Digambrrao Bindu Smark Samit's

Digambrrao Bindu college,Bhokar

Department of Botany

TEACHING PLAN: 2017-18

Name of The Teacher –**Dr. Dhole N. A.**

Class: B.Sc-I Sem-I

Paper No.: II Title : Cell and Molecular Biology

Unit No. / Month	Topic/subtopic	Planning Expected Period	Executions Actual No. Period
Unit I June	Cell Biology –I: Introduction, ultra structure of Prokaryotic & Eukaryotic cell, ultra structure & function of nucleus, ultra structure & functions of Cell organells: Golgi complex lysosomes, ER, & Ribosomes	*(10 periods)*	
Unit II July	Cell Biology –II: Chromosome: Morphology, structure chemical composition euchromatine,heterochromatin function of typical chromosome, study of Karyotype & Ideogram of Human being, structure & significance of giant chromosomes- polyten & lampbrush chromosomes cell Division: Cell cycle, Process & significance of mitosis & Meiosis.	13	
Unit III Aug	Molecular Biology-I: NA: Introduction, chemical comoposition, DNA :structure (Watson & Cick model), forms (ABZ) & Semiconservative Replication (Mesolson & Sthal's Ex.) RNA: structure function & types.	12	
Unit IV Sept	Molecular Biology-II: Gene concept: Classical (Morgan View), fine structure of gene (S Benzer), Gene mutations (Spontanious & Induced) & Related diseases (Transposable genetic elements, phenyl Alkeptonaria, Alkeptonaria, Albinism, Cickle cell anemia & Aminocentensis.) (Detrection of genetic diseases)	10	

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Department of Botany

TEACHING PLAN: 2017-18

Name of The Teacher: **Dr. Dhole N. A.**

Class: B.Sc I Sem-II

Paper No.: III Title : Diversity of Cryptogams (Algae, Bryophytes and Pteridophytes)

Unit No.	Topic/subtopic	Planning Expected Period	Executions Actual No. Period
Unit I Dec.	**ALGAE –I** General characters of algae Classification of algae (As per F.E.Fritsch,1935) Systematic position, occurrence, thallus structure, reproduction and graphic life cycle with alternation of generation of the following algal types ***Oedogonium& Chara***	*(10 periods)*	
Unit II Jan	**ALGAE-II** Systematic position, occurrence, thallus structure, reproduction and graphic life cycle with alternation of generation of the following algal types ***Ectocarpus & Batrachospermum*** Economic importance of algae (Food and fodder)	*(10 periods)*	
Unit III Feb.	**BRYOPHYTES** General characters of bryophytes ,Classification of bryophytes (As per N.S.Parihar) , Systematic position, occurrence, thallus structure(external and internal reproduction and graphic life cycle with alternation of generation of **stages not expected)** ***Riccia &Funaria, Economic Importance of Bryophytes***	*(12 periods)*	
Unit IV March	**PTERIDOPHYTES** General characters of Pteridophytes,Classification of Pteridophytes (as per N.S.Parihar) Systematic position , Occurrence , structure of sporophyte , reproduction and graphic life cycle with alternation of generation of Equisetum & Marsilia	**(***13 periods)*	

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TEACHING PLAN: 2017-18

Name of The Teacher: **Dr. Dhole N. A**

Class: B.Sc II Sem-III

Paper No.: VII Title : HISTOLOGY, ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS

Unit No. / Month	Topic/subtopic	Planning Expected Period	Executions Actual No. Period
UNIT-I June	**HISTOLOGY:** **Meristematic Tissue:** Definition, classification based on position and origin, Histological organization of root and shoot apices, Apical cell theory, Histogen theory and Tunica corpus theory. **Simple Tissues:** Parenchyma, Collenchyma, Sclerenchyma. **Complex tissues:** Xylem and Phloem. **Secretary tissues:** Laticiferous tissues (Latex cells and vessels), Glandular tissues (External glands-digestive glands, nectary glands and internal glands-Oil glands, hydathodes)	10	
UNIT-II July	**ANATOMY:** **Vascular Bundles**: Definition and types. **Primary structures:** **Root** anatomy of Monocotyledons (Maize) and Dicotyledons (Sunflower), **Stem** anatomy of Monocotyledons (Maize) and Dicotyledons (Sunflower), **Leaf** anatomy of Monocotyledons (Maize) and Dicotyledons (Sunflower), **Secondary Growth**- Normal Secondary growth in root and stem of Dicotyledons (Sunflower), **Anomalous Secondary growth** in Achyranthes stem and Dracaena stem.	12	
UNIT-III Aug.	**EMBRYOLOGY –I:** **Introduction**- Definition and Scope, **Microsporangium**- Structure (T.S. of typical anther), Microsporogenesis, Structure of Pollen grain, Pollination (self and cross pollination in brief), Development of male gametophyte, **Megasporangium**- Structure (L.S.of typical ovule), types of ovule	13	
UNIT-IV Sept.	**EMBRYOLOGY –II** : Megasporogenesis, Development of **Monosporic** (Polygonum type), **Bisporic** (Allium type) and **Tetrasporic** (Adoxa type) female gametophytes, **Fertilization**- Double fertilization and Significance, **Endosperm**- Definition and types (Nuclear, Cellular and Helobial endosperm) , **Embryo**- Definition, Development of Monocot and Dicot (Crucifer type) embryo, **Development of seed and Fruit** (Post fertilization changes)	10	

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Department of Botany

TEACHING PLAN: 2017-18

Name of The Teacher: **Dr. Dhole N. A**

Class: B.Sc II Sem-IV

Paper No.: VIII Title : GYMNOSPERMS AND PALAEOBOTANY

Unit No. Month	Topic/subtopic	Planning Expected Period	Executions Actual No. Period
UNIT-I Dec.	**GYMNOSPERMS:** Introduction, general characters and classification of Gymnosperms (as per D. D. Pant, 1957), Morphology of vegetative structures, anatomy of stem (primary and secondary growth) and anatomy of leaf, reproductive structures and life cycle (Developmental stages are not expected) and economic importance of ***Cycas.***	10	
UNIT-II Jan	**PINUS:** Morphology of vegetative structures, anatomy of stem (primary and secondary growth) and anatomy of leaf, reproductive structures and life cycle (Developmental stages are not expected) and economic importance of ***Pinus.***	12	
UNIT-III Feb	**GNETUM:** Morphology of vegetative structures, anatomy of stem (primary and secondary growth) and anatomy of leaf, reproductive structures and life cycle (Developmental stages are not expected), affinities and relationship with angiosperms and economic importance of ***Gnetum.***	13	
UNIT-IV March	**PALAEOBOTANY:** Introduction to palaeobotany, process of plant fossilization, types of fossils, geological time scale, Study of fossil: Gymnosperms-***Lyginopteris oldhamia*** (stem), ***Bennettites*** (flower) and General characters of ***Ginkgo*** (A living fossil).	10	

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TEACHING PLAN: 2017-18

Name of The Teacher: **Dr. Dhole N. A.**

Class: B.Sc III Sem-V

Paper No.: XII Title : Plant Physiology

Unit No. / Month	Topic/subtopic	Planning Expected Period	Executions Actual No. Period
UNIT-I June	**PLANT WATER RELATIONS:** **Importance of water in plant life** **Different bio-physico-chemical phenomenon:** Permeability, Diffusion, Osmosis,Plasmolysis and Imbibition. **Ascent of sap:** Introduction and mechanism (transpiration pull theory), **Transpiration:** Definition, types, structure of stomata, mechanism of opening and closing of stomata (starch-sugar theory and K+ pump theory. **Plant movements:** Introduction, classification, paratonic and nastic movements.	11	
UNIT-II July	**MINERAL NUTRITION:** **Major and Minor elements:** Introduction, source, deficiency symptoms and their role. **Mineral salt absorption:** Introduction, mechanism of passive absorption (ion exchange theory) and active absorption (carrier concept theory) **Translocation of organic solutes:** Introduction, mechanism of translocation (Munch-Mass flow hypothesis)	11	
UNIT-III Aug.	**GROWTH AND DEVELOPMENT:** **Growth and Plant growth regulators**: Introduction, phases of growth, measurement of growth (arc indicator and Pfeiffer's auxanometer), factors affecting growth, Chemical nature and practical applications of Auxins, gibberellins, cytokinins, abscisic acid and ethylene. **Seed dormancy:** Introduction, causes of seed dormancy and methods of breaking seed dormancy **Seed germination:** Introduction, types and mechanism of seed germination, **Physiology of flowering**: Introduction, Photoperiodism (LDP, SDP and DNP), **Vernalization and devernalization:** Introduction, mechanism and significance,	12	
UNIT-IV Sept.	**BIOMOLECULES AND SECONDARY METABOLITES:** **Biomolecules:** **Carbohydrates**: introduction, structure and classification, Monosaccharides, disaccharides and polysaccharides (starch and cellulose) **Protein-** Introduction, classification and biological functions of Primary, secondary (α helix and β sheets), tertiary and quaternary structure **Lipids**: Introduction, structure classification and biological functions of lipids **Secondary metabolites:** Biological functions of tannins, terpenoids, flavonoids, alkaloids, essential oils and organic acids	11	

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TEACHING PLAN: 2017-18

Name of The Teacher: **Dr. Dhole N.A.**

Class: B.Sc II Sem-IV

Paper No.: SECB-IIB Title : ALGAL BIOMASS PRODUCTION SKILL (SPIRULINA CULTIVATION)

