Programme Matrix: Bachelor of Science- Botany, Biotechnology, and Biochemistry [2019 Batch]

FACULTY OF LIFE SCIENCES

B.Sc. Botany, Biotechnology, Biochemistry

Programme Educational Objectives

PEO1: To acquire theoretical and practical knowledge in Botany, Biotechnology and Biochemistry.

PEO2: To instill scientific temperament to contribute to human development.

PEO3: To empower the students with employability skills and professional ethics.

Programme Outcome

After the successful completion of the 3 year B.Sc. BBB Programme, the graduate will be able to:

PO1: Apply professional and social skills to cater to the needs of the industry, society and global scientific community.

Programme Specific Outcomes

After the successful completion of the 3 year B.Sc. BBB Programme, the graduate will be able to:

PSO1: Appraise national and global issues in biological sciences.

PSO2: Perform effectively with professional ethics in the domains of Botany, Biotechnology and Biochemistry.

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I Semester

Course Type	Course Code	Course Title	Course Outcomes
MIL [Any ONE to be Opted]			
AECC	**AEN103A11**	**Additional English I**	1. Describe and differentiate between genres of poetry like ballads and sonnets. 2. Analyze critically the writing style of prose writers. 3. Develop interest to appreciate one act plays. 4. Apply the rules of punctuation to write concisely. 5. Demonstrate proficiency in creating leaflets and brochures.
AECC	**KAN103A11**	**Kannada I**	1. ಕನ್ನಡ ಸಾಹಿತ್ಯದ ವಿವಿಧ ಪ್ರಕಾರಗಳನ್ನು ತಿಳಿಯುವರು. 2. ಸಾಹಿತ್ಯದಲ್ಲಿ ಅಡಗಿರುವ ಸಾಮಾಜಿಕ ಮೌಲ್ಯಗಳನ್ನು ಅಳವಡಿಸಿಕೊಳ್ಳುವರು. 3. ಭಾಷಾ ಕೌಶಲ್ಯಗಳನ್ನು ಮೆರುಗುಗೊಳಿಸಿಕೊಳ್ಳುವರು
AECC	**HIN103A11**	**Hindi I**	1. हिंदी साहित्य के गद्य़ विधाओं को विश्लेषण करने की क्षमता का विकास 2. विद्यार्थयों में सामाजिक यथार्थ का मूल्यांकन करने का ज्ञान 3. सृजनात्मक कौशल्य में परिपूर्णता 4. गद्य विधाओं का अध्ययन करने के बाद सामाजिक मूल्यों का ज्ञान प्राप्त 5. अनुवाद कला और भाषा में परिशुद्धता
Compulsory Courses			
AECC	**ENG103A11**	**English I**	1. Demonstrate ability to identify nuances of prose and poetry 2. Develop the skill to appreciate prose and poetry 3. State the basic concepts of grammar and its usage 4. Develop communicative skills and become competent users of English in real life situations
DSCC	**BTG203A11**	**Biotechnology I [Cell Biology]**	1. Explain the structure of prokaryotic and eukaryotic cells, functions of the cell and the fundamentals of microscopy. 2. Review the structural and functional organization of cell organelles 3. Appraise the mechanisms of cell motility 4. Relate to the mechanism of cell division and programmed cell death.
DSCL	**BTG2L1A11**	**Biotechnology Practical I**	1. Demonstrate the use of compound microscope and micrometer. 2. Adopt staining techniques to observe mitosis and meiosis. 3. Perform the experiments to isolate chloroplast, nucleus and staining of mitochondria.
DSCC	**BCH203A11**	**Biochemistry I [Biophysical Chemistry]**	1. Describe the fundamentals of atomic structure and properties of elements based on periodic table. 2. Explain the properties of chemical bonds and hybridization pattern. 3. Apply the concept of acids and bases in determining the ph and list the applications of electrochemical series. 4. Summarize the principles and applications of adsorption, surface tension and viscosity. 5. Illustrate the detection and measurement of radioactivity and its applications
DSCL	**BCH2L1A11**	**Biochemistry Practical I**	1. Perform titrimetric estimations using standard solutions. 2. Demonstrate experiment to determine the hardness of water. Execute gravimetric estimations of sulphate and magnesium.

