, Importance & The IKS Corpus: classification framework• Caturdasa vidyasthanana (introductory information)<ul style="list-style-type: none">○ 14 branches of learning in ancient India- Purana, Nyaya, Mimamsa, Dharma sastra○ Six Vedanga- Siksha, Vyakarana, Nirukta, Chanda, Jyotisa, Kalpa○ Four Vedas: Rigveda, Yajurveda, Samaveda and Atharvaveda• Upavedas and Upanishads: introductory information on them• Sastras and some introductory information on them• 18 Puranas: Their names and five general characteristics• The Itihasas: Ramayana and Mahabharata (Learnings from them in brief)	20	6
2	Indian Astronomy: <ul style="list-style-type: none">• Unique aspects of Indian Astronomy• Historical development of Astronomy in India• The Celestial coordinate system: observation of motion of celestial bodies in the Vedic corpus. Sun, Moon, Nakshatra & Graha• Elements of Indian calendar systems as followed in different regions of India• Aryabhatiya and the Siddhantic tradition• Panchang- The Indian calendar system• Astronomical Instruments (Yantras)• Jantar Mantar of Raja Jai Singh Sawai• Prediction of monsoon rains; Parashar, Varahamithira, Pachanga, comparison with modern methods.	20	6
3	Indian Health Science <ul style="list-style-type: none">• Basic concept of Ayurveda- Definition of Health• Vedic foundations of Ayurveda and its relevance with maintenance of good health and treatment of diseases• Concepts of Three Doshas, Pancha-Mahabhuta and Sapta-dhatu and their relationship to Health• The importance of Agni (digestion). Six Rasas and their relation to Doshas.	20	6



	<ul style="list-style-type: none">• Ayurvedic view of the cause of diseases.• Daily regimen for health and wellness & Ritucharya or seasonal regimen.• Disease management<ul style="list-style-type: none">○ Diagnostic techniques○ Sleep and food – importance to health○ Drugs and physical therapy• Yoga way of life – relevance to health and wellness		
4	Indian Agriculture <ul style="list-style-type: none">• Agricultural heritage – early history & its importance• Ancient agricultural practices• Indus civilization, Vedic civilization and relevance of heritage to present day agriculture• Status of farmers in society from ancient time to till date• Plant protection through indigenous traditional knowledge during harvesting, threshing and storage• Indigenous & introduced crops: rice, sugarcane and cotton.• Gardening in ancient and medieval period, Vegetable farming, floriculture (perfumes), Medicinal plants and their relevance today	20	6
5	Indian Metallurgy <ul style="list-style-type: none">• Vedic references to metals and metal working: The Indian S & T heritage• Mining and ore extraction• Metals and metalworking technology: gold, inc, copper, mercury, lead and silver• Extraction of Iron from Biotite by Ayurvedic method & Manufacturing of steel• Wax casting of idols and artefacts	20	6
List of References & Text Books: <ul style="list-style-type: none">• Mahadevan B., Bhat V. R., Nagendra P. R. N., Introduction to Indian Knowledge System: Concepts and Applications.• https://kiran.nic.in/Agri-Heritage.html• Nene, Y.L. and Choudhary, S.L. 2002. Agricultural heritage of India. Asian Agri – History foundation, Secundrabad.• A History of Hindu Chemistry. By Praphulla Chandra. Ray			

**COURSE OUTCOMES**

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

CO 1	Course will aware students about greatest epic historical texts which will demonstrate real meaning of life as well as students will get knowledge about religious rituals of India
CO 2	Studies will also influence students about everything present in universe and brief about the Indian calendar system which will be followed by various religion in India.
CO 3	Students will learn ancient techniques and treatment related to health science which is treasure of Indian knowledge system.
CO 4	Course will impart knowledge about agriculture and its importance in Indian history as well as in present time.
CO 5	Course will provide knowledge about importance of metals., its mining and working technology of metals.

COURSE OUTCOMES MAPPING

Unit No.	Unit Name	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Indian Knowledge System	■				
2	Indian Astronomy		■			
3	Indian Health Science			■		
4	Indian Agriculture				■	
5	Indian Metallurgy					■

COURSE ARTICULATION MATRIX

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1							
CO2							
CO3							



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Department of Biotechnology

BSc Biotechnology Program

FY B.Sc.