Unit No. / month.		Planning Expected Period	Executions Actual No. Period
UNIT-I Dec.	**ALGAL BIOMASS AS NON CONVENTIONAL FOOD:** Introduction, Concept and need, Advantages, disadvantages and Sources of non-conventional food	6	
UNIT-II Jan	**SPIRULINA CULTIVATION FOR SINGLE CELL PROTEIN-SCP:** Introduction, Systematic position, thallus structure, Merits of Spirulina cultivation, Methods of cultivation- Small scale cultivation, Mass cultivation, Harvesting of Spirulina, Flow chart of Spirulina cultivation, Limiting factors for Spirulina cultivation, Spirulina products –Powder, Biscuits, Tablets	15	
UNIT-III Feb.	**PRACTICALS ON SPIRULINA CULTIVATION:** Principle, Requirement, chemicals, Sample or Inoculum of Spirulina, procedure (steps involved in Spirulina cultivation), observations, Harvesting, results and records, precautions Visit to a Spirulina cultivation laboratory in nearby area (Students are expected to prepare a model of Spirulina cultivation laboratory	8	

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TEACHING PLAN: 2017-18

Name of The Teacher: **Dr. Dhole N.A.** ----------

Class: B.Sc III Sem-V

Paper No.: SECB-III (B) Title : BIOINSTRUMENTATION

Unit No. / Month.		Planning Expected Period	Executions Actual No. Period
UNIT-I July	**Chromatography and Centrifugation:** General principles of separation, paper chromatography, thin layer, affinity, gel permeation, ion exchange, GLC, HPTLC, preparative and analytical centrifugations and their application	6	
UNIT-II Aug.	**Electrophoresis and Spectroscopy:** Basic principles of electrophoresis, Factor affecting electrophoretic mobility, native and denaturing PAGE, isoelectric focusing, 2DE, Pulse field gel electrophoresis. Spectroscopy: Theory and applications of Ultra violet and visible spectroscopy, IR, Nuclear magnetic resonance, Mass and applications.	15	
UNIT-III Sept.	**Practicals** **1. Centrifugation** a. Isolation of cell organelles like cell membrane, mitochondria, ribosomes etc. b. Determination of molecular weight of protein by centrifugation **2. Chromatography** a. Separation of amino acids by paper chromatography b. Separation of sugars by TLC c. Separation of plant pigments by paper/ TLC d. Purification of proteins by Column / ion exchange / Molecular sieve chromatography **3. Electrophoresis** a. Separation of soy bean proteins by PAGE **4. Spectroscopy** a. Validation of Lambert-Beer's law (Photometer) b. Estimation of DNA by DPA method (UV spectrophotometer) c. Estimation of reducing sugars by DNSA method (VIS-Spectro.)	8	

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TEACHING PLAN: 2018-19

Name of The Teacher: **Dr. Dhole N.A.** ----------

Class: B.Sc III Sem-V

Paper No.: SECB-III (B) Title : BIOINSTRUMENTATION

Unit No. / month		Planning Expected Period	Executions Actual No. Period
UNIT-I June	**Chromatography and Centrifugation:** General principles of separation, paper chromatography, thin layer, affinity, gel permeation, ion exchange, GLC, HPTLC, preparative and analytical centrifugations and their application	6	
UNIT-II July	**Electrophoresis and Spectroscopy:** Basic principles of electrophoresis, Factor affecting electrophoretic mobility, native and denaturing PAGE, isoelectric focusing, 2DE, Pulse field gel electrophoresis. Spectroscopy: Theory and applications of Ultra violet and visible spectroscopy, IR, Nuclear magnetic resonance, Mass and applications.	15	
UNIT-III Aug	**Practicals** **1. Centrifugation** a. Isolation of cell organelles like cell membrane, mitochondria, ribosomes etc. b. Determination of molecular weight of protein by centrifugation **2. Chromatography** a. Separation of amino acids by paper chromatography b. Separation of sugars by TLC c. Separation of plant pigments by paper/ TLC d. Purification of proteins by Column / ion exchange / Molecular sieve chromatography **3. Electrophoresis** a. Separation of soy bean proteins by PAGE **4. Spectroscopy** a. Validation of Lambert-Beer's law (Photometer) b. Estimation of DNA by DPA method (UV spectrophotometer) c. Estimation of reducing sugars by DNSA method (VIS-Spectro.)	8	

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TEACHING PLAN: 2018-19

Name of The Teacher: **Dr. ~~Tawade~~ S. V.** ~~Dr D Bhole N.A.~~ Dr Tawade S. V.

Class: B.Sc III Sem-VI

Paper No.: SECB –IVA Title :– FRUIT AND VEGETABLE PROCESSING

Unit No. / Month		Planning Expected Period	Executions Actual No. Period
UNIT-I Dec.	Production and processing scenario of fruits and vegetables in India and World, Scope of fruit and vegetable preservation industry in India. present status, constraints and prospects, Overview of principles and preservation methods of fruits and vegetables (Physical and Chemical), Commercial processing technology of fruits and vegetables, Primary processing and pack house handling of fruits and vegetables; Peeling, slicing, cubing, cutting and other size reduction operations for fruits and vegetables, Minimal processing of fruits and vegetables Blanching operations and equipment.	6	
UNIT-II Jan.	Preparation and preservation of juices, squashes, syrups, sherbets, nectars, cordials, etc; Problems on squash and RTS; Processing and equipment for above products and FSSAI specification Preparation, preservation and machines for manufacture of crystallized fruits and preserves, jam, jelly and candies, Preparation, preservation and machines for manufacture of preserve, concentrate, fruit wine, pickles, sauce, paste, ketchup; toffee, cheese, lather, soup powders; FSSAI specification, Commercial processing technology of selected fruits and vegetables for production of various value added processed products.	15	
UNIT-III Feb.	**Practicals :** 1. Preparation of jam/ jelly from selected fruit 2. Preparation of RTS beverage e.g. Amala, Mango and Pineapple etc 3. Preparation of squash 4. Preparation of fruit candy 5. Preparation of fruit leather 6. Preparation of fruit toffee 7. Preparation of pickle 8. Preparation of banana and potato wafers 9. Visit to fruits and vegetables processing unit	8	

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TEACHING PLAN: 2018-19

Name of The Teacher: **Dr. Dhole N.A.** ----------

Class: B.Sc II Sem-IV

Paper No.: SECB-IIB Title : ALGAL BIOMASS PRODUCTION SKILL (SPIRULINA CULTIVATION)

Unit No. / Month		Planning Expected Period	Executions Actual No. Period
UNIT-I Dec.	**ALGAL BIOMASS AS NON CONVENTIONAL FOOD:** Introduction, Concept and need, Advantages, disadvantages and Sources of non-conventional food	6	
UNIT-II Jan	**SPIRULINA CULTIVATION FOR SINGLE CELL PROTEIN-SCP:** Introduction, Systematic position, thallus structure, Merits of Spirulina cultivation, Methods of cultivation- Small scale cultivation, Mass cultivation, Harvesting of Spirulina, Flow chart of Spirulina cultivation, Limiting factors for Spirulina cultivation, Spirulina products –Powder, Biscuits, Tablets	15	
UNIT-III Feb.	**PRACTICALS ON SPIRULINA CULTIVATION:** Principle, Requirement, chemicals, Sample or Inoculum of Spirulina, procedure (steps involved in Spirulina cultivation), observations, Harvesting, results and records, precautions Visit to a Spirulina cultivation laboratory in nearby area (Students are expected to prepare a model of Spirulina cultivation laboratory	8	

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TEACHING PLAN: 2018-19

Name of The Teacher: **Dr. Dhole N. A** ----------

Class: B.Sc III Sem-V

Paper No.: XII Title : Plant Physiology

Unit No. Unit	Topic/subtopic	Planning Expected Period	Executions Actual No. Period
UNIT-I June	**PLANT WATER RELATIONS:** **Importance of water in plant life** **Different bio-physico-chemical phenomenon:** Permeability, Diffusion, Osmosis,Plasmolysis and Imbibition. **Ascent of sap:** Introduction and mechanism (transpiration pull theory), **Transpiration:** Definition, types, structure of stomata, mechanism of opening and closing of stomata (starch-sugar theory and K+ pump theory. **Plant movements:** Introduction, classification, paratonic and nastic movements.	11	
UNIT-II Aug	**MINERAL NUTRITION:** **Major and Minor elements:** Introduction, source, deficiency symptoms and their role. **Mineral salt absorption:** Introduction, mechanism of passive absorption (ion exchange theory) and active absorption (carrier concept theory) **Translocation of organic solutes:** Introduction, mechanism of translocation (Munch-Mass flow hypothesis)	11	
UNIT-III Sept	**GROWTH AND DEVELOPMENT:** **Growth and Plant growth regulators**: Introduction, phases of growth, measurement of growth (arc indicator and Pfeiffer's auxanometer), factors affecting growth, Chemical nature and practical applications of Auxins, gibberellins, cytokinins, abscisic acid and ethylene. **Seed dormancy:** Introduction, causes of seed dormancy and methods of breaking seed dormancy **Seed germination:** Introduction, types and mechanism of seed germination, **Physiology of flowering**: Introduction, Photoperiodism (LDP, SDP and DNP), **Vernalization and devernalization:** Introduction, mechanism and significance,	12	
UNIT-IV Oct	**BIOMOLECULES AND SECONDARY METABOLITES:** **Biomolecules**: **Carbohydrates**: introduction, structure and classification, Monosaccharides, disaccharides and polysaccharides (starch and cellulose) **Protein**- Introduction, classification and biological functions of Primary, secondary (α helix and β sheets), tertiary and quaternary structure **Lipids**: Introduction, structure classification and biological functions of	11	