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DSCC	**BOT203A11**	**Botany I [Diversity of Non-Vascular Plants]**	1. Describe the diversity, characteristics, structure and economic importance of algae 2. Explain green algae, blue green algae, red and brown algae 3. Infer symbiotic relationships of algae 4. Illustrate the method of biofertilizer production and single cell protein
DSCL	**BOT2L1A11**	**Botany Practical I**	1. Formulate algal culture media 2. Create temporary sections of algal parts

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II Semester

Course Type	Course Code	Course Title	Course Outcomes
MIL [Any ONE to be Opted]			
AECC	**AEN103A21**	**Additional English II**	1. Explain the meaning of select poetry, prose, and drama of writers from India, England, Chile, France, Nigeria and Canada by placing the texts in the cultural context. 2. Analyze the issues of race, problems faced by fisher community and women, futility of war, societal fabrications, Nazism, religion, spirituality, partition, and the political tensions in professional field relate and frame opinions on racial issues, war, struggles of women and the marginalized community. 3. Interpret film text 'Life is beautiful' and learn the historical background of the reign of Hitler and the injustices in concentration camps. 4. Solve questions on idioms, super ordinates, and hyponyms.
AECC	**HIN103B21**	**Hindi II**	1. काव्य अध्ययन में संगीतात्मक शौली को समझ लेता है 2. काव्य को विश्लेषण करने की क्षमता 3. काव्य में निहित विचारों का मूल्यांकन 4. काव्य सृजन करने का कौशल्य 5. व्याकरणिक भाषा का ज्ञान एवं स्पष्टता
AECC	**KAN103B21**	**Kannada II**	1. ಕನ್ನಡ ಸಾಹಿತ್ಯದ ವಿವಿಧ ಪ್ರಕಾರಗಳನ್ನು ತಿಳಿಯುವರು. 2. ಸಾಹಿತ್ಯದಲ್ಲಿ ಅಡಗಿರುವ ಸಾಮಾಜಿಕ ಮೌಲ್ಯಗಳನ್ನು ಅಳವಡಿಸಿಕೊಳ್ಳುವರು. 3. ಭಾಷಾ ಕೌಶಲ್ಯಗಳನ್ನು ಮೆರುಗುಗೊಳಿಸಿಕೊಳ್ಳುವರು.
Compulsory Courses			
AECC	**ENG103A21**	**English II**	1. Discuss the use of animal imagery and hypersensitive characters in the twentieth century writings 2. Describe poetic style and its devices in the English verses of the Victorian Age 3. Analyze poems and sonnets regarding existentialist and metaphysical themes 4. Discover and implement new strategies of grammar in speaking English language 5. Integrate the prominence of media and the elements of advertising by creating media awareness
AECC	**NES102A01**	**Environmental Science**	1. Discuss the overexploitation of natural resources. 2. Appraise the components of ecosystem. 3. Assess the conservation of biodiversity. 4. Criticize the mitigation process of natural disasters. 5. Survey the effects of pollution in the environment. 6. Recommend the various policies for the betterment of environment.
DSCC	**BTG203A21**	**Biotechnology II [General Microbiology]**	1. Explain the fundamentals of microscopy, staining and sterilization used in microbiology 2. Appraise the essential concepts of microbial nutrition and growth. 3. Summarize the structure and life cycle of virus 4. Describe the ultrastructure of bacteria 5. Illustrate the characteristics, classification and reproduction of fungi and algae
DSCL	**BTG2L1A21**	**Biotechnology Practical II**	1. Demonstrate safety measures, instrumentation and sterilization methods in a Microbiology laboratory 2. Formulate media for the isolation, culture and enumeration of microorganisms. 3. Perform fundamental staining techniques and biochemical tests for the identification of bacteria and fungi. 4. Execute Antibiotic sensitivity test to study microbial resistance

