

K.M.G. COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)

Approved by the Government of Tamil Nadu Permanently Affiliated to Thiruvalluvar University, Vellore. Recognized under Section 2(f) and 12(B) of the UGC Act 1956 Accredited by NAAC (2nd Cycle) with (CGPA of 3.24/4) 'A' Grade

P.G. AND RESEARCH DEPARTMENT OF BIOCHEMISTRY

B.Sc., BIOCHEMISTRY

SYLLABUS

(CHOICE BASED CREDIT SYSTEM)

Under

LEARNING OUTCOMES-BASED CURRICULUM

FRAMEWORK (LOCF)

(Effective for the Batch of Students Admitted from 2024-2025)

PREFACE

The curriculum of undergraduate Biochemistry has been designed to explain the concepts in various branches of Biochemistry such as Clinical biochemistry, Nutritional biochemistry, etc. The purpose of the outcome-based education is meant to provide an exposure to the fundamental aspects in different branches of Biochemistry and its applications, keeping in mind the growing needs for higher education, employability, entrepreneurship and social responsibility. The periodical restructuring of the syllabi is carried out to fulfill the requirements of graduate attributes, qualification descriptors, programme learning outcomes and course outcomes. The outcome-based education enriches the curriculum to deliver the basic principles, synthetic strategies, mechanisms and application-oriented learning for the benefit of students. It also includes self-learning module, minor projects and industrial internship to enable students to get equipped for higher studies and employment. The programme also includes training to students for seminar presentation, preparation of internship reports, hands-on training in lab courses, skills to handle instruments, synthesis and its analysis, developing leadership qualities, organization and participation in the interdepartmental academic competitions. The allied papers provide a platform to strengthen the understanding of the core subjects. The non-major elective courses offer chances to learn and augment interest in other related fields. The outcome-based curriculum is intended to enrich the learning pedagogy to global standards. ICT enabled teaching-learning platforms are provided to students along with the interaction of international scientists. The seminars periodically delivered by industrialists, subject experts and former professors would certainly help the students to update with latest technology/trends in different fields of Biochemistry. The exposure to the industrial internship and MOUs with industries can open an avenue for a start-up and its progress would be followed regularly. The OBE based evaluation methods will reflect the true cognitive levels of the students as the curriculum is designed with course outcomes and cognitive level correlations as per BLOOM's Taxonomy.

In pursuit of the Higher Education Department Policy Note 2022-23 Demand 20, Section 1.4, Tamil Nādu State Council for Higher Education took initiative to revamp the curriculum. On 27 July 2022, a meeting was convened by the Member-Secretary Dr. S. Krishnasamy enlightening the need of the hour to restructure the curriculum of both Undergraduate and Post-graduate programmes based on the speeches at the Tamil Nādu Legislative Assembly Budget meeting by the Honorable Higher Education Minister Dr K. Ponmudy and Honorable Finance Minister Dr. P. Thiagarajan. At present there are three different modes of imparting education in most of the educational institutions throughout the globe. Outcome Based Education, Problem Based Education, and Project Based Education.

Now our Honorable Higher Education Minister announced Industry Aligned Education. During discussion, Member Secretary announced the importance of question papers and evaluation as envisaged by the Honorable Chief Secretary to Government Dr. V. Irai Anbu. This is very well imbedded in Revised Bloom's Taxonomy forms three learning domains: the cognitive (knowledge), affective (attitude), and psychomotor (skill). This classification enables to estimate the learning capabilities of students.

Briefly, it is aimed to restructure the curriculum as student-oriented, skill-based, and institution industry- interaction curriculum with the various courses under "Outcome Based Education with Problem Based Courses, Project Based Courses, and Industry Aligned Programmes" having revised Bloom's Taxonomy for evaluating students skills. Three domains:

(i)Cognitive Domain

(Lower levels: K1: Remembering; K2: Understanding; K3: Applying; Higher levels: K4: Analyzing; K5: Evaluating; K6: Creating)(ii) Affective Domain

(iii) Psychomotor Domain

ABOUT THE COLLEGE

The College was founded in the new millennium 2000 by the vision of late Shri.K.M.Govindarajan fondly known as Iyah, with a mission to offer higher education in the fields of Arts and Science to the needy and the poor middle class students of this area and make them fully employable and economically self-reliant. With a humble beginning of launching an elementary school named Thiruvalluvar Elementary School in the year 1952, Iyah groomed it into a Higher Secondary School and later into a college. Education was his soul and breath. The college has grown into a full-fledged educational hub offering 12 under graduate programmes, 8 post graduate programmes, 5 M.Phil research programmes and 4 Ph.D programmes. The college has been accredited with 'A' grade by NAAC in 2nd cycle and recognized under section 2(f) & 12(B) of the UGC act 1956. The College is permanently affiliated to Thiruvalluvar University. The College is also acquired the status of Autonomous from the academic year 2024-2025. The College is an associate member of ICT Academy and registered member of NPTEL and Spoken Tutorials of IIT Bombay. The college is also a member of INFLIBNET and NDL.

VISION OF THE COLLEGE

Empower young men and women by educating them in the pursuit of excellence, character building and responsible citizen.

MISSION OF THE COLLEGE

Offer higher education in the fields of Arts, Science & Management to the needy and make them fully self-dependent.

QUALITY POLICY OF THE COLLEGE

KMG Students achieve the best learning results and personal growth with modern education that equip them for working life and a changing society to become deserving citizens.

ABOUT THE DEPARTMENT

The knowledge of basic science is essential for the sustainable development of the society. To get the basic knowledge in Biochemistry to young students the Department of Bio chemistry initiated in the academic year 2000-2003. The objective of our department is to motivate students to excel in Biochemistry at the global level, which is necessary for Biochemists getting placement as well as becoming an entrepreneur in future. The department was uplifted as the post graduate department in the year 2004-2006. The department has been recognized as a research department since 2008 to offer M.Phil., Followed that the Thiruvalluvar University accorded recognition to the Department as a centre for Doctoral research in Biochemistry from 2019-2020. The focus of the department is the holistic development of the students and involves them in curricular and co-curricular activities. The Bio Chemistry Department pledges itself to serve in the broadest, innovative and most liberal manner towards the advancement of Biochemistry in all of its branches through academics, research and service missions upholding the values and entrepreneurial skills. The job potential to the biochemist is very high now and opportunities to provoke research in biochemistry are ample. Needless to say that for a developing country likes ours, "BIOCHEMISTRY IS OUR LIFE AND FUTURE".

VISION OF THE DEPARTMENT

Produce World class academicians, Scientist, Industrialist and entrepreneurs in the field of Biochemistry.

MISSION OF THE DEPARTMENT

- To educate and inspire the young minds from the basics to the latest innovations in science.
- Inculcate strong theoretical, practical, research and analytical skills in the subject domains and thereby prepare the students for both employability and entrepreneurship.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

1. Professional Excellence: Graduates will demonstrate competency and excellence in their chosen fields of study, applying theoretical knowledge to practical situations effectively.

2. Character Development: Graduates will exhibit strong moral and ethical character, upholding values of integrity, honesty, and respect for others in both personal and professional endeavors.