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TEACHING PLAN: 2018-19

Name of The Teacher: **Dr. Dhole N. A** ----------

Class: B.Sc II Sem-IV

Paper No.: VIII Title : GYMNOSPERMS AND PALAEOBOTANY

Unit No. / month	Topic/subtopic	Planning Expected Period	Executions Actual No. Period
UNIT-I Dec.	**GYMNOSPERMS:** Introduction, general characters and classification of Gymnosperms (as per D. D. Pant, 1957), Morphology of vegetative structures, anatomy of stem (primary and secondary growth) and anatomy of leaf, reproductive structures and life cycle (Developmental stages are not expected) and economic importance of ***Cycas.***	10	
UNIT-II Jan	**PINUS:** Morphology of vegetative structures, anatomy of stem (primary and secondary growth) and anatomy of leaf, reproductive structures and life cycle (Developmental stages are not expected) and economic importance of ***Pinus.***	12	
UNIT-III Feb.	**GNETUM:** Morphology of vegetative structures, anatomy of stem (primary and secondary growth) and anatomy of leaf, reproductive structures and life cycle (Developmental stages are not expected), affinities and relationship with angiosperms and economic importance of ***Gnetum.***	13	
UNIT-IV March	**PALAEOBOTANY:** Introduction to palaeobotany, process of plant fossilization, types of fossils, geological time scale, Study of fossil: Gymnosperms-***Lyginopteris oldhamia*** (stem), ***Bennettites*** (flower) and General characters of ***Ginkgo*** (A living fossil).	10	

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Name of The Teacher: **Dr. Dhole N. A** ----------

Class: B.Sc II Sem-III

Paper No.: VII Title : HISTOLOGY, ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS

Unit No. / Month	Topic/subtopic	Planning Expected Period	Executions Actual No. Period
UNIT-I June	**HISTOLOGY:** **Meristematic Tissue:** Definition, classification based on position and origin, Histological organization of root and shoot apices, Apical cell theory, Histogen theory and Tunica corpus theory. **Simple Tissues:** Parenchyma, Collenchyma, Sclerenchyma. **Complex tissues:** Xylem and Phloem. **Secretary tissues:** Laticiferous tissues (Latex cells and vessels), Glandular tissues (External glands-digestive glands, nectary glands and internal glands-Oil glands, hydathodes)	10	
UNIT-II July	**ANATOMY:** **Vascular Bundles**: Definition and types. **Primary structures:** **Root** anatomy of Monocotyledons (Maize) and Dicotyledons (Sunflower), **Stem** anatomy of Monocotyledons (Maize) and Dicotyledons (Sunflower), **Leaf** anatomy of Monocotyledons (Maize) and Dicotyledons (Sunflower), **Secondary Growth**- Normal Secondary growth in root and stem of Dicotyledons (Sunflower), **Anomalous Secondary growth** in Achyranthes stem and Dracaena stem.	12	
UNIT-III Aug.	**EMBRYOLOGY –I:** **Introduction-** Definition and Scope, **Microsporangium-** Structure (T.S. of typical anther), Microsporogenesis, Structure of Pollen grain, Pollination (self and cross pollination in brief), Development of male gametophyte, **Megasporangium-** Structure (L.S.of typical ovule), types of ovule	13	
UNIT-IV Sept.	**EMBRYOLOGY –II** *:* Megasporogenesis, Development of **Monosporic** (Polygonum type), **Bisporic** (Allium type) and **Tetrasporic** (Adoxa type) female gametophytes, **Fertilization-** Double fertilization and Significance, **Endosperm-** Definition and types (Nuclear, Cellular and Helobial endosperm) , **Embryo-** Definition, Development of Monocot and Dicot (Crucifer type) embryo, **Development of seed and Fruit** (Post fertilization changes)	10	

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TEACHING PLAN: 2018-19

Name of The Teacher –**Dr. Dhole N. A.**

Class: B.Sc-I Sem-I

Paper No.: II Title : Cell and Molecular Biology

Unit No. / Month	Topic/subtopic	Planning Expected Period	Executions Actual No. Period
Unit I July	Cell Biology –I: Introduction, ultra structure of Prokaryotic & Eukaryotic cell, ultra structure & function of nucleus, ultra structure & functions of Cell organells: Golgi complex lysosomes, ER, & Ribosomes	*(10 periods)*	
Unit II Aug.	Cell Biology –II: Chromosome: Morphology, structure chemical composition euchromatine,heterochromatin function of typical chromosome, study of Karyotype & Ideogram of Human being, structure & significance of giant chromosomes- polyten & lampbrush chromosomes cell Division: Cell cycle, Process & significance of mitosis & Meiosis.	13	
Unit III Sept.	Molecular Biology-I: NA: Introduction, chemical comoposition, DNA :structure (Watson & Cick model), forms (ABZ) & Semiconservative Replication (Mesolson & Sthal's Ex.) RNA: structure function & types.	12	
Unit IV Oct.	Molecular Biology-II: Gene concept: Classical (Morgan View), fine structure of gene (S Benzer), Gene mutations (Spontanious & Induced) & Related diseases (Transposable genetic elements, phenyl Alkeptonaria, Alkeptonaria, Albinism, Cickle cell anemia & Aminocentensis.) (Detrection of genetic diseases)	10	

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Name of The Teacher: **Dr. Dhole N. A.** ----------

Class: B.Sc I Sem-II

Paper No.: III Title : Diversity of Cryptogams (Algae, Bryophytes and Pteridophytes)

Unit No. / Month	Topic/subtopic	Planning Expected Period	Executions Actual No. Period
Unit I Dec.	**ALGAE –I** General characters of algae Classification of algae (As per F.E.Fritsch,1935) Systematic position, occurrence, thallus structure, reproduction and graphic life cycle with alternation of generation of the following algal types ***Oedogonium& Chara***	*(10 periods)*	
Unit II Jan	**ALGAE-II** Systematic position, occurrence, thallus structure, reproduction and graphic life cycle with alternation of generation of the following algal types ***Ectocarpus & Batrachospermum*** Economic importance of algae (Food and fodder)	*(10 periods)*	
Unit III Feb.	**BRYOPHYTES** General characters of bryophytes ,Classification of bryophytes (As per N.S.Parihar) , Systematic position, occurrence, thallus structure(external and internal reproduction and graphic life cycle with alternation of generation of **stages not expected)** ***Riccia &Funaria, Economic Importance of Bryophytes***	*(12 periods)*	
Unit IV March	**PTERIDOPHYTES** General characters of Pteridophytes,Classification of Pteridophytes (as per N.S.Parihar) Systematic position , Occurrence , structure of sporophyte , reproduction and graphic life cycle with alternation of generation of Equisetum & Marsilia	**(***13 periods)*	

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Department of Botany

TEACHING PLAN: 2019-20

Name of The Teacher: **Dr. Dhole N. A.----------**

Class: B.Sc-I Sem-I

Paper No.: I Title : Viruses, Bacteria Algae ,Fungi , Lichens and Mycorrhiza

Unit No.	Topic/subtopic	Planning Expected Period	Executions Actual No. Period
Unit I June	**Microbes** Viruses –Introduction, general characters of viruses, replication (general account), and RNA virus (TMV); Economic importance; study of yellow vein mosaic of Bhendi Bacteria – Introduction, General characters and cell structure; Reproduction – vegetative, asexual (Binary Fission) and recombination (conjugation,) Study of Citrus Canker and Economic importance of Bacteria.	*(10 periods)*	
Unit II July	**Algae** Introduction, General characters, Ecology and distribution; Range of thallus organization and reproduction; Classification of algae (F. E. Fritch's 1935); Morphology and life-cycles of the following: *Nostoc, Oedogonium* and *Ectocarpus.* Economic importance of algae	*(12 periods)*	
Unit III Aug	**Fungi** Introduction- General Characteristics, ecology and significance, cell wall composition, nutrition, reproduction and classification (Alexopolous & Mims 1979); General characteristics, ecology, significance and life cycle of, *Penicillium, Alternaria* (Deuteromycota), *Agaricus* (Basidiomycota).	*(13 periods)*	
Unit IV Sept	**Lichens and Mycorrhiza** Lichens: General characters, types and economic importance. Mycorrhiza: General characters, ectomycorrhiza and endomycorrhiza and their significance	*(10 periods)*	

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TEACHING PLAN: 2019-20

Name of The Teacher: **Dr. Dhole N. A.** ----------

Class: B.Sc I Sem-II

Paper No.: III Title : Bryophytes, Pteridophytes ,Gymnosperms & Paleobotany

Unit No.	Topic/subtopic	Planning Expected Period	Executions Actual No. Period
Unit I Dec.	**Bryophytes** General characters, Classification (N.S.Parihar), morphology, anatomy and reproduction of *Marchantia* and *Funaria*. (Developmental study not expected), Economic importance of bryophytes.	*(10 periods)*	
Unit II Jan	**Pteridophytes** General characters, classification (N.S.Parihar), morphology, anatomy and reproduction of *Lycopodium* and *Marsilea*. (Developmental study not expected), Homospory, Heterospory and seed habit, stelar evolution, economical importance of Pteridophytes.	*(13 periods)*	
Unit III Feb	**Gymnosperms** General characters, classification (K.R.Sporne, 1964), morphology, anatomy and Reproduction of *Cycas* and *Pinus*. (Developmental study not expected), Ecological and Economic importance	*(12 periods)*	
Unit IV March	**Paleobotany** Introduction to palaeobotany, process of plant fossilization, types of fossils, geological time scale, Study of fossil Gymnosperms-***Lyginopteris oldhamia*** (stem), ***Bennettites*** (flower) and General characters of ***Ginkgo*** (A living fossil).	**(***10 periods)*	

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TEACHING PLAN: 2019-20

Name of The Teacher: **Dr. Dhole N. A** ----------

Class: B.Sc II Sem-III

Paper No.: VII Title : HISTOLOGY, ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS

Unit No.	Topic/subtopic	Planning Expected Period	Executions Actual No. Period
UNIT-I **June**	**HISTOLOGY:** **Meristematic Tissue:** Definition, classification based on position and origin, Histological organization of root and shoot apices, Apical cell theory, Histogen theory and Tunica corpus theory. **Simple Tissues:** Parenchyma, Collenchyma, Sclerenchyma. **Complex tissues:** Xylem and Phloem. **Secretary tissues:** Laticiferous tissues (Latex cells and vessels), Glandular tissues (External glands-digestive glands, nectary glands and internal glands-Oil glands, hydathodes)	10	
UNIT-II **July**	**ANATOMY:** **Vascular Bundles:** Definition and types. **Primary structures:** **Root** anatomy of Monocotyledons (Maize) and Dicotyledons (Sunflower), **Stem** anatomy of Monocotyledons (Maize) and Dicotyledons (Sunflower), **Leaf** anatomy of Monocotyledons (Maize) and Dicotyledons (Sunflower), **Secondary Growth**- Normal Secondary growth in root and stem of Dicotyledons (Sunflower), **Anomalous Secondary growth** in Achyranthes stem and Dracaena stem.	12	
UNIT-III **Aug**	**EMBRYOLOGY –I:** **Introduction-** Definition and Scope, **Microsporangium-** Structure (T.S. of typical anther), Microsporogenesis, Structure of Pollen grain, Pollination (self and cross pollination in brief), Development of male gametophyte, **Megasporangium-** Structure (L.S.of typical ovule), types of ovule	13	
UNIT-IV **Sept**	**EMBRYOLOGY –II** *:* Megasporogenesis, Development of **Monosporic** (Polygonum type), **Bisporic** (Allium type) and **Tetrasporic** (Adoxa type) female gametophytes, **Fertilization-** Double fertilization and Significance, **Endosperm-** Definition and types (Nuclear, Cellular and Helobial endosperm) , **Embryo-** Definition, Development of Monocot and Dicot (Crucifer type) embryo, **Development of seed and Fruit** (Post fertilization changes)	10	

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TEACHING PLAN: 2019-20

Name of The Teacher: **Dr. Dhole N. A** ----------

Class: B.Sc II Sem-IV

Paper No.: VIII Title : GYMNOSPERMS AND PALAEOBOTANY

Unit No.	Topic/subtopic	Planning Expected Period	Executions Actual No. Period
UNIT-I Dec	**GYMNOSPERMS:** Introduction, general characters and classification of Gymnosperms (as per D. D. Pant, 1957), Morphology of vegetative structures, anatomy of stem (primary and secondary growth) and anatomy of leaf, reproductive structures and life cycle (Developmental stages are not expected) and economic importance of ***Cycas.***	10	
UNIT-II Jan	**PINUS:** Morphology of vegetative structures, anatomy of stem (primary and secondary growth) and anatomy of leaf, reproductive structures and life cycle (Developmental stages are not expected) and economic importance of ***Pinus.***	12	
UNIT-III Feb	**GNETUM:** Morphology of vegetative structures, anatomy of stem (primary and secondary growth) and anatomy of leaf, reproductive structures and life cycle (Developmental stages are not expected), affinities and relationship with angiosperms and economic importance of ***Gnetum.***	13	
UNIT-IV March	**PALAEOBOTANY:** Introduction to palaeobotany, process of plant fossilization, types of fossils, geological time scale, Study of fossil: Gymnosperms-***Lyginopteris oldhamia*** (stem), ***Bennettites*** (flower) and General characters of ***Ginkgo*** (A living fossil).	10	

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TEACHING PLAN: 2019-20

Name of The Teacher: **Dr. Dhole N. A** ----------

Class: B.Sc III Sem-V

Paper No.: XII Title : Plant Physiology

Unit No.	Topic/subtopic	Planning Expected Period	Executions Actual No. Period
UNIT-I June	**PLANT WATER RELATIONS:** **Importance of water in plant life** **Different bio-physico-chemical phenomenon:** Permeability, Diffusion, Osmosis,Plasmolysis and Imbibition. **Ascent of sap:** Introduction and mechanism (transpiration pull theory), **Transpiration:** Definition, types, structure of stomata, mechanism of opening and closing of stomata (starch-sugar theory and K+ pump theory. **Plant movements:** Introduction, classification, paratonic and nastic movements.	11	
UNIT-II July	**MINERAL NUTRITION:** **Major and Minor elements:** Introduction, source, deficiency symptoms and their role. **Mineral salt absorption:** Introduction, mechanism of passive absorption (ion exchange theory) and active absorption (carrier concept theory) **Translocation of organic solutes:** Introduction, mechanism of translocation (Munch-Mass flow hypothesis)	11	
UNIT-III Aug	**GROWTH AND DEVELOPMENT:** **Growth and Plant growth regulators**: Introduction, phases of growth, measurement of growth (arc indicator and Pfeiffer's auxanometer), factors affecting growth, Chemical nature and practical applications of Auxins, gibberellins, cytokinins, abscisic acid and ethylene. **Seed dormancy:** Introduction, causes of seed dormancy and methods of breaking seed dormancy **Seed germination:** Introduction, types and mechanism of seed germination, **Physiology of flowering**: Introduction, Photoperiodism (LDP, SDP and DNP), **Vernalization and devernalization:** Introduction, mechanism and significance,	12	
UNIT-IV Sept	**BIOMOLECULES AND SECONDARY METABOLITES:** **Biomolecules**: **Carbohydrates**: introduction, structure and classification, Monosaccharides, disaccharides and polysaccharides (starch and cellulose) **Protein**- Introduction, classification and biological functions of Primary, secondary (α helix and β sheets), tertiary and quaternary structure **Lipids**: Introduction, structure classification and biological functions of lipids **Secondary metabolites:** Biological functions of tannins, terpenoids, flavonoids, alkaloids, essential oils and organic acids	11	

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TEACHING PLAN: 2019-20

Name of The Teacher: **Dr. Dhole N. A.** ----------

Class: B.Sc III Sem-VI

Paper No.: XIV Title : Plant Metabolism, Biochemistry and Biotechnology

Unit No.	Topic/subtopic	Planning Expected Period	Executions Actual No. Period
UNIT-I Dec	**PHOTOSYNTHESIS AND RESPIRATION:** **Photosynthesis:** Introduction, significance, ultra structure of chloroplast, photosynthetic pigments, concepts of two Photo systems, Mechanism of photosynthesis, Light reaction, Hill reaction, Cyclic and Non cyclic photophoshorylation, Dark phase, Calvin cycle (C3) and Hatch and Slack (C4) pathway, CAM pathway **Respiration:** Introduction, significance, ultra structure of mitochondria, structure and functions of ATP, **Types of respiration**: Aerobic respiration- Glycolysis, Kreb's cycle, Electron Transport System. Anaerobic respiration- Fermentation (alcoholic and lactic acid)	11	
UNIT-II Jan	**ENZYMES AND NITROGEN METABOLISM:** **Enzymes:** Introduction, nomenclature and classification (IUB), mechanism of enzyme action (lock and key model, induced fit model), Concept of holoenzyme, mechanism of regulation of enzyme activity-Feedback and allosteric regulation. **Nitrogen metabolism:** Introduction, sources and forms of nitrogen, types of nitrogen fixationphysical and biological (symbiotic and asymbiotic), Ammonification, nitrification and denitrification	11	
UNIT-III Feb	**BIOTECHNOLOGY:** **Tissue culture:** Introduction and basic aspects of tissue culture, media, culture techniques, cellular totipotency. **Applications of tissue culture:** Micropropagation, Production of disease free plants, production of secondary metabolites, Anther culture and production of haploids, protoplast culture and somatic hybridization, synthetic seeds	12	
UNIT-IV March	**GENETIC ENGINEERING:** Introduction, tools and techniques of recombinant DNA technology, Cloning vectors, Gene cloning, Genomic library and cDNA library, *Agrobacterium* mediated gene transfer, transgenic plants. **Bioinformatics:** Introduction, Biological database, NCBI, BLAST.	11	

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TEACHING PLAN: 2019-20

Name of The Teacher: **Dr. Dhole N.A.** ----------

Class: B.Sc II Sem-IV

Paper No.: SECB-IIB Title : ALGAL BIOMASS PRODUCTION SKILL (SPIRULINA CULTIVATION)

Unit No.		Planning Expected Period	Executions Actual No. Period
UNIT-I	**ALGAL BIOMASS AS NON CONVENTIONAL FOOD:** Introduction, Concept and need, Advantages, disadvantages and Sources of non-conventional food	6	
UNIT-II	**SPIRULINA CULTIVATION FOR SINGLE CELL PROTEIN-SCP:** Introduction, Systematic position, thallus structure, Merits of Spirulina cultivation, Methods of cultivation- Small scale cultivation, Mass cultivation, Harvesting of Spirulina, Flow chart of Spirulina cultivation, Limiting factors for Spirulina cultivation, Spirulina products –Powder, Biscuits, Tablets	15	
UNIT-III	**PRACTICALS ON SPIRULINA CULTIVATION:** Principle, Requirement, chemicals, Sample or Inoculum of Spirulina, procedure (steps involved in Spirulina cultivation), observations, Harvesting, results and records, precautions Visit to a Spirulina cultivation laboratory in nearby area (Students are expected to prepare a model of Spirulina cultivation laboratory	8	

