



## BSAG 102: Fundamentals of Biochemistry

SUBJECT CODE	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
		THEORY			PRACTICAL		L	T	P	CREDITS
		END SEM University Exam	Two term exam*	Teachers Assessment *	END SEM University Exam	Teachers Assessment *				
BSAG102	FUNDAMENTALS OF BIOCHEMISTRY	60	20	20	30	20	2	2	1	5

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C-Credit;  
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### Course Objective:

1. To study the basic concept of biomolecules in the plant cell

### Course Outcomes:

1. Student will able to understand structure functional relationship of biomolecules
2. Student will able to understand identification and detection of biomolecules from different sources

### Unit I:

Importance of Biochemistry. Properties of Water, pH and Buffer. Carbohydrate: Importance and classification. Structures of Monosaccharides, Reducing and oxidizing properties of Monosaccharides; Mutarotation: Structure of Disaccharides and Poly saccharides.

### Unit II:

Lipid: Importance and classification; Structures and properties of fatty acids; storage lipids and membrane lipids.

### Unit III:

Proteins: Importance of proteins and classification; Structures, titration and zwitterions nature of amino acids :Structural organization of proteins

### Unit IV:

Enzymes: General properties; Classification; Mechanism of action ;Michaelis&Menten and Line Weaver Burk equation &plots; Introduction to allosteric enzymes.

### Unit V:

Nucleic acids: Importance and classification; Structure of Nucleotides, A, B& Z DNA; RNA : Types secondary& Tertiary structure

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**Practical: BSAGL 108**

Preparation of solution, pH& buffers, Qualitative tests of carbohydrates and amino acids. Quantitative estimation of glucose / proteins. Titrations methods for estimation of amino acids/lipids, Effect of pH, temperature and substrate concentration on enzyme action, Paper chromatography /TLC demonstration for separation of amino acids/Monosaccharides. Sterilization techniques

**Books:**

1. Thayumanavan, B, Krishnaveni, S and Parvathi, K., Galgotia (). Biochemistry for agricultural sciences. Publications Pvt Ltd., New Delhi.
2. Nelson DL, Cox MM. Lehninger (). Principles of biochemistry. MacMillian, Worth Publishers.
3. Chesworth, JM., Stuchbury, T. and Scaife, JR (). An Introduction to agricultural Biochemistry. Chpman and Hall.
4. Goodwin, T.W. and Mercer, E.I (). Introduction to plant biochemistry. Pergamon Press.
5. Wilson K. and Walker, J.M. (). Principles and technique of Practical Biochemistry. Cambridge University Press

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**BSAG 103: Principles of Genetics**

SUBJECT CODE	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
		THEORY			PRACTICAL		L	T	P	CREDITS
		END SEM University Exam	Two term exam*	Teachers Assessment *	END SEM University Exam	Teachers Assessment *				
BSAG103	PRINCIPLES OF GENETICS	60	20	20	30	20	2	2	1	5

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C-Credit;  
\***Teacher Assessment** shall be based on following components: Quiz / Assignment / Project / Participation in Class, given that no component shall exceed more than 10 marks.

**Course Objectives**

1. To study the genetics concept in crops

**Course Outcomes**

1. Student will able to understand structural and functional aspect of heredity material in crops
2. Student will able to understand cell and cell cycle for the improvement of crop

**Unit-1**

Pre and Post Mendelian concepts of heredity, Mendelian principles of heredity. Architecture of chromosome; chromonemata, chromosome matrix, chromomeres, centromere, secondary constriction and telomere; special types of chromosomes.

**Unit-2**

Chromosomal theory of inheritance –cell cycle and cell division –mitosis and meiosis.Probability and Chi-square.Dominance relationship, Epistatic interactions with example.

**Unit-3**

Multiple alleles, pleiotropism and pseudoalleles, Linkage and it's estimation, crossing over mechanisms , chromosome mapping. Structural and numerical variations in chromosome and their implications.

**Unit-4**

Use of haploids, dihaploids and doubled haploids in Genetics. Mutation classification, Methods of inducing mutations & CIB technique, mutagenic agents and induction of mutation.Qualitative and Quantitative traits, Polygenes and continuous variations, multiple factor hypothesis, Cytoplasmic inheritance.

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### **Unit-5**

Nature, structure and replication of genetic material. Protein synthesis, transcription and translational mechanism of genetic material. Gene concept :Gene structure, function and regulation, Lac and Trp operons

### **Practical: BSAGL 109**

Study of microscope, Study of cell structure. Mitosis and Meiosis cell division. Experiments on monohybrid, dihybrid, trihybrid, testcross and back cross, Experiments on epistatic interactions including test cross and back cross, Practice on mitotic and meiotic cell division, Experiments on probability and Chi-square test. Determination of linkage and cross over analysis (through two point test cross and three point test cross data. Study of models on DNA and RNA structures.