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DSCC	**BCH203A21**	**Biochemistry II [Biomolecules]**	1. Infer the spatial configuration and structural forms of biomolecules. 2. Classify carbohydrates, amino acids, lipids, nucleic acids, vitamins and minerals. 3. Assess physical and chemical properties of carbohydrates, amino acids and lipids. 4. Illustrate the biological importance of biomolecules. 5. Explain denaturation, renaturation and packing properties of DNA.
DSCL	**BCH2L1A21**	**Biochemistry Practical II**	1. Perform qualitative analysis of sugars. 2. Execute qualitative analysis of amino acids.
DSCC	**BOT203A21**	**Botany II [Mycology, Lichens, Mycorrhiza, Plant Pathology, Bryophytes and Plant Anatomy]**	1. Paraphrase classification, structure, life cycle and economic importance of fungi 2. Summarize the morphology and reproductive mechanisms of various classes of fungi 3. Identify plant diseases, symptoms and its preventive measures 4. Discuss parasitic mechanisms of fungi
DSCL	**BOT2L1A21**	**Botany Practical II**	1. Perform isolation and identification of fungi from soil samples 2. Create temporary slides of vegetative and reproductive structures of fungi

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III Semester

Course Type	Course Code	Course Title	Course Outcomes
MIL [Any ONE to be Opted]			
AECC	**AEN103A31**	**Additional English III**	1. Appreciate the theme of love and suspense in the works of Alfred Noyes, Robert Southey, Sir Arthur Conan Doyle and Shakespeare 2. Discover the sufferings of human being in the works of Tagore, Mary Fisher, Charley Chaplin, John Stainbeck and Philip Larkin 3. Analyses the dramatic techniques in the prescribed one act play 4. Outline the difference between essay writings and precis writing 5. Develop the interest on poem and prose
AECC	**HIN103B31**	**Hindi III**	1. हिंदी कविता और खंडकाव्य के भेद को समझलेता है 2. पौराणिक कथा का विश्लेषण करता है 3. पौराणिक काव्य में आदर्श विचारों का अनुकरण करता है 4. आधुनिक और पौराणिक विचारो का मूल्यांकन 5. काव्य सृजन शौली का विकास
AECC	**KAN103B31**	**Kannada III**	1. ಕನ್ನಡ ಸಾಹಿತ್ಯದ ವಿವಿಧ ಪ್ರಕಾರಗಳನ್ನು ತಿಳಿಯುವರು. 2. ಸಾಹಿತ್ಯದಲ್ಲಿ ಅಡಗಿರುವ ಸಾಮಾಜಿಕ ಮೌಲ್ಯಗಳನ್ನು ಅಳವಡಿಸಿಕೊಳ್ಳುವರು. 3. ಭಾಷಾ ಕೌಶಲ್ಯಗಳನ್ನು ಮೆರುಗುಗೊಳ್ಳಿಸಿಕೊಳ್ಳುವರು
Compulsory Courses			
AECC	**ENG103A31**	**English III**	1. State the problems of a man and the significance of parental affection in real life. 2. Review the historical background of true events in roman history. 3. Extrapolate the reflections on the lives of writers in literary genres. 4. Interpret the significance of English literature in the forms of movies and serials in media. 5. Formulate the structure of oral and written presentations and develop speaking skills.
DSCC	**BTG203A31**	**Biotechnology III [Bioinstrumentation and Biostatistics]**	1. Describe the methods of centrifugation and electrophoresis. 2. Illustrate the working principle and applications of spectroscopy. 3. Appraise the principles, methods and applications of adsorption and partition chromatography. 4. Relate to the significance of measures of central tendency, dispersion, hypothesis testing and probability in analyzing biological data .
DSCL	**BTG2L1A31**	**Biotechnology Practical III**	1. Perform paper chromatography for the separation of amino acids and leaf pigments. 2. Execute isolation of dna and separation by gel electrophoresis 3. Demonstrate bacterial growth curve by colorimetry
DSCC	**BCH203A31**	**Biochemistry III [Bioanalytical Techniques]**	1. Summarize the principle and applications of centrifugation, chromatography, electrophoresis. 2. Describe the instrumentation and applications of spectroscopy. 3. Illustrate the usage of different types of biosensors
DSCL	**BCH2L1A31**	**Biochemistry Practical III**	1. Formulate citrate and phosphate buffers. 2. Demonstrate the separation of amino acids using paper and thin layer chromatography. 3. Execute gel electrophoresis for the separation of nucleic acids and proteins.