3. Leadership and Citizenship: Graduates will emerge as responsible leaders and active citizens, contributing positively to their communities and society at large through their actions and initiatives.

4. Continuous Learning: Graduates will engage in lifelong learning and professional development activities, adapting to evolving technologies, methodologies, and societal needs.

5. Self-Dependency and Entrepreneurship: Graduates will possess the skills and mindset necessary to be self-reliant and entrepreneurial, capable of creating opportunities for themselves and others through innovation and initiative.

6. Effective Communication and Collaboration: Graduates will demonstrate proficiency in communication skills, both verbal and written, and exhibit the ability to collaborate effectively with diverse teams and stakeholders.

7. Global Perspective: Graduates will have a broad understanding of global issues and perspectives, demonstrating cultural sensitivity and adaptability in multicultural environments.

PROGRAM OUTCOMES (POs)

On successful completion of the Programme, the students will be able to:

POs	Graduate Attributes	Statements
PO1	Disciplinary Knowledge	Acquire detailed knowledge and expertise in all the disciplines of the subject.
PO2	Communication Skills	Ability to express thoughts and ideas effectively in writing, listening and confidently Communicate with others using appropriate media
PO3	Critical Thinking	Students will develop aptitude Integrate skills of analysis, critiquing, application and creativity.
PO4	Analytical Reasoning	Familiarize to evaluate the reliability and relevance of evidence, collect, analyze and interpret data.
PO5	Problem Solving	Capacity to extrapolate the learned competencies to solve different kinds of non-familiar problems.
PO6	Employability and Entrepreneurial Skill	Equip the skills in current trends and future expectations for placements and be efficient entrepreneurs by accelerating qualities to facilitate startups in the competitive environment.
PO7	Individual and Team Leadership Skill	Capability to lead themselves and the team to achieve organizational goals and contribute significantly to society.
PO8	Multicultural Competence	Possess knowledge of the values and beliefs of multiple cultures and a global perspective.
PO 9	Moral and Ethical awareness/reasoning	Ability to embrace moral/ethical values in conducting one's life.
PO10	Lifelong Learning	Identify the need for skills necessary to be successful in future at personal development and demands of work place.

PROGRAM SPECIFIC OUTCOMES (PSOs)

On successful completion of the B.Sc., Biochemistry, the students will be able to:

PSOs	Statements
PSO1	Comprehend the knowledge in the biochemical, analytical, biostatistical and computational areas.
PSO2	Ability to understand the technical aspects of existing technologies that help inaddressing the biological and medical challenges faced by human kind.
PSO3	Acquiring analytical and hands on skills to perform research in multidisciplinaryenvironments.

Correlation Rubrics:

High	Moderate	Low	No Correlation
3	2	1	-

Mapping of PSOs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
PSO1	3	3	3	3	2	3	2	1	1	2
PSO2	3	2	3	3	3	2	2	1	1	2
PSO3	3	3	2	3	3	3	3	2	3	2

K.M.G. COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)

Subject and Credit System- B.Sc., Biochemistry (Effective for the Batch of Students Admitted from 2024-2025)

SendeskiiFailCategoryCodeCourse File/WeekCitentIntILanguageAULT10/ AULU10General Tamil - 1/Urdu - 1633IIEnglishAULE10English - I633IIICore - 1AUCBC11Nutritional Biochemistry655IIICore - 2AUCPBC 12Core Practical I - Nutritional Biochemistry333IIIElective-IAUECH13Chemistry I333IIIElective Practical IAUEPCH23Chemistry Practical2IVSkill EnhancementAUEBC14Health and Nutrition222IVSkill EnhancementAUFBC15Foundation Course (Basics of Biochemistry222IIICore - 3AUCBC21Cell Biology553IIICore - 4AUCBC22Practical II-Cell Biology333IIIElective-IIAUECH23Chemistry II333IIICore - 4AUCPBC22Practical II-Cell Biology333IIIElective-IIAUECH23Chemistry II333IIIElective-IIAUECH23Chemistry II333IIICore - 4AUCPBC22Practical II-Cell Biology333IIIElective-IIAUECH23Chemistry II333IIIElective	Somostor	Dort	Cotogory	Course	Course Title	Ins.Hrs	Credit	Max	imum Marl	KS
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III Core - 1 AUCBC11 Nutritional Biochemistry 6 5 III Core - 2 AUCPBC 12 Core Practical I - Nutritional Biochemistry 3 3 3 III Elective-I AUECH13 Chemistry I 3 3 3 III Elective-I AUEPCH23 Chemistry Practical 2 IV Skill Enhancement AUSBC14 Health and Nutrition 2 2 IV Skill Enhancement AUFBC15 Foundation Course (Basics of Biochemistry 2 2 IV Skill Enhancement AULT20/ AULU20 General Tamil – II / Urdu - II 6 3 II Language AULT20/ AULU20 General Tamil – II / Urdu - II 6 3 III Core - 4 AUCPBC22 Practical II - Cell Biology 5 5 III Core - 4 AUCPBC22 Practical II - Cell Biology 3 3 III Elective-II AUEPCH23 Chemistry Practical 3 3 III Elec		II	English	AULE10	English – I	6	3	25	75	100
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IIIElective-IAUECH13Chemistry I33IIIElective Practical IAUEPCH23Chemistry Practical2IVSkill EnhancementAUSBC14Health and Nutrition22IVSkill EnhancementAUFBC15Foundation Course (Basics of Biochemistry22Semester Total3021ILanguageAULT20 / AULU20General Tamil – II / Urdu - II63IIEnglishAULE20English – II631IIICore - 3AUCBC21Cell Biology551IIICore - 4AUCPBC22Practical II- Cell Biology331IIIElective-IIAUEPCH23Chemistry II333IIIElectiveAUEPCH23Chemistry Practical331IVSkill Practical IIAUSBC24Medicinal Diet22IVSkill EnhancementAUSBC25First Aid22	R - I	III	Core – 2	AUCPBC 12	Core Practical I - Nutritional Biochemistry	3	3	25	75	100
IIIElective Practical IAUEPCH23Chemistry Practical2IVSkill EnhancementAUSBC14Health and Nutrition22IVSkill EnhancementAUFBC15Foundation Course (Basics of Biochemistry22IVSkill EnhancementAUFBC15Foundation Course (Basics of Biochemistry22ILanguageAUFBC15Foundation Course (Basics of Biochemistry22IILanguageAULT20 / AULU20General Tamil – II / Urdu - II63IIEnglishAULE20English – II631IIICore - 3AUCBC21Cell Biology551IIICore - 4AUCPBC22Practical II- Cell Biology331IIIElective-IIAUECH23Chemistry Practical333IIIElectiveAUECH23Chemistry Practical331IIIElectiveAUEPCH23Chemistry Practical333IIIVSkill EnhancementAUSBC24Medicinal Diet222IVSkill EnhancementAUSBC25First Aid222	STE	III	Elective-I	AUECH13	Chemistry I	3	3	25	75	100
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ILanguageAULT20 / AULU20General Tamil – II / Urdu - II63IIEnglishAULE20English – II63IIICore - 3AUCBC21Cell Biology55IIICore - 4AUCPBC22Practical II- Cell Biology33IIIElective-IIAUECH23Chemistry II33IIIElective Practical IIAUEPCH23Chemistry Practical33IVSkill EnhancementAUSBC24Medicinal Diet22IVSkill EnhancementAUSBC25First Aid22					Semester Total	30	21			
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IIICore - 4AUCPBC22Practical II- Cell Biology33IIIElective-IIAUECH23Chemistry II33IIIElective Practical IIAUEPCH23Chemistry Practical33IVSkill EnhancementAUSBC24Medicinal Diet22IVSkill EnhancementAUSBC25First Aid22	_	III	Core - 3	AUCBC21	Cell Biology	5	5	25	75	100
IIIElective-IIAUECH23Chemistry II33IIIElective Practical IIAUEPCH23Chemistry Practical33IVSkill EnhancementAUSBC24Medicinal Diet22IVSkill EnhancementAUSBC25First Aid22	H	III	Core – 4	AUCPBC22	Practical II- Cell Biology	3	3	25	75	100
IIIElective Practical IIAUEPCH23Chemistry Practical33IVSkill EnhancementAUSBC24Medicinal Diet22IVSkill EnhancementAUSBC25First Aid22	ER	III	Elective-II	AUECH23	Chemistry II	3	3	25	75	100
IVSkill EnhancementAUSBC24Medicinal Diet22IVSkill EnhancementAUSBC25First Aid22	AEST	III	Elective Practical II	AUEPCH23	Chemistry Practical	3	3	25	75	100
IVSkill EnhancementAUSBC25First Aid22	SEN	IV	Skill Enhancement	AUSBC24	Medicinal Diet	2	2	25	75	100
		IV	Skill Enhancement	AUSBC25	First Aid	2	2	25	75	100
Semester Total 30 24					Semester Total	30	24			
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Semester	Part	Category	Course	Course Title	Ins.Hrs	ns.Hrs Wook Credit		imum Marl	ks
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	T	Language	AULT30/	General Tamil – III / Urdu - III	6	3	25	75	10
	1	88.	AULU 30	Solora faim my orda m		5	23	15	10
	II	English	AULE30	English – III	6	3	25	75	10
-	III	Core - 5	AUCBC31	Biomolecules	4	4	25	75	10
H -	III	Core – 6	AUCPBC32	Practical III Biomolecules	3	3	25	75	10
rer	III	Allied-III	AUAEMB33	Allied Microbiology I	3	3	25	75	10
IES	III	Allied-III	AUAEPMB43	Allied Microbiology Practical	2		-	-	-
EN	IV	Skill	AUSDC24	Tissue Culture	2	2	25	75	10
	IV	Enhancement	AUSBC34	l'issue Culture	Z	Z	25	15	10
	IV	Skill	AUSBC35	Plant Biochemistry & Plant	2	2	25	75	10
	1 4	Enhancement	NODE35	therapeutics	2	2	25	15	10
	IV	Compulsory	AUES30	Environmental Science	2	2	25	75	10
				Semester Total	30	22			
								-	_
	Ι	Language	AULT40 / AULU 40	General Tamil – IV / Urdu - IV	6	3	25	75	10
	II	English	AULE40	English – IV	6	3	25	75	10
>	III	Core - 7	AUCBC41	Biochemical Techniques	5	5	25	75	10
L -	III	Core - 7	AUCPBC42	Practical IV	3	3	25	75	10
ER	III	Allied-IV	AUAEMB43	Allied Microbiology II	3	3	25	75	10
E	III	Allied-IV	AUAEPMB43	Allied Microbiology Practical	3	3	25	75	10
SEME	IV	Skill Enhancement Course	AUSBC44	Bioinformatics	2	2	25	75	10
	IV	Skill Enhancement	AUSBC45	Biochemical Pharmacology	2	2	25	75	10
					30	24			