### **Books:**

1. B. D. Singh .*Plant Breeding – Principles and methods*. Kalyani Publishers New Delhi.
2. Phunadan Singh. *Essentials of Plant Breeding*. Kalyani publisher new Delhi.
3. Chopra, V.L. .*Plant breeding theory and practice*. Oxford and IBH Publishing Co. PVT. Ltd.
4. Allard, R. .*Principles of plant breeding*. John Wiley and Sons , New Delhi.
5. J. R. Sharma. *Principles and Practices of Plant Breeding*. Tata McGraw-Hill publishing Co., New Delhi

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**BSAG 104: Fundamentals of soil science**

SUBJECT CODE	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
		THEORY			PRACTICAL		L	T	P	CREDITS
		END SEM University Exam	Two term exam*	Teachers Assessment *	END SEM University Exam	Teachers Assessment *				
BSAG104	FUNDAMENTALS OF SOIL SCIENCE	60	20	20	30	20	2	2	1	5

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C-Credit;

**\*Teacher Assessment** shall be based on following components: Quiz / Assignment / Project / Participation in Class, given that no component shall exceed more than 10 marks.

**Course Objective:** Basic knowledge of soil

**Course Outcomes**

1. Student will able to understand origin, classification of soil
2. Student will able to understand soil properties

**Unit-1:**

Soil as a natural body, Pedological and edaphological concepts of soil; Soil genesis: soil forming rocks and minerals; weathering, processes and factors of soil formation; Soil profile, components of soil; Soil physical properties: soil-texture, structure, density and porosity, soil colour, consistence and plasticity.

**Unit-2:**

Elementary knowledge of soil taxonomy classification and soils of India; Soil water retention, movement and availability; Soil air, composition, gaseous exchange, problem and plant growth, Soil temperature; source, amount and flow of heat in soil; effect on plant growth.

**Unit-3**

Soil reaction –pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability; soil colloids –inorganic and organic; silicate clays: constitution and properties; sources of charge; ion exchange, cation exchange capacity, base saturation;

**Unit-4**

Soil organic matter: composition, properties and its influence on soil properties; humic substances –nature and properties; soil organism: macro and microorganisms, their beneficial and harmful effects.

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**Unit-5**

Soil pollution –behaviour of pesticides and inorganic contaminants, prevention and mitigation of soil pollution.

**Practical: BSAGL 110**

Study of soil profile in field. Study of soil sampling tools, collection of representative soil sample, its processing and storage. Study of soil forming rocks and minerals. Determination of soil density, moisture content and porosity. Determination of soil texture by feel and Bouyoucos Methods. Studies of capillary rise phenomenon of water in soil column and water movement in soil. Determination of soil colour. Demonstration of heat transfer in soil. Estimation of organic matter content of soil.

**Books:**

1. Indian society of soil science (ISSS) .*Fundamentals of soil science*. ICAR Publication, New Delhi.
2. Brady, N. C. & Well, R. R. (). *The Nature and Properties of soil*. Macmillan 15th edition.
3. A.K. Saha. *A Text Book of soil Physics*. Kalyani Publication, New Delhi.

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**BSAG 105: Agriculture rural heritage and rural sociology**

SUBJECT CODE	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
		THEORY			PRACTICAL		L	T	P	CREDITS
		END SEM University Exam	Two term exam*	Teachers Assessment *	END SEM University Exam	Teachers Assessment *				
BSAG105	Agriculture rural heritage and rural sociology	60	20	20		20	3	2		5

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C-Credit;  
\***Teacher Assessment** shall be based on following components: Quiz / Assignment / Project / Participation in Class, given that no component shall exceed more than 10 marks.

**Course Objective:**

To study about history of Indian Agriculture

**Course Outcomes:**

1. Student will able to understand ITK( indigenous technology knowledge )
2. Student will able to understand development of agriculture in India

**Unit -1**

Introduction of Indian Agricultural heritage; Ancient agricultural practices, Relevance of heritage to present day agriculture; Past and present status of agriculture and farmers in society;

**Unit -2**

Journey of Indian agriculture and it's development from past to modern era; Plant production and protection through indigenous traditional knowledge; Crop voyage in India and world;

**Unit -3**

Agriculture scope; Importance of agriculture and agricultural resource available in India; Crop significance and classifications; National agriculture setup in India;

**Unit- 4**

Current scenario of Indian agriculture; Indian agricultural concerns and future prospects.

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**Unit-5**

Sociology and Rural sociology: Definition and scope, it's significance in agriculture extension, Social ecology, Rural society, Social Groups, Social Stratification, Culture Concept, Social Institution, Social Change & Development.

**Books:**

1. M. S. Randhawa (). *A History of agriculture in India*. ICAR New Delhi.
2. Sagar Mondal (). *A text book of rural development*. Kalyani publisher.
3. B.D. Tyagi (). *Fundamental of rural sociology*. Rama Publisher.