Semester I

IKS201-1C: Indian Knowledge System

Credit 2

Contact Hour per week 2

Outline of the Course:

Course type	Theory
Purpose of Course	The course is intended to provide undergraduates with a foundational guide to the history, culture and philosophy of India and introduce them to the main themes and debates relating to that history.
Course Objective	CO 1. To provide a general introduction to Indian Knowledge System (IKS) and sensitize the students to the contributions made by ancient Indians in the field of Science, Philosophy and related applications and concepts. CO 2. To demonstrate the evolution of Indian teaching and involvement of Sanskrit in linguistics CO 3. To demonstrate the students about the contributions of ancient sages and saints. CO 4. To demonstrate the students the scientific approach of IKS in Ayurveda.
Minimum weeks per Semester	15
Last Review / Revision	June 2023
Pre-requisite	Eagerness to learn our ancient culture, our tradition.
Teaching Methodology	Class Room Teaching, Discussion and Assignment
Evaluation Method	Continuous And Comprehensive Evaluation (CCE) (50%) Semester End Evaluation (SEE) (50%)

**Course Content**

Units	Particulars	% Weightage of Unit	Minimum Nos. of Hours
1	Indian Knowledge System/Bhartiya Gyan Parampara <ul style="list-style-type: none">• Definition, Importance and Historical aspects of IKS Foundational Literature of Indian Civilization <ul style="list-style-type: none">• The IKS Corpus: classification framework: Caturdasa vidyasthana, Vedas, Vedanga, Purana, Nyaya, Mimamsa, Dharma sastra, Upavedas and Upanishads	25	7
2	Bhartiya Education System and its philosophy <ul style="list-style-type: none">• History of BES from Ancient to Modern era• Domains of Education: Gurukul, Pathshala, Vidyalay, Vishvavidyalay Linguistics <ul style="list-style-type: none">• Linguistics: Components of a language - Paṇini's work on Sanskrit grammar - Phonetics in Sanskrit and the role of Sanskrit in natural language processing.	25	8
3	Contribution of Indian Sages and Saints in Science <ul style="list-style-type: none">• Acharya Kanad, Bhaskaracharya I, Bhaskaracharya II, Acharya Charak, Acharya Sushruta, Vymaanika Shaastra by Sage Bharadwaj, Rishi Kanva, Kapil Muni, Patanjali, Acharya Aryabhata, Varaha Mihira, Baudhayana, Acharya Nagarjuna, Panini, Rishi Agastya, Sage Vishwamitra	25	7
4	Scientific Approaches of IKS in Ayurveda (Health and Wellness) <ul style="list-style-type: none">• Basic concept of Ayurveda• Vedic foundations of Ayurveda and its relevance with maintenance of good health and treatment of diseases• Concepts of Three Doshas, Pancha-Mahabhuta and Sapta-dhatu and their relationship to Health• The importance of Agni (digestion). Six Rasas and their relation to Doshas.• Ayurvedic view of the cause of diseases.	25	8

**COURSE OUTCOMES**

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

CO 1	Course will aware students about greatest epic historical texts which will demonstrate real meaning of life as well as students will get knowledge about religious rituals of India
CO 2	Students will be aware about how the teaching learning process was taken place in ancient time and how it has been evolved through the ages. Also, how the Sanskrit Grammer is involved in linguistics
CO 3	Students will get knowledge about the contributions of our saints and sages in development of science. This would convey how reach our Sanskruti was in ancient time.
CO 4	Students will learn ancient techniques and treatment related to health science which is treasure of Indian knowledge system.

COURSE OUTCOMES MAPPING

Unit No.	Unit Name	Course Outcomes			
		CO1	CO2	CO3	CO4
1	Indian Knowledge System & Foundational Literature of Indian Civilization	■			
2	Bhartiya Education System and its philosophy & Linguistics		■		
3	Contribution of Indian Sages and Saints in Science			■	
4	Scientific Approaches of IKS in Ayurveda (Health and Wellness)				■

COURSE ARTICULATION MATRIX

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1							
CO2							
CO3							