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DSCC	**BOT203A31**	**Botany III [Pteridophytes and Environmental Biology]**	1. Describe General characteristics, occurrence, distribution, structure and reproduction of Bryophytes and Pteridophytes 2. Appraise the mechanism of fossilization and its types 3. Illustrate the structure and reproduction of Gymnosperms 4. Explain tissues of vascular plants
DSCL	**BOT2L1A31**	**Botany Practical III**	1. Create temporary slides of plant tissues 2. Trace permanent slides of different tissues of plants

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IV Semester

Course Type	Course Code	Course Title	Course Outcomes
MIL [Any ONE to be Opted]			
AECC	**AEN103A41**	**Additional English IV**	1. Interpret select poems of Robert Frost, Sarojini Naidu and William Blake. 2. Explain the style and significant features of prose writings of R. K Narayan, Willa Cather, Doris Lessing, O. Henry, and Booker. T. Washington. 3. Compare the ethical and cultural differences in Wole Soyinka's play 'The Lion and the Jewel' and learn the unique native culture of Nigeria. 4. Assess the issues related to marriage, education, moral code of conduct, the concept of sublime, modernity, tradition, and the mindsets of human beings in life. 5. Appraise the literary devices and techniques used in poetry and prose. Formulate grammatically correct sentences using proper punctuations. 6. Create citations of books, articles and journals using MLA format 8th edition.
AECC	**HIN103B41**	**Hindi IV**	1. हिंदी व्यंग्य अध्ययन करने की शौली को समझलेता है 2. व्यंग्य में निहित विचारों का विश्लेषण 3. व्यंग्य कथाओं में अभिव्यक्त विचारों का मूल्यांकन 4. निबंधों में निहित आदर्श विचारों का अनुकरण 5. व्यंग्य सृजन कौशल्य का विकास
AECC	**KAN103B41**	**Kannada IV**	1. ಕನ್ನಡ ಸಾಹಿತ್ಯದ ವಿವಿಧ ಪ್ರಕಾರಗಳನ್ನು ತಿಳಿಯುವರು. 2. ಸಾಹಿತ್ಯದಲ್ಲಿ ಅಡಗಿರುವ ಸಾಮಾಜಿಕ ಮೌಲ್ಯಗಳನ್ನು ಅಳವಡಿಸಿಕೊಳ್ಳುವರು. 3. ಭಾಷಾ ಕೌಶಲ್ಯಗಳನ್ನು ಮೆರುಗುಗೊಳಿಸಿಕೊಳ್ಳುವರು
Compulsory Courses			
AECC	**ENG103A41**	**English IV**	1. Recognize, define, and identify poetic terms and genres. 2. Examine novels analytically and interpretively, to identify literary elements like plot, character, setting, tone, point of view, theme, style, symbol, metaphor, and image. 3. Analyze the characters and themes of one act plays. 4. Acquire vital employability skills and employment opportunities with in-depth knowledge of CV, cover letter, report writing and paragraph writing.
DSCC	**BTG203A41**	**Biotechnology IV [Molecular Biology]**	1. Appraise the structure and functions of nucleic acids, DNA replication and repair mechanisms 2. Summarize the events and mechanism of protein synthesis 3. Describe the concepts and process of gene regulation in prokaryotes and eukaryotes.
DSCL	**BTG2L1A41**	**Biotechnology Practical IV**	1. Adopt a method to estimate nucleic acids. 2. Perform chemical lysis of rbc 3. Execute precipitation and estimation of proteins from animal or plant source
DSCC	**BCH203A41**	**Biochemistry IV [Human Physiology]**	1. Explain the structure, defect and mechanistic interplay of photo pigments of eye 2. Describe the components of blood and mechanism of respiration 3. Infer the process of human digestion and excretion 4. Illustrate the mechanism of muscle contraction and neurotransmission 5. Relate anatomy and endocrinology of reproductive system

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DSCL	**BCH2L1A41**	**Biochemistry Practical IV**	1. Adopt methods to estimate nucleic acids, proteins and glucose. 2. Demonstrate prothrombin time and erythrocyte sedimentation rate to analyze blood clot formation.
DSCC	**BOT203A41**	**Botany IV [Gymnosperms and Embryology of Angiosperms]**	1. Describe the development and structure of male and female gametophyte in flower 2. Explain the process of fertilization in flower 3. Classify monocot and dicot embryo 4. Relate seed structure and its development
DSCL	**BOT2L1A41**	**Botany Practical IV**	1. Perform wet mount of reproductive structures of flower. 2. Trace the permanent slides of pollen and ovules.
NCCC	**LSE5A2A41**	**Life Skills Education**	1. Analyze the emotional competence at work place. 2. Design the empathy map for the people.