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TEACHING PLAN: 2019-20

Name of The Teacher: **Dr. Dhole N.A.** ----------

Class: B.Sc III Sem-V

Paper No.: SECB-III (B) Title : BIOINSTRUMENTATION

Unit No.		Planning Expected Period	Executions Actual No. Period
UNIT-I	**Chromatography and Centrifugation:** General principles of separation, paper chromatography, thin layer, affinity, gel permeation, ion exchange, GLC, HPTLC, preparative and analytical centrifugations and their application	6	
UNIT-II	**Electrophoresis and Spectroscopy:** Basic principles of electrophoresis, Factor affecting electrophoretic mobility, native and denaturing PAGE, isoelectric focusing, 2DE, Pulse field gel electrophoresis. Spectroscopy: Theory and applications of Ultra violet and visible spectroscopy, IR, Nuclear magnetic resonance, Mass and applications.	15	
UNIT-III	**Practicals** **1. Centrifugation** a. Isolation of cell organelles like cell membrane, mitochondria, ribosomes etc. b. Determination of molecular weight of protein by centrifugation **2. Chromatography** a. Separation of amino acids by paper chromatography b. Separation of sugars by TLC c. Separation of plant pigments by paper/ TLC d. Purification of proteins by Column / ion exchange / Molecular sieve chromatography **3. Electrophoresis** a. Separation of soy bean proteins by PAGE **4. Spectroscopy** a. Validation of Lambert-Beer's law (Photometer) b. Estimation of DNA by DPA method (UV spectrophotometer) c. Estimation of reducing sugars by DNSA method (VIS-Spectro.)	8	

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Annual Teaching Plan for 2020 - 2021

Work Distribution

Class	Teachers			
	Dr. S. V. Tawade		Dr. N. A. Dhole	
	Theory	Practicals	Theory	Practicals
B.Sc. I Sem I	Paper II	Paper V	Paper I	Paper V
B.Sc. I Sem II	Paper IV		Paper III	
B.Sc. II Sem III	Paper VI	PAPER – X	Paper VII	paper XI
B.Sc. II Sem IV	Paper VIII		Paper IX	
B.Sc. III Sem V	Paper XIII-A	PAPER- XVI	Paper -XII	PAPER-XVI
B.Sc. III Sem VI	Paper-XV-A		Paper XIII	

SEC -I & II

SEC III & IV

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DEPARTMENT OF BOTANY

Class: B.SC-F.Y

Academic Year-2020-2021

Title of the Paper & No.: **Viruses, Bacteria Algae , Fungi , Lichens andMycorrhiza- I & Bryophytes, Pteridophytes Gymnosperms and paleobotany-III**

Name of the Teacher: **Dr. Dhole N A**

ANNUAL TEACHING PLAN 2020-21		
Month	**Course content**	**Expected Periods**
June	Admission	
July	**Unit I: Microbes** Viruses –Introduction, general characters of viruses, replication (general account), and RNA virus (TMV); Economic importance; study of yellow vein mosaic of Bhendi Bacteria – Introduction, General characters and cell structure; Reproduction – vegetative, asexual (Binary Fission) and recombination (conjugation,) Study of Citrus Canker and Economic importance of Bacteria..	**10 Lectures**
	Study of morphology of Bacteria by Gram staining method	**1 Practical**
	Study of citrus canker disease, Study of symptoms of yellow vein mosaic of Bhendi	**1 Practical**
	Study of Algae : Systematic position and external features of *Nostoc, Oedogonium, Ectocarpus*	**1 Practical**
	Study of Fungi: systematic position, external and internal features of *Penicillium, Alternaria and Agaricus.*	**1 Practical**
Aug	**Unit II: Algae** Introduction, General characters, Ecology and distribution; Range of thallus organization and reproduction; Classification of algae (F. E. Fritch's 1935); Morphology and life-cycles of the following: *Nostoc, Oedogonium* and *Ectocarpus.* Economic importance of algae	**12 Lectures**
	Study of different forms of Lichens	**1 Practical**
	Study of ectomycorrhiza and endomycorrhiza	**1 Practical**
	Study of *Marchantia*- morphology of thallus, w.m. rhizoids and scales, v.s. thallus through gemma cup, w.m. gemmae (all temporary slides).	**1 Practical**
	v.s. antheridiophore, archegoniophore, L. S. of sporophyte (all permanent slides)	**1 Practical**
Sept	**Unit III: Fungi** Introduction, General characters, Ecology and distribution; Range of thallus organization and reproduction; Classification of algae (F. E. Fritch's 1935); Morphology and life-cycles of the following: *Nostoc, Oedogonium* and *Ectocarpus.* Economic importance of algae	**13 Lectures**
	Study of *Funaria*- morphology, w.m. leaf, rhizoids, operculum, peristome, annulus, spores (temporary slides).	**1 Practical**
	permanent slides showing antheridial and archegonial heads, L.S.of capsule and protonema	**1 Practical**
	Lycopodium- morphological and anatomical study	**1 Practical**
Oct	**Unit IV: Lichens and Mycorrhiza** Lichens: General characters, types and economic importance. Mycorrhiza: General characters, ectomycorrhiza and endomycorrhiza and their significance	**10 Lectures**
	Marsilea- morphological and anatomical study of petiole and rhizome	**1 Practical**
Nov	**Examinations**	
Dec	**Unit I: Bryophytes** General characters, Classification (N.S.Parihar), morphology, anatomy and	**10 Lectures**

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	reproduction of *Marchantia* and *Funaria*. (Developmental study not expected), Economic importance of bryophytes.	
	Cycas- morphology ,T.S of. rachis, T.S.of leaflet, male and female cone	**1 Practical**
	Pinus- morphology (long and dwarf shoots, w.m. dwarf shoot, male and female cone).	**1 Practical**
	Study of fossil Plants	**1 Practical**
	Estimation of soil Bulk density and porosity	**1 Practical**
Jan	**Unit II:** Pteridophytes General characters, classification (N.S.Parihar), morphology, anatomy and reproduction of *Lycopodium* and *Marsilea*. (Developmental study not expected), Homospory, Heterospory and seed habit, stelar evolution, economical importance of Pteridophytes.	**13 Lectures**
	Study of morphological and anatomical adaptations of hydrophytes (*Hydrilla* stem and *Nymphea* petiole)	**1 Practical**
	xerophytes (*Nerium* leaf and *Casuarina* stem)	**1 Practical**
	Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus	**1 Practical**
	Brassicaceae	**1 Practical**
Feb	**Unit III: Gymnosperms** General characters, classification (K.R.Sporne, 1964), morphology, anatomy and Reproduction of *Cycas* and *Pinus*. (Developmental study not expected), Ecological and Economic importance.	**12 Lectures**
	Study of Family : Fabaceae.	**1 Practical**
	Study of Family : Solanaceae.	**1 Practical**
	Study of Family : Lamiaceae.	**1 Practical**
	Study of Family : Poaceae.	**1 Practical**
March	**Unit IV: Paleobotany** Introduction to palaeobotany, process of plant fossilization, types of fossils, geological time scale, Study of fossil Gymnosperms-***Lyginopteris oldhamia*** (stem), ***Bennettites*** (flower) and General characters of ***Ginkgo*** (A living fossil)..	**10 Lectures**
April	**Examinations**	

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DEPARTMENT OF BOTANY

Class: B.SC-S.Y **Academic Year-2020-2021**
Title of the Paper & No.: **Plant Physiology and Biochemistry–VII & Plant Metabolism and Biotechnology-IX**
Name of the Teacher: **Dr. Dhole N A**

ANNUAL TEACHING PLAN 2020-2021

Month	Course content	Expected Periods
June	**UNIT-I: PLANT WATER RELATIONS** **Physical aspects of water absorption** – Diffusion, DP, DPD Imbibition Osmosis – OP, Exosmosis, Endosmosis, Plasmolysis ,Water potential ,Mechanism of water absorption by root –active and passive absorption **Ascent of sap:** Introduction and mechanism (transpiration pull theory) **Transpiration:** Definition, types, structure of stomata, mechanism of opening and closing of Stomata (starch-sugar theory and K+ pump theory), guttation, antitranspirants.	**11 Periods**
	To determine the water potential of potato tuber	1 practical
	To determine the osmotic potential of vacuolar sap by plasmolysis	1 practical
July	**Plant movements:** Introduction, classification, paratonic and nastic movements.	**04 Periods**
	UNIT-II: MINERAL NUTRITION **Major and Minor elements:** Introduction, source, deficiency symptoms and their role. Foliar nutrition , hydroponic technique. **Mineral salt absorption:** Introduction, mechanism of passive absorption (ion exchange theory) and active absorption (carrier concept theory)	**08 Periods**
	To study the effect of temperature/ organic solvent/ concentration of different organic solvents on permeability of plasma membrane (Beet root) by using colorimeter / spectrophotometer.	1 practical
	Separation of photosynthetic pigments by paper chromatography.	1 practical
	To study the effect of light intensity on rate of photosynthesis.	1 practical
	Determination of RF value and identification of amino acids in a mixture.	1 practical
	SEC	
Aug	**Translocation of organic solutes:** Introduction, mechanism of translocation (Munch-Mass Flow hypothesis).	**04 Periods**
	UNIT III: GROWTH AND DEVELOPMENT **Growth and Plant growth regulators**: Introduction, phases of growth, measurement of growth (Arc indicator and Pfeiffer's auxanometer), factors affecting growth.Chemical nature and practical applications of Auxins, Gibberellins, Cytokinins, Abscisic Acid and Ethylene. Circadian Rhythms in plants. **Seed dormancy:** Introduction, causes of seed dormancy and methods of breaking seed dormancy **Seed germination:** Introduction, types and mechanism of seed ermination,	**10 Periods**
	Preparation of standard graph of starch/Glucose using Colorimeter/ Spectrophotometer and determination of starch / Glucose content of the given plant material.	1 practical
	Preparation of standard graph of protein using Colorimeter/ Spectrophotometer and determination of protein content from given plant material.	1 practical