Somester	Dont	Catagowy	Course	Course Title	Ins.Hrs	Credit	Max	imum Marl	ks
Semester	rari	Calegory	Code	Course The	/ Week	Crean	Internal	External	Total
	III	Core – 9	AUCBC51	Enzymes	5	4	25	75	100
	III	Core – 10	AUCBC52	Intermediary Metabolism	4	3	25	75	100
	III	Core – 11	AUCBC53	Clinical Biochemistry	4	3	25	75	100
>	III	Core – 12	AUCPBC54	Core Practical V/Project with Viva-voce	3	3	25	75	100
STER - '	III	Elective-V (Choose any one)	AUEBC55A AUEBC55B AUEBC55C	Medical Lab Technology Research Methodology Bioentrepreneurship	4	3	25	75	100
ME	III	Elective-VI	AUEPBC56	Practical VI	3	3	25	75	100
SE	III	Core – 13	AUPBC57	Project with Viva-voce	5	4	25	75	100
	IV	Compulsory	AUVE50	Value Education	2	2	25	75	100
	IV	Compulsory	AUIBC58	BC58 Internship/Industrial Training (Carried out in II-Year Summer vacation) (30hours)		2	100	-	100
	1		l .	30	27				
				Γ					
	III	Core – 14	AUCBC61	Molecular Biology	6	4	25	75	100
	III	Core – 15	AUCBC62	Physiology	6	4	25	75	100
Ν	III	Core – 16	AUCBC63	Biotechnology	6	4	25	75	100
. R -	III	Elective-VII	AUEBC64	Medical coding	5	4	25	75	100
STE		Elective-VIII	AUEBC65A	Immunology (or)					
EME	111	(Choose any one)	AUEBC65B	Basics of Forensic Science	5	3	25	75	100
$\mathbf{\tilde{s}}$	IV	Compulsory	AUEA60	Extension Activity	-	1	100	-	100
	V	Compulsory	AUPCBC66	Professional Competency Skill	2	2	25	75	100
				Semester Total	30	22			

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Parts	Semester-I	Semester- II	Semester- III	Semester-IV	Semester-V	Semester-VI	Total Credits
Part-I	03	03	03	03	-	-	12
Part-II	03	03	03	03	-	-	12
Part-III	11	14	10	14	23	19	91
Part-IV	04	04	06	04	4	01	23
Part-V	-	-	-	-	-	2	2
Total	21	24	22	24	27	22	140

Consolidated Semester wise and Component wise Credit distribution

*Part I, II, and Part III components will be separately taken into account for CGPA calculation and classification for the under graduate programme and the other components. IV, V has to be completed during the duration of the programme as per the norms, to be eligible for obtaining the UG degree.

Title of the Course	Nutritional Biochemistry	Hours/Week	06
Course Code	AUCBC11	Credits	05
Category	Core-1	Year & Semester	I & I
Prerequisites	Higher secondary Chemistry/Biology/Mathematics/Botany/ Zoology/Physics	Regulation	2024

Objectives of the course:

The objectives of this course are to

- > Create awareness about the role of nutrients in maintaining proper health.
- > Understand the nutritional significance of carbohydrates, lipids and proteins.
- > Understand the importance of a balanced diet.
- > Study the effect of additives, emulsifiers, and flavor enhancing substances in food.
- Study the significance of nutraceuticals.