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V Semester

Course Type	Course Code	Course Title	Course Outcomes
DSCC	**BTG203A51**	**Biotechnology V [Genetic Engineering]**	1. Illustrate the steps and role of enzymes in gene cloning and construction of gene libraries 2. Review the importance of vectors and host systems in gene cloning 3. Compare the physical, chemical, and biological methods of genetic transformation. 4. Appraise the techniques of blotting, sequencing, dna synthesis and amplification
DSCL	**BTG2L2A51**	**Biotechnology Practical V**	1. Master the procedures for isolation of genomic DNA from microbial, plant and animal sources. 2. Perform isolation and purification of plasmid DNA. 3. Execute spectrometric quantification of DNA and separation by gel electrophoresis. 4. Demonstrate competent cell preparation for bacterial transformation and follow screening and selection of transformants.
DSCC	**BTG203A52**	**Biotechnology VI [Immunology and Animal Biotechnology]**	1. Differentiate humoral and cell mediated immune responses, and the cells and organs involved in immunity 2. Illustrate the mechanisms and applications of antigen and antibody interactions 3. Appraise the concepts of vaccination and immunization 4. Review the principles and applications of animal cell culture
DSCL	**BTG2L2A52**	**Biotechnology Practical VI**	1. Perform blood grouping, differential count of WBC, Widal and venereal disease research laboratory tests. 2. Demonstrate agglutination and precipitation reactions. 3. Perform mechanical disintegration of liver tissue for primary culture 4. Execute serum separation from blood and precipitation of immunoglobulins.
DSCC	**BCH203A51**	**Biochemistry V [Advanced Bimolecular Chemistry]**	1. Assess the functions of biomolecules in cell organelles. 2. Classify carbohydrates, amino acids, lipids and its structural configuration 3. Illustrate properties and biological importance of biomolecules 4. Composition, functions and structure of membrane models. 5. Analyze the concept of bioenergetics in spontaneous biochemical reactions.
DSCL	**BCH2L2A51**	**Biochemistry Practical V**	1. Trace the concentration of blood glucose, amino acids, calcium and ascorbic acid in biological samples. 2. Adopt method to prepare casein and starch. 3. Demonstrate experiment to check the quality of lipid.
DSCC	**BCH203A52**	**Biochemistry VI [Enzymes and Enzyme Technology]**	1. Explain classification, properties, characterization and mechanism of enzymes. 2. Illustrate the kinetics involved in inhibition and regulation of enzymes. 3. Appraise the role of coenzymes, cofactors in the action of enzymes. 4. Assess the industrial production of enzymes from biological sources and enzyme immobilization. 5. Illustrate the applications of enzymes in clinical diagnosis.
DSCL	**BCH2L2A52**	**Biochemistry practical VI**	1. Demonstrate the preparation of crude enzymes. 2. Execute enzyme assay of amylase and acid phosphatase. 3. Perform optimization of factors affecting enzyme activity.
DSCC	**BOT203A51**	**Botany V [Taxonomy and Economic Botany]**	1. Classify different systems of classification of taxonomy 2. Describe herbarium techniques and identify its taxonomical keys 3. Distinguish between monocot and dicot plants 4. List and label botanical and common names, plant families, parts used & its medicinal importance

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DSCL	**BOT2L2A51**	**Botany Practical V**	1. Trace the taxonomic characteristics of plant families. 2. Create herbarium specimens of plant parts
DSCC	**BOT203A52**	**Botany VI [Cytology, Genetics, Evolution and Plant breeding]**	1. Explain about Mendel experiment and method of calculation. 2. Infer different types of gene interaction. 3. Summarize chromosome theory of inheritance and numerical aberrations. 4. Describe about plant breeding and germplasm conservation.
DSCL	**BOT2L2A52**	**Botany Practical VI**	1. Create temporary squash of mitosis and meiosis. 2. Construct karyotyping 3. Solve genetics numerical.
NCCC	**EEC5A2A51**	**Extra-Curricular and Extension Activities as per Annexure II**	1. Adopt self-awareness, empathy, creative thinking, critical thinking, coping with emotions and stress for intra-personal effectiveness 2. Develop communication skills, inter-personal skills, problem solving and decision making skills for inter-personal effectiveness