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**BSAG 106: Fundamentals of Agronomy**

SUBJECT CODE	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
		THEORY			PRACTICAL		L	T	P	CREDITS
		END SEM University Exam	Two term exam*	Teachers Assessment *	END SEM University Exam	Teachers Assessment *				
BSAG106	FUNDAMENTALS OF AGRONOMY	60	20	20	30	20	2	2	1	5

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C-Credit;

\***Teacher Assessment** shall be based on following components: Quiz / Assignment / Project / Participation in Class, given that no component shall exceed more than 10 marks.

**Course Objective:**

To study the principles of Agronomy

**Course Outcomes:**

1. Student will able to understand the importance of tillage in agriculture
2. Student will able to understand weed crop growth and development in terms of agronomy

**Unit-1**

Agronomy and it's scope, seeds and sowing, tillage and tilth, crop density and geometry, Crop nutrition, manures and fertilizers, nutrient use efficiency

**Unit-2**

water resource, soil plant water relationship, crop water requirement, water use efficiency, irrigation –scheduling criteria and methods, quality of irrigation water, logging

**Unit-3**

Weeds –importance, classification, crop weed competition, concepts of weed management–principles and methods, herbicides–classification, selectivity and resistance, allelopathy.

**Unit-4**

Growth and development of crops, factors affecting growth and development, plant ideotypes, crop rotation and it's principles, adaptation and distribution of crops.

**Unit-5**

Crop management technologies in problematic areas, harvesting and threshing of crops.

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**Practical: BSAGL 111**

Identification of crops, seeds, fertilizers, pesticides and tillage implements, study of agro-climatic zones of India, Identification of weeds in crops, Methods of herbicides and fertilizer application, Study of yield contributing characters and yield estimation, seed germination and viability test, Numerical exercises on fertilizers requirement, plant population, herbicides and water requirement, Use of tillage implements –reversible plough, one way plough, harrow, leveler, seed drill, Study of soil moisture measuring device, Measurement of field capacity, bulk density and infiltration rate, Measurement of irrigation water.

**Books:**

1. Principles of Agronomy – S. R. Reddy (1999) Kalyani Publication, New Delhi
2. Handbook of Agriculture (2006) ICAR Publications
3. Introduction to Agronomy and soil and water Management –V.G. Vaidya and K. K. Sahatrabudhe.

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**BSAG 107: Principles of Plant Breeding**

SUBJECT CODE	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
		THEORY			PRACTICAL		L	T	P	CREDITS
		END SEM University Exam	Two term exam*	Teachers Assessment *	END SEM University Exam	Teachers Assessment *				
BSAG107	PRINCIPLES OF PLANT BREEDING	60	20	20	30	20	2	2	1	5

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C-Credit;  
\***Teacher Assessment** shall be based on following components: Quiz / Assignment / Project / Participation in Class, given that no component shall exceed more than 10 marks.

**Course Objective:** To study the principle, objective, methods and use of plant breeding

**Course Outcomes**

1. Student will able to understand different scientific methods to provide improved crop varieties to the farmers /mass
2. Student will able to understand advanced technology of plant breeding

**Unit-1**

Historical development, concept, nature and role of plant breeding, major achievements and future prospects; Genetics in relation to plant breeding, modes of reproduction and apomixes, self-incompatibility and male sterility-genetic consequences, cultivar options.

**Unit-2**

Domestication, Acclimatization and Introduction; Centres of origin/diversity, components of Genetic variation; Heritability and genetic advance; genetic basis and breeding methods in self-pollinated crops –mass and pure line selection, hybridization techniques and handling of segregating population; Multiline concept, Concept of population genetics and Hardy-Weinberg Law.

**Unit-3**

Genetic basis and methods of breeding cross pollinated crops, modes of selection; Population improvement scheme – Ear to row methods, Modifies Ear to Row; recurrent selection schemes; Heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties.

**Unit-4**

Breeding methods in asexually propagated crops, Clonal selection and hybridization; Maintenance of breeding record and data collection; Wide hybridization and pre breeding; Polyploidy in relation to plant breeding, mutation breeding –methods and uses; Breeding for important biotic and abiotic stresses.

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**Unit-5**

Biotechnological tools -DNA markers and marker assisted selection. Participatory plant breeding, Intellectual Property Rights, Patenting, Farmer's Right

**BSAGL 112 Practical:**

Plant Breeders kit, Study of germplasm of various crops. Study of floral structure of self-pollinated and cross pollinated crops. Emasculation and hybridization techniques in self and cross pollinated crops. Consequences of inbreeding on genetic structure of resulting populations. Study of male sterility system. Handling of segregation populations. Methods of calculating mean, range, variance, standard deviation, heritability. Designs used in plant breeding experiments, analysis of Randomized Block Design. To work out the mode of pollination in a given crop and extent of natural out-crossing. Prediction of performance of double cross hybrids.

**Books:**

1. Essentials of Plant Breeding , Phundhan Singh, Kalyani Publishers 2018
2. Plant Breeding, Principles and methods , Kalyani Publishers 2017

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