UNIT	Contents	COs	Cognitive
S		005	Levels
I-LINU	Concepts of food and nutrition. Basic food groups-energy yielding, bodybuilding and functional foods. Modules of energy. Calorific and nutritive value of foods. Measurement of Calories by bomb calorimeter. Basal metabolic rate (BMR) - definition, determination of BMR and factors affecting BMR. Respiratory quotient (RQ) of nutrients and factors affecting the RQ. SDA- definition and determination- Anthropometric measurement and indices – Height, Weight, chest and waist circumference BMI.	CO1 CO3	K1 K2 K3
II-JINU	Physiological role and nutritional significance of carbohydrates, lipids and protein. Evaluation of proteins by nitrogen balance method- Biological value of proteins- Digestibility coefficient, Protein Energy Ratio and Net Protein Utilization. Protein energy malnutrition –Kwashiorkor and Marasmus, Obesity-Types and preventive measures.	CO1 CO2 CO3	K1 K2 K3 K4

Department of Biochemistry - Syllabus (Effect from 2024-2025)

	Balanced diet, example of low and high cost balanced diet- for		K1
Η·	infants, children, adolescents, adults and elderly people. ICMR	CO3	K2
LIN	classification of five food groups and its significance. Food	CO4	К3
5	pyramid. Junk foods- definition and its adverse effects.		
	Food additives: Structure, chemistry, function and application of		
	preservatives, emulsifying agents, buffering agents, stabilizing	CO2	K1
M -	agents, natural and artificial sweeteners, bleaching, starch	CO3	K2
IIN	modifiers, antimicrobials, food emulsions, fat replacers, viscosity	CO4	K3
D	agents, gelling agents and maturing agents. Food colors,	CO5	
	flavours, anti-caking agent, antioxidants. Safety assessment of		
	food additives.		
	Nutraceuticals and Functional Foods: Definition, properties and	CO2	K1
V-TIN	function of Nutraceuticals, food Supplements, dietary	CO3	K2
	supplements prebiotics, probiotics, and functional Foods. Food	CO4	K3
D	as medicine. Natural pigments from plants– carotenoids,	CO5	
	anthocyanins and its benefits.		
D			
	nmended Text Books	d b a a a a	- 2012
1.	Galle Moe, Danita Kelley, Jacqueline Berning and Carol Byrd-Bre		er. 2013.
	Wardlaw's Perspectives in Nutrition: A Functional Approach. McGrav	V-H111, J	nc., NY,
2	USA.		
2.	M.Swaminadnan (1995) Principles of Nutrition and Dietetics. Bapped		
5.	Comments IS Lenses WDT and Balala A (2000). Home a metaition and di	s, USA	(104 1)
4.	Garrow, JS.James WP1 and Raipn A (2000). Human nutrition and di	etetics ((10thed)
~	Churchill Livingstone.	1.1 (1st	
). 	Andreas M.Papas (1998). Antioxidant Status, Diet, Nutrition, and He	alth (1 st	ed) CRC.
Kefer	ence Books		
1.	Branen, A.L., Davidson PM & Salminen S. 2001. Food Additive	s. 2nd	Ed. Marce
	Dekker.		
2.	George, A.B. 1996. Encyclopedia of Food and Colour Additives. Vol	. III. CR	C Press.

- 3. Advances in food biochemistry, Fatih Yildiz (Editor), CRC Press, Boca Raton, USA, 2010
- 4. Food biochemistry & food processing, Y.H. Hui (Editor), Blackwell Publishing, Oxford, UK,2006.
- 5. Geoffrey Campbell-Platt. 2009. Food Science and Technology. Wiley-Blackwell, UK.

Website and e-learning source

- 1. http://old.noise.ac.in/SecHmscicour/english/LESSON O3.pdf
- 2. <u>https://study.com/academy/lesson/energy-yielding-nutrients-carbohydratesfat-</u>
- 3. protein.html.https://www.nhsinform.scot/healthy-living/food-andnutrition/eatingwell/vitamins-and-minerals

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Cognizance of basic food groups viz. Carbohydrates, proteins and lipids and their nutritional aspects as well as calorific value.	K1,K2,k3
CO2	Identify and explain nutrients in foods and the specific functions in maintaining health.	K1,K2,K3
CO3	Classify the food groups and its significance	K1,K2,K3
CO4	Understand the effect of food additives	K1,K2,K3
CO5	Describe the importance of nutraceuticals and pigments	K1,K2,K3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	1	1	2	1	-	-	-	3	3	3	3
CO2	3	3	2	2	1	1	1	1	-	3	3	3	3
CO3	3	2	2	2	1	1	-	2	-	3	1	3	3
CO4	3	2	2	3	2	1	1	-	2	3	3	3	3
CO5	3	3	2	2	2	2	-	1	1	3	3	3	3

Title of the Course	Core Practical I-Nutritional Biochemistry	Hours/Week	03
Course Code	AUCPBC12	Credits	03
Category	Core-II	Year & Semester	I & I
Prerequisites	Higher secondary chemistry/Biology/Mathematics/Botany/Zoology/Physics	Regulation	2024

Objectives of the course:

The objectives of this course are to

- > Impart hands-on training in the estimation of various constituents by titrimetric method
- > Prepare Biochemical preparations.
- > Determine the ash content and extraction of lipid.

UNITS	Contents	COs	Cognitive
UNITS			Levels
I-TINU	 TITRIMETRY 1. Estimation of ascorbic acid in a citrus fruit. 2. Estimation of calcium in milk. 3. Estimation of glucose by Benedict's method in honey. 4. Estimation of phosphorous (Plant source) 	CO1,CO3	K5,K4,K3
II-LINU	 BIOCHEMICAL PREPARATIONS 1. Preparation of the following substances and its qualitative tests. 2. Lecithin from egg yolk. 	CO1, CO2, CO3	K1,K2, K3,K5
UNIT- III	 Starch from potato. Casein and Lactalbumin from milk. 	CO3 CO4	K1,K2 K5
UNIT- TINU	GROUP EXPERIMENT1. Determination of ash content and moisture content in food sample	CO1,CO2 CO3	K1,K2 K5
A-TINU	1. Extraction of lipid by Soxhlet's method.	CO1,CO2 CO4	K1,K2 K5

Recommended Text Books

- Laboratory manual in Biochemistry, J. Jayaraman, 2nd edition, New Age International Publishers, 2011,
- An Introduction to Practical Biochemistry, David T. Plummer, 3rd edition, Tata McGraw-Hill Publishing Company Limited, 2001.

