Telangana State Council of Higher Education, Govt. of Telangana
B.Sc., CBCS Common Core Syllabi for all Universities in Telangana
(*wef* 2016-2017)

PROPOSED SCHEME FOR CHOICE BASED CREDIT SYSTEM IN BSc GENETICS

CODE	COURSE TITLE	COURSE TYPE	HPW	CREDITS
FIRST YEAR- SEMESTER I				
BS 101	Communication	AECC-1	2	2
BS 102	English	CC-1A	5	5
BS 103	Second language	CC-2A	5	5
BS 104	Optional I	DSC-1A	4T=2P=6	4+1=5
BS 105	Optional II	DSC-2A	4T=2P=6	4+1=5
BS 106	**Optional III- Classical Genetics**	DSC-3A	4T=2P=6	4+1=5
	TOTAL			**27**
FIRST YEAR- SEMESTER II				
BS 201	Environmental studies	AECC-2	2	2
BS 202	English	CC-1B	5	5
BS 203	Second language	CC-2B	5	5
BS 204	Optional I	DSC-1B	4T=2P=6	4+1=5
BS 205	Optional II	DSC-2B	4T=2P=6	4+1=5
BS 206	**Optional III- Cytogenetics**	DSC-3B	4T=2P=6	4+1=5
	TOTAL			**27**
SECOND YEAR- SEMESTER III				
BS 301	**Basic Statistics and Genetic Analysis**	SEC-I	2	2
BS 302	English	CC-1C	5	5
BS 303	Second language	CC-2C	5	5
BS 304	Optional I	DSC-1C	4T=2P=6	4+1=5
BS 305	Optional II	DSC-2C	4T=2P=6	4+1=5
BS 306	**Optional III- Molecular Genetics**	DSC-3C	4T=2P=6	4+1=5
	TOTAL			**27**
SECOND YEAR- SEMESTER IV				
BS 401	**Cytogenetics- Lab Processing and Analysis**	SEC-2	2	2
BS 402	English	CC-1D	5	5
BS 403	Second language	CC-2D	5	5
BS 404	Optional I	DSC-1D	4T=2P=6	4+1=5
BS 405	Optional II	DSC-2D	4T=2P=6	4+1=5
BS 406	**Optional III- Microbial Genetics & Genetic Engineering**	DSC-3D	4T=2P=6	4+1=5
	TOTAL			**27**

THIRD YEAR- SEMESTER- V				
CODE	**COURSE TITLE**	**COURSE TYPE**	**HPW**	**CREDITS**
BS 501	**Analytical Techniques in Molecular Genetics**	SEC-3	2	2
BS 502	**Foundations of Genetics**	GE-1	2T	2
BS 503	Optional - I	DSC-1E	3T=2P=5	3+1=4
BS 504	Optional- II	DSC-2E	3T=2P=5	3+1=4
BS 505	**Optional- III- Biostatistics & Bioinformatics**	DSC-3E	3T=2P=5	3+1=4
BS 506	Optional I- A/B	DSC-1E	3T=2P=5	3+1=4
BS 507	Optional II- A/B	DSC-2E	3T=2P=5	3+1=4
BS 508	**Optional III- A/B** **A. Plant Genetics & Biotechnology** **(or)** **B. Animal Cell Technology & Animal Genetics**	DSE-3E	3T=2P=5	3+1=4
	TOTAL		**34**	**28**
THIRD YEAR- SEMESTER- VI				
BS 601	**DNA Technology in Health Care & Transgenics**	SEC-4	2	2
BS 602	**Applied Genetics**	GE-2	2T	2
BS 603	Optional - I	DSC-1F	3T=2P=5	3+1=4
BS 604	Optional- II	DSC-2F	3T=2P=5	3+1=4
BS 605	**Optional- III- Population Genetics & Evolution**	DSC-3F	3T=2P=5	3+1=4
BS 606	Optional I- A/B	DSC-1F	3T=2P=5	3+1=4
BS 607	Optional II- A/B	DSC-2F	3T=2P=5	3+1=4
BS 608	**Optional III- A/B** **A. Human Genome & Human Genetics** **(or)** **B. Cellular & Molecular Immunology**	DSE-3F	3T=2P=5	3+1=4
	TOTAL		**34**	**28**
	TOTAL Credits			**164**