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	To estimate the percentage of oil content in given oil seeds using Soxhlet extractor.	1 practical
	Study of catalase activity under different pH and temperature.	1 practical
	To study the phenomenon of seed germination (effect of light and darkness).	1 practical
Sept.	**Physiology of flowering**: Introduction, Photoperiodism (LDP, SDP and DNP), Phytochrome, red and far red light responses on photomorphogenesis. Photo-morphogenesis: Photo receptors, phyto-chrome, crypto-chrome **Vernalization and devernalization:** Introduction, mechanism and significance	**02 Periods**
	UNIT IV: BIOMOLECULES AND SECONDARY METABOLITES **Carbohydrates**: Introduction, structure and classification, onosaccharides, disaccharides and polysaccharides (starch and cellulose) biological functions of carbohydrates. **Protein-** Introduction, classification and biological functions of Primary, secondary (α helix and β sheets), tertiary and quaternary structure of proteins **Lipids**: Introduction, structure classification and biological functions of lipids.	**08 Periods**
	Demonstration of osmosis by potato osmoscope.	1 practical
	Demonstration of Ascent of Sap by Balsam plant .	1 practical
	To study the mineral deficiency symptoms in at least four locally available plants.	1 practical
	Demonstrations of the Arc indicator (lever auxanometer).	1 practical
	Clinostat (Geotropism), Kuhn's fermentation tube experiment	1 practical
Oct	**Secondary metabolites:** Biological functions of tannins, terpenoids, flavonoids, alkaloids, essential oils and organic acids	**02 Periods**
	Qualitative analysis of proteins (Biuret/ Xanthoproteic/ Millon tests),	1 practical
	Carbohydrates (Molisch /Fehlings /Benedict's) Glucose, sucrose, starch, Cellulose and Pectin.	1 practical
Nov	**Examinations**	
Dec	**Unit-I: Photosynthesis & Respiration** **Photosynthesis:** Introduction, ultra structure of chloroplast, hotosynthetic pigments, concepts of two Photosystems, Mechanism of photosynthesis, Light reaction, Hill's reaction, Cyclic and Non-cyclic photophosphorylation, , Calvin cycle (C3) and Hatch and Slack (C4) pathway, CAM pathway, Significance of photosynthesis, photorespiration. **Respiration:** Introduction, ultra structure of mitochondria, structure and functions of ATP, significance of respiration. Respiratory quotient (RQ) **Types of respiration**: Aerobic respiration- Glycolysis, Kreb's cycle, Electron Transport System. Anaerobic respiration- Fermentation (Alcoholic and Lactic acid)	**11 Periods**
	Qualitative test of tannin, terpenoids, saponins, flavonoids and alkaloids.	1 practical
	Micro chemical test for organic acids – Tartaric acid, Citric acid, Oxalic and Malic acid.	1 practical
	Study of tools used in Tissue culture laboratory for sterilization and inoculation. Principle and working of Autoclave, oven, incubator, Laminar Air flow,	1 practical
	Preparation of media for tissue culture.	1 practical
	Establishment of callus cultures –from carrot.	1 practical
Jan	**UNIT-II: ENZYMES AND NITROGEN METABOLISM** **Enzymes:** Introduction, nomenclature and classification (IUB), mechanism of enzyme action (Lock and key model, induced fit model), Concept of holoenzyme, mechanism of regulation of Enzyme activity-Feedback and allosteric regulation. **Nitrogen metabolism:** Introduction, types of nitrogen fixation- Physical and biological (Symbiotic and Asymbiotic), Ammonification, Nitrification and Denitrification, Nitrate reductase, Nitrogen cycle.	**11 Periods**

	Different steps involved in genetic engineering for production of Bt. cotton, Golden rice, Flavr Savr tomato through photographs.	1 practical
	Study of methods of gene transfer through photographs: *Agrobacterium*-mediated gene transfer .	1 practical
	Field study of several types of flower with different pollination mechanisms.	1 practical
	Study major biological databases.	1 practical
	Study of methods of gene transfer through photographs: *Agrobacterium*-mediated gene transfer .	1 practical
Feb	**UNIT III: BIOTECHNOLOGY-PLANT TISSUE CULTURE** Introduction to Biotechnology, current uses of biotechnology, Plant Tissue Culture: Introduction to plant tissue culture, totipotency of plant cells, basic aspects of tissue culture laboratory, nutrient media, composition and its preparation , Technique of plant tissue culture: selection and surface sterilization of explants, inoculation, incubation (temperature and light regime) ,Initiation of callus cultures and cell suspension cultures, Regeneration of plants (Organogenesis and embryogenesis). **Applications of tissue culture**: Micropropagation, Production of disease free plants, production of secondary metabolites, Anther culture and production of haploids, protoplast culture and somatic hybridization, synthetic seeds	**12 Period**
	Field study of several types of flower with different pollination mechanisms.	1 practical
	Study major biological databases	1 practical
March	**UNIT IV: BIOTECHNOLOGY-GENETIC ENGINEERING** technology, Cloning vectors (Plasmid-PBR 322, Bacteriophage, Cosmid, Phagemid), Gene cloning, Genomic library and cDNA library, *Agrobacterium* mediated gene transfer, transgenic plants, Polymerase Chain Reaction and its applications. **Bioinformatics**: Introduction, Biological database, NCBI, BLAST.	**11 Period**
	Agrobacterium-mediated gene transfer .	1 practical
April	**Examinations**	

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DEPARTMENT OF BOTANY

Class: B.SC-T.Y
Academic Year-2020-2021
Title of the Paper & No.: Cell and Molecular biology -XII & Genetics and Plant Breeding -XIV
Name of the Teacher: Dr. Dhole N A

ANNUAL TEACHING PLAN 2020-2021

Month	Course content	Expected Periods
June	**UNIT-I : CELL BIOLOGY-I** 1. Cell: the unit of life, ultra structure of Prokaryotic and eukaryotic cells, 2. Ultra structure and functions of cell wall and cell membranes (Fluid Mosaic Model),	**06Periods**
July	3. Ultra Structure and functions of cell organelles: Golgi apparatus, Endoplasmic reticulum, Ribosomes, Lysosomes, Peroxisomes, Glyoxisomes and Nucleus. **UNIT-II : CELL BIOLOGY-II** 1. Chromosome: Morphology, structure and function of typical chromosome and Karyotype and Idiogram, 2. Structure and significance of giant Chromosomes: Polytene chromosome and Lampbrush chromosome,	**05 Periods** **08 Periods**
	Study of ultra-structure of cell organelles with the help of photocopies/slides	1 practical
	Study of giant chromosome with the help of photocopies/ slides	1 practical
	Study of Salivary gland chromosome from *Chironomous* larvae	1 practical
Aug	3. Cell cycle: G0 - G1 - S - G2 phase, Cell division: Process and significance of Mitosis and Meiosis. **UNIT-III: MOLECULAR BIOLOGY-I** 1. Nucleic Acids- Introduction, Chemical composition, Structure of DNA (Watson and Crick model), Replication of DNA Meselson and Stahl expt.), Structure, function and types of RNA.	**03 Periods** **10 Periods**
	study of mitosis (Onion/Garlic root tips	1 practical
	mitotic index	1 Practical
	Effect of colchicine on mitosis	2 Practical
Sept.	2. Protein synthesis: Genetic code (Nature and Properties), Transcription, Translation.	**02 Periods**
	UNIT-IV: MOLECULAR BIOLOGY-II 1. Classical concept of gene (theory of Morgan), Fine structure of gene (Seymour Benzer's), Regulation of gene expression in prokaryotes (Lac Operon Model) 2. Mutation: Introduction,	**09 Periods**

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	Mutagens, Molecular basis of gene mutation and related diseases: Phenylketonuria (PKU), Alkaptonuria (AKU), Albinism, Sickle cell anaemia and Amniocentesis (Detection of genetic diseases).	
	study of meiosis from Onion/Maize floral buds	1 Practical
	Preparation of Awla candy,	1 Practical
	Awla masticator (Awla supari),	1 Practical
	Adulsa syrup	1 Practical
Oct	Sickle cell anaemia and Amniocentesis (Detection of genetic diseases).	**03 Periods**
Nov	**Examinations**	
Dec	**UNIT-I : GENETICS-I** 1. Mendelian inheritance: Mendel's Laws of inheritance. Explanation and examples of Monohybrid cross, dihybrid cross (back cross and test cross) 2. Gene interaction and epistasis (Allelic and non-allelic) explanation and examples of, 9:7, 9:3:4, 12:3:1 and 15:1 ratios, Collaborator gene (comb shape in fowl) 3. Sex determination: Discovery of sex chromosomes, chromosomal theory of sex determination, sex determination in insects (XOXX), Birds (ZW-ZZ method), Animals (Drosophila and Man), and Plants (*Melandrium* and *Asparasgus*).	**11 Periods**
	Problems based on 9:7	1 Practical
	Problems based on 9:3:4	1 Practical
	Problems based on 15:1	1 Practical
	Problems based on 12:3:1	1 Practical
Jan	**UNIT –II: GENETICS-II** 1. Linkage: (Definitions and significance) Coupling and repulsion hypothesis. Type of linkage (maize and drosophila) 2. Sex linked inheritance: Definition classification (x-linked, y-linked and xy-linked), Sex linked inheritance in Drosophila (white eye colour), Man (Hemophilia, colour blindness and holandric gene-hypertrochosis) and Birds (barred feathers) 3. Genetic variations: Polyploidy, Euploidy-Autoploy ploidy and Allopolyploidy with reference to Raphanobrassica and Hexaploid wheat, Aneuploidy (Hyper and Hypoploidy), Syndromes in human i) Down's syndrome ii) Edward's syndrome iii) Patau's syndrome iv) Turner's syndrome v) Klinefelter's syndrome.	**12 Periods**
	Problems based on sex-linked inheritance	1 Practical
	Study of syndromes in Man by using photocopies	1 Practical
	Pollen viability tests- Acetocarmine method and Sugar solution method	1 Practical
	Study of floral structure of self-pollinated (wheat) and cross pollinated (Maize) crops	1 Practical
	Hybridization techniques-Emasculation, Pollination and	1 Practical