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VI Semester

Course Type	Course Code	Course Title	Course Outcomes
DSCC	**BTG203A61**	**Biotechnology VII [Plant Biotechnology]**	1. Appraise the sterilization techniques, culture methods and generation of variants in plant tissue culture. 2. Illustrate the methods of plant transformation and its applications. 3. Explain the importance of intellectual property rights in biotechnology. 4. Summarize the application of biotechnology in the production of energy, fertilizers and extraction of minerals. 5. Justify the importance of conventional and biotechnological methods of waste management and bio-remediation
DSCL	**BTG2L2A61**	**Biotechnology Practical VII**	1. Demonstrate the concentration of glycogen from liver. 2. Perform experiment to estimate glucose, ketoses, nucleic acid from biological samples. 3. Adopt a method to estimate chlorophyll from green leaves.
DSCC	**BTG203A62**	**Biotechnology VIII [Industrial Biotechnology]**	1. Perform culture of *Spirullina*, *Agaricus*, Yeast and *Aspergillus* 2. Execute citric acid, lactic acid, and lactose and alcohol estimation. 3. Demonstrate immobilization of yeast cells using gel entrapment. 4. Execute wine preparation
DSCL	**BTG2L2A62**	**Biotechnology Practical VIII**	1. Perform the biochemical tests to determine the level of urea and uric acid from clinical sample. 2. Trace the levels of liver function enzymes. 3. Adopt a method to estimate the level of blood glucose and cholesterol.
DSCC	**BCH203A61**	**Biochemistry VII [Intermediary Metabolism]**	1. Relate the process of anabolism, catabolism with metabolic pathways in cells and energy conservation. 2. Describe the pathways involved in synthesis of biomolecules. 3. Summarize the metabolic pathway and energetics involved in carbohydrates, proteins, lipids and nucleic acids. 4. Explain the role of electron transport chain in cellular respiration.
DSCL	**BCH2L2A61**	**Biochemistry Practical VII**	1. Demonstrate the concentration of glycogen from liver. 2. Perform experiment to estimate glucose, ketoses, nucleic acid from biological samples. 3. Adopt a method to estimate chlorophyll from green leaves
DSCC	**BCH203A62**	**Biochemistry VIII [Clinical Biochemistry]**	1. Describe the biochemical basis of disorders due to errors in carbohydrate, lipid, amino acid & nucleic acid metabolism. 2. Illustrate the clinical manifestations of metabolic disorders. 3. Interpret the gastric, pancreatic and intestinal function test. 4. Analyze the types of liver and kidney function test for diagnosis.
DSCL	**BCH2L2A62**	**Biochemistry Practical VIII**	1. Perform the biochemical tests to determine the level of urea and uric acid from clinical sample. 2. Trace the levels of liver function enzymes. 3. Adopt a method to estimate the level of blood glucose and cholesterol.
DSCC	**BOT203A61**	**Botany VII [Molecular Biology, Genetic Engineering, Biotechnology and Plant Physiology I]**	1. Explain the role and importance of water in plant metabolism. 2. Examine the role of minerals as nutrition in plants. 3. Summarize the cyclic pathways of photosynthesis and respiration in plants. 4. Discuss the physiological responses of plants to biotic and abiotic stress
DSCL	**BOT2L2A61**	**Botany Practical VII**	1. Perform and determine the physiological parameters of plants. 2. Execute the estimation of transport mechanisms in plants

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DSCC	**BOT203A62**	**Botany VIII [Plant Physiology II]**	1. Relate the scope and importance of unnani, siddha and ayurvedic traditional medicines 2. Recognize plants drugs from root, stem, leaves, seed and flowers 3. Illustrate the pharmacological action of plant drugs. 4. Assess plant based crude drug processing
DSCL	**BOT2L2A62**	**Botany Practical VIII**	1. Formulate plant based crude drug.Trace the names of common medicinal plants and its specific parts.
DSEP	**LSC2P2A61**	**Project**	1. Demonstrate sound knowledge and skills on the research topic 2. Design and conduct experiments individually 3. Interpret the results of research 4. Report research findings orally and in manuscripts