Reference Books

- 1. Biochemical Methods, Sadasivam S and Manickam A, 4h edition, New Age International Publishers, 2016.
- 2. Essentials of Food and Nutrition, Vol. I & amp; II, M.S. Swami Nathan.
- Bowman and Robert M. 2006. Present Knowledge in Nutrition. 9th edition, International Life Sciences Publishers.
- 4. Indrani TK. 2003. Nursing Manual of Nutrition and Therapeutic Diet, 1st edition Jaypee Brothersmedical publishers.
- 5. Martha H. and Marie A. 2012. Biochemical, Physiological, and Molecular Aspects of HumanNutrition. 3rd edition. Chand Publishers

Website and e-learning source

1.https://www.elsevier.com/journals/clinical-biochemistry/0009-9120/guide-for-authors

2.http://rajswasthya.nic.in/RHSDP%20Training%20Modules/Lab.%20Tech/Biochemistry/

Dr.%20Jagarti%20Jha/Techniques%20In%20Biochemistry%20Lab.pdf

 $3. https://dspace.cuni.cz/bitstream/handle/20.500.11956/111493/Clinical_biochemistrypdf.puller/linical_biochemistrypdf.pul$

df? sequence=1&isAllowed=y

4.https://dspace.cuni.cz/bitstream/handle/20.500.11956/111493/Clinical_biochemistry pdf.p

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Estimate the important biochemical constituents in the food samples.	K1,K2
CO2	Prepare the macronutrients from the rich sources.	K1,K2,K4
CO3	Determine the ash and moisture content of the food samples	K1,K2,K3
CO4	Extract oil from its sources	K1,K2,K3
CO5	Determine Prophase, Anaphase, Metaphase, Telophase of the Cell	K1,K2,K3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	2	-	-	-	-	3	3	3
CO2	3	2	3	2	2	2	1	1	-	1	3	3	3
CO3	3	2	3	2	1	2	1	2	-	1	3	3	3
CO4	3	2	3	2	1	2	-	-	1	-	3	3	3
CO5	3	3	3	3	1	2	-	-	1	1	3	3	3

Title of the Course	Health and Nutrition	Hours/Week	02
Course Code	AUSBC14	Credits	02
Category	Skill enhancement Course –SEC-1	Year & Semester	I & I
Prerequisites	Higher secondary chemistry/Biology/Mathematics/Botany/Zoology/Physics	Regulation	2024

Objectives of the course:

The objectives of this course are to

- ➢ Gain basic knowledge about health.
- > Understand about vitamins.
- ➢ Learn about functions of fat on health.
- Understand the types of minerals and its functions
- ➤ Know about the importance of carbohydrates and proteins on health

UNITS	Contents	COs	Cognitive Levels
I-LINU	Health – definition, Factors affecting human health. Importance of health care of children, adults and elderly people. Balanced diet and calorific value.	CO1 CO3	K1 K2 K3
II-LINN	Vitamins-definition, classification, sources, properties, Functions and deficiency symptoms. Recommended daily allowances.	CO1 CO2 CO3	K1 K2 K3 K4
III-LINU	Sources and functions of dietary fats Role of fats in health and diseases (LDL, HDL, VLDL and Cholesterol).	CO3 CO4	K1 K2 K3
AI-LINU	Minerals- Role of minerals on human health Sources biological functions, deficiency disorders with special reference to Calcium, Phosphorus,Potassium, Copper, Iron, Zinc and Selenium. Minerals in biological systems and their importance –Iron, Calcium, Phosphorus, Iodine, Copper, Zinc.	CO2 CO3 CO4	K1 K2 K3
A-LINU	Role of proteins and carbohydrates in health. Functions of protein and carbohydrate and their calorific value. Dietary sources and deficiency disorders – Kwashiorkor and Marasmus – supplementation programs in India and their implications.	CO2 CO3 CO4 CO5	K1 K2 K3

Recommended Text Books

- 1. Davidson and J.R.Passmore (1986) Human Nutrition and Dietetics, (8th ed), Churchill Livingstone.
- 2. J. S. Garrow, W. Philip T. James, A. Ralph (2000), Human Nutrition and Dietetics (10th ed), Churchill Livingstone.
- 3. M.Swaminathan (1995) Principles of Nutrition and Dietetics, Bappco.

Reference Books

1. Margaret Mc Williams (2012). Food Fundamentals (10th ed), Prentice Hall

Website and e-learning source

- 1. https://www.universalclass.com/articles/health/nutrition/nutritional-needs-for-differentages.
- 2. nhp.gov.in/healthy living/healthy diet
- 3. www.anme.com.mx/libros/PrinciplesofNutrition.pdf

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Understand about the importance of health and diet.	K1,K2
CO2	Discuss about the classification, properties and deficiencies of vitamins.	K1,K2,K4
CO3	Understand about sources and functions of fats and lipids onhealth.	K1,K2,K3
CO4	Detail about the different typed of minerals and its role in health.	K1,K2,K3
CO5	Relate the role of proteins and carbohydrates on health.	K1,K2,K3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	3	1	3	-	-	-	-	3	3	2
CO2	3	2	3	3	2	3	1	1	-	1	3	3	2
CO3	3	3	3	2	2	3	-	2	-	1	3	3	3
CO4	3	3	3	2	2	3	-	-	1	-	3	3	2
CO5	3	3	3	2	2	3	-	-	1	1	3	3	3

Title of the Course	Basics of Biochemistry	Hours/Week	02
Course Code	AUFBC15	Credits	02
Category	Foundation course (Bridge course)	Year & Semester	I & I
Prerequisites	Higher secondary Chemistry/Biology/Mathematics/Botany/Zoology/Physics	Regulation	2024

Objectives of the course:

The objectives of this course are to

- > Create awareness about the role of nutrients in maintaining proper health.
- > Understand the nutritional significance of carbohydrates, lipids and proteins.
- > Understand the importance of a balanced diet.
- > Study the effect of additives, emulsifiers, and flavor enhancing substances in food.
- Study the significance of nutraceuticals.

UNITS	Contents	COs	Cognitive Levels
I-LINU	Definition, Important Functional & structural features of biomolecules in biological system Outline the classification of carbohydrates-Mono, Di, and Polysaccharide Proteins classification- Simple. Conjugated Proteins- Keratin, Collagen, Silk fibroin, Hemoglobin. Lipids Classification - simple, complex, and derived lipids. Role of lipids-DNA is genetic material.	CO1 CO3	K1 K2 K3
II-LINU	Nucleic acids- Central dogma, Watson Crick model of DNA, Mode of Replication, RNA - Structure and type's m-RNA, t-RNA, r-RNA with function – Genetic code.	CO1 CO2 CO3	K1 K2 K3 K4
III-LINU	Enzymes-structure, and function in a biological system Vitamins classification and its deficiency symptoms.	CO3 CO4	K1 K2 K3
VI-TINU	Classification of microbes .Role of Microbes in fermentation and infections. Immune system- Definition of Immunity, Role of immune cells in infections.	CO2 CO3 CO4	K1 K2 K3

		CO2	K1
Γ-V	Role of Medical lab in the diagnosis of Clinical disorder Applications	CO3	K2
IN	of Medical Coding.	CO4	K3
1		CO5	

Recommended Text Books

- David L. Nelson and Michael M.Cox (2012) Lehninger Principles of Biochemistry (6th Edition) W.H.Freeman.
- 2. Voet.D & Voet.J.G (2010) Biochemistry, (4th Edition), John Wiley & Sons, Inc.
- 3. Metzler D.E (2003). The chemical reactions of living cells (2nd Edition), Academic Press.
- 4. Zubay G.L (1999) Biochemistry, (4th Edition), McGrew-Hill.
- 5. Lubert Stryer (2010) Biochemistry, (7th Edition), W.H.Freeman
- Satyanarayan.U (2014) Biochemistry (4th Edition), Arunabha Sen Books & Allied (P) Ltd, Kolkata.