	Bagging	
	Requirement for mushroom cultivation	1 Practical
	Procedure for mushroom cultivation,	1 Practical
	Field Visit	1 Practical
Feb	**UNIT –III: PLANT BREEDING-I** 1. Introduction and objectives of plant breeding, methods of plant breeding: Selection-Mass selection, pure line selection and clonal selection, 2. Hybridization: definition, objectives, various steps in hybridization, applications,3. Heterosis and hybrid vigour: definition, effects, utilization and limitations.	**11 Period**
	observations, Harvesting of mushroom cultivation	1 Practical
March	**UNIT –IV: PLANT BREEDING -II** 1. Plant introduction and acclimatization, types, advantages and disadvantages, 2. Mutational breeding: objectives, procedure, applications, Mutational breeding with reference to groundnut 3. Male sterility: Genetic Male Sterility (GMS), Cytoplasmic Male Sterility (CMS).	**11 Period**
April	**Examinations**	

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DEPARTMENT OF BOTANY

Class: B.SC-F.Y

Academic Year-2021-2022

Title of the Paper & No.: **Viruses, Bacteria Algae , Fungi , Lichens andMycorrhiza- I & Bryophytes, Pteridophytes Gymnosperms and paleobotany-III**

Name of the Teacher: **Dr. Dhole N A**

ANNUAL TEACHING PLAN 2021-22

Month	Course content	Expected Periods
June	Admission	
July	**Unit I: Microbes** Viruses –Introduction, general characters of viruses, replication (general account), and RNA virus (TMV); Economic importance; study of yellow vein mosaic of Bhendi Bacteria – Introduction, General characters and cell structure; Reproduction – vegetative, asexual (Binary Fission) and recombination (conjugation,) Study of Citrus Canker and Economic importance of Bacteria..	**10 Lectures**
	Study of morphology of Bacteria by Gram staining method	**1 Practical**
	Study of citrus canker disease, Study of symptoms of yellow vein mosaic of Bhendi	**1 Practical**
	Study of Algae : Systematic position and external features of *Nostoc, Oedogonium, Ectocarpus*	**1 Practical**
	Study of Fungi: systematic position, external and internal features of *Penicillium, Alternaria and Agaricus.*	**1 Practical**
Aug	**Unit II: Algae** Introduction, General characters, Ecology and distribution; Range of thallus organization and reproduction; Classification of algae (F. E. Fritch's 1935); Morphology and life-cycles of the following: *Nostoc, Oedogonium* and *Ectocarpus*. Economic importance of algae	**12 Lectures**
	Study of different forms of Lichens	**1 Practical**
	Study of ectomycorrhiza and endomycorrhiza	**1 Practical**
	Study of *Marchantia*- morphology of thallus, w.m. rhizoids and scales, v.s. thallus through gemma cup, w.m. gemmae (all temporary slides).	**1 Practical**
	v.s. antheridiophore, archegoniophore, L. S. of sporophyte (all permanent slides)	**1 Practical**
Sept	**Unit III: Fungi** Introduction, General characters, Ecology and distribution; Range of thallus organization and reproduction; Classification of algae (F. E. Fritch's 1935); Morphology and life-cycles of the following: *Nostoc, Oedogonium* and *Ectocarpus*. Economic importance of algae	**13 Lectures**
	Study of *Funaria*- morphology, w.m. leaf, rhizoids, operculum, peristome, annulus, spores (temporary slides).	**1 Practical**
	permanent slides showing antheridial and archegonial heads, L.S.of capsule and protonema	**1 Practical**
	Lycopodium- morphological and anatomical study	**1 Practical**
Oct	**Unit IV: Lichens and Mycorrhiza** Lichens: General characters, types and economic importance. Mycorrhiza: General characters, ectomycorrhiza and endomycorrhiza and their significance	**10 Lectures**
	Marsilea- morphological and anatomical study of petiole and rhizome	**1 Practical**
Nov	**Examinations**	
Dec	**Unit I: Bryophytes** General characters, Classification (N.S.Parihar), morphology, anatomy and	**10 Lectures**

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	reproduction of *Marchantia* and *Funaria*. (Developmental study not expected), Economic importance of bryophytes.	
	Cycas- morphology ,T.S of. rachis, T.S.of leaflet, male and female cone	**1 Practical**
	Pinus- morphology (long and dwarf shoots, w.m. dwarf shoot, male and female cone).	**1 Practical**
	Study of fossil Plants	**1 Practical**
	Estimation of soil Bulk density and porosity	**1 Practical**
Jan	**Unit II:** Pteridophytes General characters, classification (N.S.Parihar), morphology, anatomy and reproduction of *Lycopodium* and *Marsilea*. (Developmental study not expected), Homospory, Heterospory and seed habit, stelar evolution, economical importance of Pteridophytes.	**13 Lectures**
	Study of morphological and anatomical adaptations of hydrophytes (*Hydrilla* stem and *Nymphea* petiole)	**1 Practical**
	xerophytes (*Nerium* leaf and *Casuarina* stem)	**1 Practical**
	Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus	**1 Practical**
	Brassicaceae	**1 Practical**
Feb	**Unit III: Gymnosperms** General characters, classification (K.R.Sporne, 1964), morphology, anatomy and Reproduction of *Cycas* and *Pinus*. (Developmental study not expected), Ecological and Economic importance.	**12 Lectures**
	Study of Family : Fabaceae.	**1 Practical**
	Study of Family : Solanaceae.	**1 Practical**
	Study of Family : Lamiaceae.	**1 Practical**
	Study of Family : Poaceae.	**1 Practical**
March	**Unit IV: Paleobotany** Introduction to palaeobotany, process of plant fossilization, types of fossils, geological time scale, Study of fossil Gymnosperms-***Lyginopteris oldhamia*** (stem), ***Bennettites*** (flower) and General characters of ***Ginkgo*** (A living fossil)..	**10 Lectures**
April	**Examinations**	

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DEPARTMENT OF BOTANY

Class: B.SC-S.Y Academic Year-2021-2022
Title of the Paper & No.: **Plant Physiology and Biochemistry–VII & Plant Metabolism and Biotechnology-IX**
Name of the Teacher: **Dr. Dhole N A**

ANNUAL TEACHING PLAN 2021-2022		
Month	**Course content**	**Expected Periods**
June	**UNIT-I: PLANT WATER RELATIONS** **Physical aspects of water absorption** – Diffusion, DP, DPD Imbibition Osmosis – OP, Exosmosis, Endosmosis, Plasmolysis ,Water potential ,Mechanism of water absorption by root –active and passive absorption **Ascent of sap:** Introduction and mechanism (transpiration pull theory) **Transpiration:** Definition, types, structure of stomata, mechanism of opening and closing of Stomata (starch-sugar theory and K+ pump theory), guttation, antitranspirants.	**11 Periods**
	To determine the water potential of potato tuber	1 practical
	To determine the osmotic potential of vacuolar sap by plasmolysis	1 practical
July	**Plant movements:** Introduction, classification, paratonic and nastic movements.	**04 Periods**
	UNIT-II: MINERAL NUTRITION **Major and Minor elements:** Introduction, source, deficiency symptoms and their role. Foliar nutrition , hydroponic technique. **Mineral salt absorption:** Introduction, mechanism of passive absorption (ion exchange theory) and active absorption (carrier concept theory)	**08 Periods**
	To study the effect of temperature/ organic solvent/ concentration of different organic solvents on permeability of plasma membrane (Beet root) by using colorimeter / spectrophotometer.	1 practical
	Separation of photosynthetic pigments by paper chromatography.	1 practical
	To study the effect of light intensity on rate of photosynthesis.	1 practical
	Determination of RF value and identification of amino acids in a mixture.	1 practical
	SEC	
Aug	**Translocation of organic solutes:** Introduction, mechanism of translocation (Munch-Mass Flow hypothesis).	**04 Periods**
	UNIT III: GROWTH AND DEVELOPMENT **Growth and Plant growth regulators**: Introduction, phases of growth, measurement of growth (Arc indicator and Pfeiffer's auxanometer), factors affecting growth.Chemical nature and practical applications of Auxins, Gibberellins, Cytokinins, Abscisic Acid and Ethylene. Circadian Rhythms in plants. **Seed dormancy:** Introduction, causes of seed dormancy and methods of breaking seed dormancy **Seed germination:** Introduction, types and mechanism of seed ermination,	**10 Periods**
	Preparation of standard graph of starch/Glucose using Colorimeter/ Spectrophotometer and determination of starch / Glucose content of the given plant material.	1 practical
	Preparation of standard graph of protein using Colorimeter/ Spectrophotometer and determination of protein content from given plant material.	1 practical