Total credits= 164-12 (AECC 4 + SEC 8) =152

AECC: Ability **E**nhancement **C**ompulsory **C**ourse
SEC: S*kill* ***E****nhancement* ***C****ourse*
DSC: D*iscipline* ***S****pecific* ***C****ourse*
DSE: D*iscipline* ***S****pecific* ***E****lective*
GE: G*eneric* ***E****lective*

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Department of Genetics
Scheme Pattern for each optional in Genetics for BSc Course

Year	Semester	Course Type	Credits/ Theory	Teaching hours/ week- Theory	Credits- Practicals	Lab hours/ week- Practical	Dept. workload/ week/ section
FIRST YEAR	ONE	BS106- Classical Genetics	4	4	1	2	6
	TWO	BS206- Cytogenetics	4	4	1	2	6
SECOND YEAR	THREE	Bs306-Molecular Genetics	4	4	1	2	6
	FOUR	BS406- Microbial Genetics & Genetic Engineering	4	4	1	2	6
THIRD YEAR	FIVE	CORE: BS505- Biostatistics & Bioinformatics	3	3	1	2	5
		ELECTIVE: A. BS508A- Plant Genetics & Biotechnology (or) B. BS508B- Animal Cell Technology & Animal Genetics	3	3	1	2	10 (A+B)
	SIX	CORE: BS605- Population Genetics & Evolution	3	3	1	2	5
		ELECTIVE: A. BS608A- Human Genome & Human Genetics (or) B. BS608B- Cellular & Molecular Immunology	3	3	1	2	10 (A+B)

Career Oriented Courses that can be opted by B.Sc. Genetics Undergraduates

1. Advanced Diploma in Biotechnology
2. Advanced Diploma in Healthcare Informatics and Management
3. Applied Biotechnology in Herbal Medicine
4. Applied Techniques in Industry and Laboratories
5. Biodiversity and Conservation
6. Bioinformatics
7. Biotechnology
8. C.C. Hospital Waste Management
9. C.C. Advance Biological Techniques
10. C.C. in Biodiversity
11. C.C. in Plant Biotechnology
12. C.C. in Plant tissue Culture
13. C.C. in Statistics and SPSS
14. C.C. on Statistical Package R
15. Certificate in Bio-fertilizer Production
16. Certificate Programme in Health Care
17. Clinical Biochemistry
18. Clinical Pathology
19. Computation with Matlab
20. Computational Biology
21. Computer assisted Drug Designing and Synthesis
22. Computer Programing and Utilization
23. Computer and Software skills
24. Database Management System
25. Diploma in Bioinformatics
26. Diploma in in Medical Laboratory Technician
27. Diploma in Medical Transcription
28. Diploma Nano Science and NanoTechnology
29. Drug Analysis
30. Fermentation and Alcohol Technology
31. Health care and Waste Management
32. Herbal Medicine
33. Herbal Medicine and Tech.
34. Hospital Waste Disposal Management
35. Identification and Cultivation of Medicinal Plants
36. Industrial and Applications of Biostatistics
37. Industrial applications of Medicinal Plants
38. Medical Lab Technology
39. Medical Laboratory Technician
40. Medicinal Plants
41. Microbial Biotechnology
42. Plant Tissue Culture
43. Plant Tissue Culture Technology
44. Tissue Culture
45. Vermicomposting

B.Sc. GENETICS I YEAR
SEMESTER- I
DISCIPLINE SPECIFIC COURSE (DSC)
BS106: CLASSICAL GENETICS

Unit 1: Mendelian Inheritance

1. Mendel's experiments- Choice of material, characters. Terminology and definitions –phenotypes, genotype, locus, allele, homozygotes, heterozygotes, Johanssen's Pure line concept, filial generations, reciprocal cross, back cross, test cross
2. Law of Segregation- Monohybrid crosses with examples, Law of Independent Assortment – Dihybrid and Trihybrid crosses with examples
3. Variations to Dominance - Penetrance and Expressivity; Co-dominance & Incomplete dominance, Pleiotropism
4. Lethal and Sub-lethal Genes – Dominant and recessive lethals. Balanced lethals – Drosophila (Cy /Pm, H / Sb)
5. Paramutation – mottling phenotypes in maize; Segregation distortion – Sd gene in Drosophila
6. Features of Quantitative Inheritance – Additive effect; Kernel colour in Maize, skin colour, height and IQ in man. Effect of Temperature, altitude etc.
7. Multifactorial inheritance – Hypertension, Diabetes mellitus