Reference Books

- Voet.D. etal., 2012. Fundamentals of Biochemistry: Life at the Molecular level, 4th Edition John Wiley and Sons.
- 2. Zubay, G.L. 1998. Biochemistry, Wm. C. Brown Publishers.
- 3. Sinden, S.R.DNA structure and function, First Edition, Academic Press, 1994.
- 4. Carl Branden and John Tooze, Introduction to Protein Structure, Second Edition, Garland Publishing, 1999.
- 5. Garrett, R. and Grisham C, 2010 .Biochemistry, 4th Edition, Saunders.
- 6. Chemistry of Biomolecules by RJ Simond.
- 7. Biomolecules: Chemistry of Living System by VK Ahluwalia.
- 8. Cell Biology (Cytology, Biomolecules and Molecular Biology) by Verma PS and Agarwal V
- Textbook of Biochemistry with clinical correlations by Thomas. M. Devlin, John Wiley liss Hobokhen NJ Publishers 2006.
- 10. Biochemistry and Molecular Biology of Antimicrobial Drug Action, 6th Edition Paperback–
 2005. by franklint.j. et.al (Author).

Website and e-learning source

- 1. <u>http://old.noise.ac.in/SecHmscicour/english/LESSON O3.pdf</u>
- 2. https://study.com/academy/lesson/energy-yielding-nutrients-carbohydratesfat-
- 3. https://www.nhsinform.scot/healthy-living/food-and-
- nutrition/eatingwell/vitamins-and-minerals

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Students will be introduced to the structure of biomolecules.	K1,K2
CO2	The significance of carbohydrates in biological processes will be understood.	K1,K2,K4
CO3	The structure, properties and biological significance of lipids in the biological system will be studied	K1,K2,K3
CO4	Students will learn about the concepts of protein structure and their significance in biological processes and creatively comprehend the role of membrane components with their biological Significance.	K1,K2,K3
CO5	Students will gain knowledge about the structures and functional roles of nucleic acids in the Biological system	K1,K2,K3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	-	-	-	-	-	3	3	2
CO2	3	2	2	2	1	-	1	1	-	1	3	3	1
CO3	3	2	2	2	1	-	-	2	-	1	3	3	1
CO4	3	3	2	3	2	1	1	-	-	-	3	3	2
CO5	3	3	2	3	2	1	1	-	1	1	3	3	2

Title of the Course	ALLIED BIOCHEMISTRY I	Hours/Week	04
Course Code	AUEBC15	Credits	03
Category	Elective subject	Year & Semester	I & I
Prerequisites	Higher secondary chemistry/Biology/Mathematics/Botany/Zoology/Physics	Regulation	2024

Learning objectives

The objectives of this course are to

- > Introduce the structure and classification of carbohydrates
- > Comprehend the metabolism of carbohydrates
- > Study the classification and properties of amino acids
- > Elucidate the various levels of organization of Proteins
- > Study functions and deficiency diseases of vitamins

LINITS	Contonts	COs	Cognitive
UNITS	Contents	COS	Levels
I-LINU	Definition and classification of carbohydrates Linear and cyclic forms (Haworth projection) for glucose fructose and mannose and disaccharides (Maltose, Lactose sucrose).General properties of monosaccharide and disaccharides. Occurrence and significance of polysaccharides.	CO1 CO3	K1 K2 K3
II-TINU	Metabolism- Catabolism and Anabolism. Carbohydrate metabolism – Glycolysis, TCA cycle, HMP shunt and glycogen metabolism and energetics.	CO1 CO2 CO3	K1 K2 K3 K4
III-LINU	Amino acids Classifications, Physical properties - amphoteric nature, Isoelectric point and chemical reactions of carboxyl, Amino and both groups. Amino acid metabolism- transamination, deamination and decarboxylation.	CO3 CO4	K1 K2 K3
AI-TINU	Proteins Classification-Biological functions physical properties - ampholytes, Isoelectric point, salting in and salting out, Denaturation, nature of peptide bond. Secondary structure α -helix β -pleated sheet Tertiary structure of various forces involved- quaternary structure.	CO2 CO3 CO4	K1 K2 K3

	Vitamins	CO2	K1
V-1	Classification - Fat Soluble vitamins (A, D, E and K) and water	CO3	K2
LINU	Soluble Vitamins and Vitamin C – sources, RDA, biological	CO4	K3
1	functions and deficiency diseases.	CO5	
		COS	

Recommended Text Books

1 Satyanarayan.U (2014) Biochemistry (4th ed), Arunabha sen Books & Allied (P) Ltd,

Kolkata.2.Jain J.L.(2007) Fundamentals of Biochemistry, S.Chand publishers 311

Reference Books

1. David L.Nelson and Michael M.Cox (2012) Lehninger Principles of Biochemistry (6th ed)

W.H.Freeman.

2. Voet.D & Voet. J.G (2010) Biochemistry, (4th ed), John Wiley & Sons, Inc.

3. Lubert Stryer (2010) Biochemistry, (7th ed), W.H.Freeman.

4. Satyanarayan, U (2014) Biochemistry (4th ed), Arunabha Sen Books & Allied (P) Ltd, Kolkata.

5. Jain J.L. (2007) Fundamentals of Biochemistry, S.Chand publishers 31.

Website and e-learning source

1.onlinecourses.swayam2.ac.in/cec20_bt12

Course Outcome

COs	CO Description	Cognitive Level
CO1	Classify the structure of carbohydrates and its properties.	K1,K2,K3
CO2	Explain the metabolism of carbohydrates and its significance.	K1,K2,K3
CO3	Classify amino acids and its properties.	K1,K2,K3,K4
CO4	Explain the classification and elucidate the different levels of structural organization of proteins.	K1,K2,K3
CO5	Identify the disease caused by the deficiency of vitamins.	K1,K2,K4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	-	-	-	-	-	3	1	3
CO2	3	3	1	1	2	-	1	1	-	1	3	1	3
CO3	3	3	1	2	1	-	-	2	-	1	3	3	3
CO4	3	3	2	2	2	-	-	-	-	-	3	2	3
CO5	3	3	2	1	2	1	-	-	1	1	3	2	3

Title of the Course	ALLIED BIOCHEMISTRY PRACTICAL I	Hours/Week	03
Course Code	AUEPBC15	Credits	03
Category	Elective subject Practical	Year & Semester	I & I
Prerequisites	Higher secondary chemistry/Biology/Mathematics/Physics	Regulation	2024

Learning objectives

- Identify carbohydrates by qualitative test
- Estimate biomolecules volumetrically
- Estimate protein quantitatively