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	To estimate the percentage of oil content in given oil seeds using Soxhlet extractor.	1 practical
	Study of catalase activity under different pH and temperature.	1 practical
	To study the phenomenon of seed germination (effect of light and darkness).	1 practical
Sept.	**Physiology of flowering**: Introduction, Photoperiodism (LDP, SDP and DNP), Phytochrome, red and far red light responses on photomorphogenesis. Photo-morphogenesis: Photo receptors, phyto-chrome, crypto-chrome **Vernalization and devernalization:** Introduction, mechanism and significance	**02 Periods**
	UNIT IV: BIOMOLECULES AND SECONDARY METABOLITES **Carbohydrates**: Introduction, structure and classification, onosaccharides, disaccharides and polysaccharides (starch and cellulose) biological functions of carbohydrates. **Protein-** Introduction, classification and biological functions of Primary, secondary (α helix and β sheets), tertiary and quaternary structure of proteins **Lipids**: Introduction, structure classification and biological functions of lipids.	**08 Periods**
	Demonstration of osmosis by potato osmoscope.	1 practical
	Demonstration of Ascent of Sap by Balsam plant .	1 practical
	To study the mineral deficiency symptoms in at least four locally available plants.	1 practical
	Demonstrations of the Arc indicator (lever auxanometer).	1 practical
	Clinostat (Geotropism), Kuhn's fermentation tube experiment	1 practical
Oct	**Secondary metabolites:** Biological functions of tannins, terpenoids, flavonoids, alkaloids, essential oils and organic acids	**02 Periods**
	Qualitative analysis of proteins (Biuret/ Xanthoproteic/ Millon tests),	1 practical
	Carbohydrates (Molisch /Fehlings /Benedict's) Glucose, sucrose, starch, Cellulose and Pectin.	1 practical
Nov	**Examinations**	
Dec	**Unit-I: Photosynthesis & Respiration** **Photosynthesis:** Introduction, ultra structure of chloroplast, hotosynthetic pigments, concepts of two Photosystems, Mechanism of photosynthesis, Light reaction, Hill's reaction, Cyclic and Non-cyclic photophosphorylation, , Calvin cycle (C3) and Hatch and Slack (C4) pathway, CAM pathway, Significance of photosynthesis, photorespiration. **Respiration:** Introduction, ultra structure of mitochondria, structure and functions of ATP, significance of respiration. Respiratory quotient (RQ) **Types of respiration**: Aerobic respiration- Glycolysis, Kreb's cycle, Electron Transport System. Anaerobic respiration- Fermentation (Alcoholic and Lactic acid)	**11 Periods**
	Qualitative test of tannin, terpenoids, saponins, flavonoids and alkaloids.	1 practical
	Micro chemical test for organic acids – Tartaric acid, Citric acid, Oxalic and Malic acid.	1 practical
	Study of tools used in Tissue culture laboratory for sterilization and inoculation. Principle and working of Autoclave, oven, incubator, Laminar Air flow,	1 practical
	Preparation of media for tissue culture.	1 practical
	Establishment of callus cultures –from carrot.	1 practical
Jan	**UNIT-II: ENZYMES AND NITROGEN METABOLISM** **Enzymes:** Introduction, nomenclature and classification (IUB), mechanism of enzyme action (Lock and key model, induced fit model), Concept of holoenzyme, mechanism of regulation of Enzyme activity-Feedback and allosteric regulation. **Nitrogen metabolism:** Introduction, types of nitrogen fixation- Physical and biological (Symbiotic and Asymbiotic), Ammonification, Nitrification and Denitrification, Nitrate reductase, Nitrogen cycle.	**11 Periods**

	Different steps involved in genetic engineering for production of Bt. cotton, Golden rice, Flavr Savr tomato through photographs.	1 practical
	Study of methods of gene transfer through photographs: *Agrobacterium*-mediated gene transfer .	1 practical
	Field study of several types of flower with different pollination mechanisms.	1 practical
	Study major biological databases.	1 practical
	Study of methods of gene transfer through photographs: *Agrobacterium*-mediated gene transfer .	1 practical
Feb	**UNIT III: BIOTECHNOLOGY-PLANT TISSUE CULTURE** Introduction to Biotechnology, current uses of biotechnology, Plant Tissue Culture: Introduction to plant tissue culture, totipotency of plant cells, basic aspects of tissue culture laboratory, nutrient media, composition and its preparation , Technique of plant tissue culture: selection and surface sterilization of explants, inoculation, incubation (temperature and light regime) ,Initiation of callus cultures and cell suspension cultures, Regeneration of plants (Organogenesis and embryogenesis). **Applications of tissue culture**: Micropropagation, Production of disease free plants, production of secondary metabolites, Anther culture and production of haploids, protoplast culture and somatic hybridization, synthetic seeds	**12 Period**
	Field study of several types of flower with different pollination mechanisms.	1 practical
	Study major biological databases	1 practical
March	**UNIT IV: BIOTECHNOLOGY-GENETIC ENGINEERING** technology, Cloning vectors (Plasmid-PBR 322, Bacteriophage, Cosmid, Phagemid), Gene cloning, Genomic library and cDNA library, *Agrobacterium* mediated gene transfer, transgenic plants, Polymerase Chain Reaction and its applications. **Bioinformatics**: Introduction, Biological database, NCBI, BLAST.	**11 Period**
	Agrobacterium-mediated gene transfer .	1 practical
April	**Examinations**	

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DEPARTMENT OF BOTANY

Class: B.SC-T.Y
Academic Year-2021-2022
Title of the Paper & No.: Cell and Molecular biology -XII & Genetics and Plant Breeding -XIV
Name of the Teacher: Dr. Dhole N A

ANNUAL TEACHING PLAN 2021-2022		
Month	**Course content**	**Expected Periods**
June	**UNIT-I : CELL BIOLOGY-I** 1. Cell: the unit of life, ultra structure of Prokaryotic and eukaryotic cells, 2. Ultra structure and functions of cell wall and cell membranes (Fluid Mosaic Model),	**06Periods**
July	3. Ultra Structure and functions of cell organelles: Golgi apparatus, Endoplasmic reticulum, Ribosomes, Lysosomes, Peroxisomes, Glyoxisomes and Nucleus. **UNIT-II : CELL BIOLOGY-II** 1. Chromosome: Morphology, structure and function of typical chromosome and Karyotype and Idiogram, 2. Structure and significance of giant Chromosomes: Polytene chromosome and Lampbrush chromosome,	**05 Periods** **08 Periods**
	Study of ultra-structure of cell organelles with the help of photocopies/slides	1 practical
	Study of giant chromosome with the help of photocopies/ slides	1 practical
	Study of Salivary gland chromosome from *Chironomous* larvae	1 practical
Aug	3. Cell cycle: G0 - G1 - S - G2 phase, Cell division: Process and significance of Mitosis and Meiosis. **UNIT-III: MOLECULAR BIOLOGY-I** 1. Nucleic Acids- Introduction, Chemical composition, Structure of DNA (Watson and Crick model), Replication of DNA Meselson and Stahl expt.), Structure, function and types of RNA.	**03 Periods** **10 Periods**
	study of mitosis (Onion/Garlic root tips	1 practical
	mitotic index	1 Practical
	Effect of colchicine on mitosis	2 Practical
Sept.	2. Protein synthesis: Genetic code (Nature and Properties), Transcription, Translation.	**02 Periods**
	UNIT-IV: MOLECULAR BIOLOGY-II 1. Classical concept of gene (theory of Morgan), Fine structure of gene (Seymour Benzer's), Regulation of gene expression in prokaryotes (Lac Operon Model) 2. Mutation: Introduction,	**09 Periods**

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	Mutagens, Molecular basis of gene mutation and related diseases: Phenylketonuria (PKU), Alkaptonuria (AKU), Albinism, Sickle cell anaemia and Amniocentesis (Detection of genetic diseases).	
	study of meiosis from Onion/Maize floral buds	1 Practical
	Preparation of Awla candy,	1 Practical
	Awla masticator (Awla supari),	1 Practical
	Adulsa syrup	1 Practical
Oct	Sickle cell anaemia and Amniocentesis (Detection of genetic diseases).	**03 Periods**
Nov	**Examinations**	
Dec	**UNIT-I : GENETICS-I** 1. Mendelian inheritance: Mendel's Laws of inheritance. Explanation and examples of Monohybrid cross, dihybrid cross (back cross and test cross) 2. Gene interaction and epistasis (Allelic and non-allelic) explanation and examples of, 9:7, 9:3:4, 12:3:1 and 15:1 ratios, Collaborator gene (comb shape in fowl) 3. Sex determination: Discovery of sex chromosomes, chromosomal theory of sex determination, sex determination in insects (XOXX), Birds (ZW-ZZ method), Animals (Drosophila and Man), and Plants (*Melandrium* and *Asparasgus*).	**11 Periods**
	Problems based on 9:7	1 Practical
	Problems based on 9:3:4	1 Practical
	Problems based on 15:1	1 Practical
	Problems based on 12:3:1	1 Practical
Jan	**UNIT –II: GENETICS-II** 1. Linkage: (Definitions and significance) Coupling and repulsion hypothesis. Type of linkage (maize and drosophila) 2. Sex linked inheritance: Definition classification (x-linked, y-linked and xy-linked), Sex linked inheritance in Drosophila (white eye colour), Man (Hemophilia, colour blindness and holandric gene-hypertrochosis) and Birds (barred feathers) 3. Genetic variations: Polyploidy, Euploidy-Autoploidy and Allopolyploidy with reference to Raphanobrassica and Hexaploid wheat, Aneuploidy (Hyper and Hypoploidy), Syndromes in human i) Down's syndrome ii) Edward's syndrome iii) Patau's syndrome iv) Turner's syndrome v) Klinefelter's syndrome.	**12 Periods**
	Problems based on sex-linked inheritance	1 Practical
	Study of syndromes in Man by using photocopies	1 Practical
	Pollen viability tests- Acetocarmine method and Sugar solution method	1 Practical
	Study of floral structure of self-pollinated (wheat) and cross pollinated (Maize) crops	1 Practical
	Hybridization techniques-Emasculation, Pollination and	1 Practical

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	Requirement for mushroom cultivation	1 Practical
	Procedure for mushroom cultivation,	1 Practical
	Field Visit	1 Practical
Feb	**UNIT –III: PLANT BREEDING-I** 1. Introduction and objectives of plant breeding, methods of plant breeding: Selection-Mass selection, pure line selection and clonal selection, 2. Hybridization: definition, objectives, various steps in hybridization, applications,3. Heterosis and hybrid vigour: definition, effects, utilization and limitations.	**11 Period**
	observations, Harvesting of mushroom cultivation	1 Practical
March	**UNIT –IV: PLANT BREEDING -II** 1. Plant introduction and acclimatization, types, advantages and disadvantages, 2. Mutational breeding: objectives, procedure, applications, Mutational breeding with reference to groundnut 3. Male sterility: Genetic Male Sterility (GMS), Cytoplasmic Male Sterility (CMS).	**11 Period**
April	**Examinations**	

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