Unit 2: Extensions to Mendelian Genetics

1. Gene-Gene Interactions - Different types of Epistasis with examples from different organisms
2. Multiple alleles – theories of multiple allelic inheritance- Eye color in Drosophila, coat color in mice and rabbits. ABO blood groups, blood group incompatibility in transfusion. Self incompatibility in plants
3. Extrachromosomal inheritance in Paramecium, Yeast, Drosophila
4. Sex linked inheritance: X—linked and Y-linked traits
5. Sex chromosome inactivation – dosage compensation
6. Gynandromorphs

Unit 3: Linkage and gene mapping

1. Cytological proof of crossing over
2. Phases of linkage, test cross, recombination frequency, gene mapping, determination of map distances based on two and three point test crosses, coincidence, interference eg. Drosophila and Maize
3. Tetrad analysis – Neurospora
4. Mitotic crossing over - Drosophila

Unit 4: Organellar inheritance

1. Non-Mendelian inheritance
2. Variegation in leaves of higher plants – *Mirabilus jalapa*
3. Maternal inheritance – poky mutants in Neurospora, shell coiling in snails, Leber's optic atrophy
4. Uniparental inheritance – mutations in extra nuclear genes in Chlamydomonas, Male sterility in Maize, Plasmids, Is elements.
5. Mitochondrial and Chloroplast genomes, evolutionary significance

PRACTICALS

BS106: CLASSICAL GENETICS

1. Scoring of Drosophila and Maize cobs for Monohybrid and Dihybrid segregations
2. Problems on Mendelian Segregations (Monohybrid, Dihybrid & Trihybrid Crosses)
3. Problems on Multiple alleles and non-allelic interactions
4. Problems on Linkage analysis and mapping of genes
5. Phenotyping of ABO blood groups
6. Screening for Barr body

RECOMMENDED BOOKS

1. Genetics – Strickberger
2. Theory and problems in Genetics – Stansfield
3. Genetics – Redei
4. Genetics - Ursula Goodenough
5. Introduction to Genetic Analysis - Suzuki, Griffith, Richard and Lewontin
6. Principles of Genetics - Gardner, Simmons and Snustad
7. Principles of Genetics - Simmons and Snustad
8. Concepts of Genetics - Klug and Cummings

B.SC. GENETICS I YEAR
SEMESTER- II
DISCIPLINE SPECIFIC COURSE (DSC)
BS206: CYTOGENETICS

Unit 1: Cell division and Chromosome segregation.

1. Eukaryotic Cell cycle - Phases of cell cycle G0, G1, S, G2
2. Genes that determine the cell cycle – cyclins, CDK proteins, role of p^{53} in cell cycle
3. Mitosis – Stages in mitotic cell division- significance of mitosis
4. Meiosis - Formation of Synaptonemal complex, crossing over, chiasma formation, significance of meiosis

Unit 2: Chromosome structure, chromatin organization and variation

1. Chromosome morphology- size and shape; Euchromatin and Heterochromatin- constitutive and facultative heterochromatin
2. Components of chromatin, histones & non-histones
3. Packing of DNA into chromatin – Nucleosome and higher order organization
4. Specialized Chromosomes – Lampbrush chromosomes,Polytene Chromosomes, Super numerary chromosomes
5. Chromosome Variation – Structural aberrations- duplications, deletions, inversions & translocations with examples, Genetic consequences
6. Numerical aberrations – aneuploidy, euploidy auto-polyploidy and allo-polyploidy, Genetic consequences

Unit 3: Cell communication and signaling

1. Overview of extracellular and intracellular signaling
2. Basics of cell signaling – paracrine, endocrine, autocrine
3. Tight junctions and gap junctions
4. Secondary messengers and their role in cell communication and signaling (cAMP, phosphotidyl inositol, Ca^{+2} and IP3)
5. G-protein coupled receptors and Tyrosine Kinase receptors

Unit 4: Dysregulation of Cell cycle

1. Necrosis, senescence, programmed cell death (apoptosis)
2. Mechanism of necrosis, senescence and programmed cell death (intrinsic and extrinsic factors)
3. Cancer as a negative regulator of cell cycle

PRACTICALS
BS206: CYTOGENETICS

1. Study of Mitosis in Onion root tips
2. Study of Meiosis in Maize/Grasshopper
3. Preparation of Drosophila salivary gland chromosomes
4. Identification of structural and numerical aberrations

RECOMMENDED BOOKS

1. Cytology and cytogenetics - Swanson, Merz and Young
2. Cell & Molecular Biology – E.D.D. De Robertis & E.M.F. De Robertis
3. Molecular Biology of the Cell – Bruce Alberts