UNITS	Contents	COs	Cognitive
			Levels
	I Qualitative analysis of carbohydrates- 25 Hrs	CO1	K1
LIN	a. Monosaccharide -Glucose, Fructose	CO3	K2
C	b. Disaccharides- Lactose, Maltose		K3
II	c. Disaccharides – Sucrose (Non reducing)	CO1,CO2,	K1,K2
LINU	d. Polysaccharides-Starch	CO3	K3,K4
	II Volumetric analysis 15 Hrs		
II	1. Estimation of ascorbic acid using 2,6 dichlorophenol-	CO3	K1
-TIN	indophenol as a link solution.	CO4	K2
D	2. Estimation of Glucose by Benedict's method.		K3
NI-	1 Estimation of Clusing by Soughoon Formal tituation	CO2,CO3,	
LINU	1. Estimation of Grycine by Sofenson Formal utration.	CO4	K1,K2,K3
N	III Quantitative analysis (Demonstration Expt)	CO2.CO3	
-TIN	1. Colorimetric estimation of protein by Biuret method	CO4,CO5	K1,K2,K3

Recommended Text Books

- Laboratory manual in Biochemistry, J. Jayaraman, 2nd edition, New Age International Publishers, 2011,
- An Introduction to Practical Biochemistry, David T. Plummer, 3 rd edition, Tata McGraw-Hill Publishing Company Limited, 2001.

Reference Books

 Biochemical Methods, Sadasivam S and Manickam A, 4h edition, New Age International Publishers, 2016

Website and e-learning source

1. onlinecourses.swayam2.ac.in/cec20_bt12

Course Outcome

COs	CO Description	Cognitive Level
CO1	Qualitatively analyze and report the type of carbohydrate based	K1.K2,K3
	on specific tests	
CO2	Quantitatively estimate the carbohydrates, amino acids and	K1,K2,K4
	ascorbic acid.	
CO3	Estimate protein by colorimetric method.	K1,K2,K3
CO4	Estimation of ascorbic acid using 2,6dichlorophenol -	K1,K2,K4
	indophenol as link solution.	
CO5	Colorimetric estimation of protein by Biuret method.	K1,K2,K4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	1	1	3	-	-	1	1	3	3	3
CO2	3	3	3	1	2	3	1	1	1	1	3	3	3
CO3	3	3	3	2	1	3	-	2	1	1	3	3	3
CO4	3	3	3	2	2	3	-	-	1	1	3	3	3
CO5	3	3	3	2	2	3	-	-	1	1	3	3	3

Title of the Course	CELL BIOLOGY	Hours/Week	5
Course Code	AUCBC 21	Credits	5
Category	CORE -III	Year & Semester	I & II
Prerequisites	Higher secondary chemistry/Biology/Mathematics/Botany/ Zoology/Physics	Regulation	2024

Objectives of the course:

- Provide basic understanding of architecture of cells and its organelles.
- Understand the organization of prokaryotic and eukaryotic genome.
- Educate on the structural organization of bio membrane and transport mechanism.
- Impart knowledge on cell cycle, cell division and basics of cells
- Familiarize the concept of mechanism of cell-cell interactions.

UNITS	Contents	COs	Cognitive Levels
I-LINU	Architecture of cells- Structural organization of prokaryotic and eukaryotic cells, microbial, plant and animal cells. The Ultra structure of nucleus, mitochondria, RER, SER, Golgi apparatus,lysosome, peroxisome and their functions.	CO1	K2, K3
II-LINU	Cytoskeleton- microfilament, microtubules and intermediary filament- structure, composition and functions. Organization of Genome - prokaryotic and eukaryotic genome. Organization of chromatin – histones, nucleosome concept, formation of chromatin structure.	CO2	K1,K2,K3

III-LINU	Biomembranes - Structural organization of bilipid layer model and basic functions - transport across cell membranes- Uniport, Symport and Antiport. Passive and active transport.	CO3	K1,K3
UNIT-IV	Cell Cycle - Definition and Phases of Cell cycle - Cell Division - Mitosis and Meiosis and its significance, Cancer Cells - definition, types and characteristics of cancer cells.	CO4	K2,K3
A-TINU	Extracellular matrix – Collagen, Laminin, Fibronectin and Proteoglycans- structure and biological role. Structure and role of cadherin, selectins, Integrin, Cell - cell interactions- Types- gapjunctions, tight junctions and Desmosomes.	CO5	K1,K2,K3

Recommended Text Books

- 1. Arumugam. N, Cell biology. Sara's publication(10ed, paperback), 2019
- 2. Devasena.T. Cell Biology. Oxford University Press India-ISBN: 9780198075516, 0198075510, 2012
- 3. Bruce Albert's and Dennis Bray. 2018, Essential Cell Biology. (5th Ed). Garland Science.
- 4. Karp's Cell Biology, Global Edition By Gerald Karp, Janet Iwasa, Wallace Marshall \cdot 2018

Reference Books

- 1. Arumugam.N. (2019). Cell biology. Saras publication (10ed, paperback)
- 2. Devasena.T. (2012). Cell Biology. Oxford University Press India ISBN: 9780198075516, **0198075510**
- 3. Cooper, G.A.The Cell: A Molecular Approach. Sinauer Associates, Inc ISBN10: 0878931066 / ISBN 13: 9780878931064, 2013
- E.M.F., D.R,Cell and Molecular Biology. Lippincott Williams & Wilkins Philadelphia ISBN: 0781734932 9780781734936,
- 5 .Lodish H.A, Berk C.A, Kaiser M, Krieger M.P, Scott A, Bretscher H, Plough and Matsudaira. 2007. Molecular Cell Biology, 6th Edition, WH. Freeman Publishers, NewYork, USA.
- 6. Mechanics of the cell by David boal, Cambridge publishers. 2nd edition, 2012

Website and e-learning source

- 1. Cell biology: https://nicholls.edu/biol-ds/bio1155/Lectures/Cell%20Biology.pdf
- 2. The Cell: https://www.medicalnewstoday.com/article/320878.php
- 3. Cell structure: https://biologydictionary.net/cell

Course Learning Outcomes (for Mapping with Pos and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Explain the structure and functions of basic components of Prokaryotic and Eukaryotic cells, especially the organelles.	K2, K3
CO2	Familiarize the Cytoskeleton and Chromatin	K1,K2,K3
CO3	Illustrate the structure, composition and functions of cell membrane related to membrane transport	K1,K3
CO4	Elaborate the phases of Cell cycle and Cell division, Mitosis and Meiosis and characteristics of cancer cells.	K2,K3
CO5	Relate the structure and biological role of extracellular matrix in cellular interactions	K1,K2,K3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	-	1	-	-	2	2	2	-
CO2	3	3	2	-	3	3	-	-	1	3	2	-	3
CO3	3	3	3	-	3	2	-	1	-	2	3	2	3
CO4	3	3	3	2	-	3	-	-	-	2	3	3	3
CO5	3	3	3	2	-	3	-	1	-	3	3	3	2

Title of the Course	PRACTICAL II -CELL BIOLOGY	Hours/Week	3
Course Code	AUCPBC 22	Credits	3
Category	CORE-IV	Year & Semester	I & II
Prerequisites	Higher secondary Chemistry/Biology/Mathematics/Botany/ Zoology/Physics	Regulation	2024

Objectives of the course

- ✤ Learn the parts of Microscope.
- Investigate the Cells under microscope.
- Image the Cells using different stains.
- ✤ Identify the Cells, Organelles and stages of cell division
- Identify the spotters.

UNITS	Contents	COs	Cognitive Levels
I-TINU	 MICROSCOPY 1. Study the parts of Light and Compound microscope. 2. Preparation of Slides and Micrometry. 3. Examination of prokaryotic and eukaryotic cell. 4. Visualization of animal and plant cell by methylene blue. 	CO1	K1,K2,K3
II-LINU	STAINING TECHNIQUES5. Visualization of Nuclear fraction by acetocarmine stain.6. Staining and Visualization of Mitochondria by Janus Green stain.	CO2	K2
UNIT- III	GROUP EXPERIMENT7. Identification of different stages of Mitosis in onion root tip.8. Identification of different stages of Meiosis in onion bulb.	CO3	K2,K3
AI-TINU	 SPOTTERS 9. a) Cells: Nerve, Plant and Animal cell b)Organelles: Mitochondria, Chloroplast, Endoplasmic reticulum, 	CO4	K1,K2
V-TINU	SPOTTERS c) Mitosis stages–Prophase, Anaphase, Metaphase, Telophase	CO5	K1,K2

Website and e learning source

- 1. Cell organelle: https://www.microscopemaster.com/organelles.html
- 2. Biochemistry books: https://www.pdfdrive.com/biochemistry-books.htm
- 3. Histology studies : http://medcell.med.yale.edu/histology/cell_lab.php#:~:text=
- 4. Mitosis: http://amrita.olabs.edu.in/?sub=79&brch=18&sim=237&cnt=1

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Identify the parts of Microscope.	K1,K2,K3
CO2	Understand the Preparation of Slides and staining techniques.	K2
CO3	Identify the stages of Mitosis & Meiosis	K2,K3
CO4	Visualize Nucleus and Mitochondria by staining methods	K1,K2
CO5	Identify the spotters of cells, organelles and stages of Cell division	K1,K2

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	3	-	3	3	2	1	-	3	3	3	2
CO2	2	2	2	2	2	3	2	2	-	3	3	3	3
CO3	2	3	3	3	3	3	3	-	1	3	3	3	2
CO4	2	2	2	2	3	3	2	1	-	2	3	3	3
CO5	2	2	3	3	2	2	2	-	3	2	2	2	2

Title of the Course	MEDICINAL DIET	Hours/Week	2
Course Code	AUSBC 24	Credits	2
Category	SKILL ENHANCEMENT COURSE-III	Year & Semester	I & II
Prerequisites	Higher secondary chemistry/Biology/Mathematics/Botany/ Zoology/Physics	Regulation	2024

Objectives of the course:

- Provide basic knowledge about diet.
- Understand of diet modification for GI diseases.
- ✤ Plan a diet for liver diseases.
- Prepare diet chart for Infectious diseases.
- Plan a diet for Diabetes, Renal and Cardio-vascular diseases.

Ul	NITS	Contents	COs	Cognitive Levels
	I-LINU	Principles of Therapeutic Diet: Definitions of Normal diet, Therapeutic diet, Soft Diet and Liquid diet. Objectives of Diet Therapy. Advantages of using normal diet as the basis for Therapeutic diet.	CO1	K1,K2,K3
	II-LIND	CO2	K1,K2,K3	
	III-TINU	Diet Modification in liver and gall bladder in diseases: Etiology, symptoms and dietary treatment in jaundice, hepatitis, Cirrhosis of liver and hepatic coma.	CO3	K2,K3
	VI-TINU	Diet Modification in Infectious Diseases: Fevers, Typhoid, Tuberculosis and Viral Hepatitis. Dietary modifications in Tuberculosis.	CO4	K2,K3

	UNIT-V	Diet Modification in Diabetes, Renal and Cardio-vascular diseases- Diabetes Acute & Chronic glomerulonephritis, nephrosis, renal failure, kidney stone and Hypertension.	CO5	K1,K2,K3				
Re	comme	ended Text Books						
	1.	M. Raheena Begum, A Text Book of Foods, Nutrition and Dietetics.	Sterling					
	Pu	blishersPvt. Ltd. 3 rd edition.2014	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~					
	2.	M.V.Raja Gopal, Sumati. R., Mudambi, Fundamentals of foods an	d Nutriti	ion.				
	W	lleyEastern Limited, Year-1990.		,				
	3.	William S.R Nutrition and Diet Therapy, 1985, 5 th edition, Mosly Co.	St.Louis.					
	4.	Modern Nutrition by Catharineross, Woiters Kiuwe publishers.						
	 5. Complete food and Nutrition Guide By Robert Larson day off, John and Willy Publishers. 6.Food as Medicine : A Handbook of Natural nutrition by Kirsten Hartvig,2023.ISBN 1801521174 							
Re	ference	Books						
	 Nutritional Biochemistry by Patricla Trueman, 2019 ISBN 10:81-8094-031-4. Food as Medicine: A Handbook of Natural Nutrition Paperback, 28 November 2023 by Kirsten Hartyig (Author) 							
	3. 1	Food As Medicine By Guru Dharma Singh Khalsa · 2010						
	4. W	Villiam's Essentials of Nutrition and Diet Therapy by Eleanor D .Schle	enkar &					
		Joyce Gilbert – 2015,11 th Edition						
	5. F	bod and Nutrients in Disease Management, Ingrid Kohlstadt \cdot 2016.						
We	bsite ar	nd e-learning source						
1.	Medici	nal diet: https://www.rickysinghmd.com/a-guide-to-the-medicinal-diet	/					
2.	2. Healthy diet: https://www.who.int/news-room/fact-sheets/detail/healthy-diet							
3.	3. Food and nutrition: https://www.healthline.com/nutrition/food-as-medicine							
4.	Food a	s medicine: https://nutrition.org/food-as-medicine/						

Course Learning Outcomes (for Mapping with Pos and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Possess basic knowledge about diet.	K1,K2,K3
CO2	Acquire knowledge on diet plan for GI diseases.	K1,K2,K3
CO3	Sketch diet modifications for liver diseases.	K2,K3
CO4	Understand diet plan for Infectious diseases.	K2,K3
CO5	Prepare diet chart for Diabetes Renal and Cardio-vascular diseases.	K1,K2,K3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	-	-	3	1	3	3	3	3	-	1
CO2	3	3	2	2	3	2	1	3	3	3	3	-	1
CO3	3	3	2	2	3	2	2	3	3	3	3	-	1
CO4	3	3	-	2	3	2	2	3	3	3	3	-	2
CO5	3	3	-	2	3	2	2	3	3	3	3	-	2

Title of the Course	FIRST AID	Hours/Week	2
Course Code	AUSBC 25	Credits	2
Category	SKILL ENHANCEMENT COURSE-IV	Year & Semester	I & II
Prerequisites	Higher secondary chemistry/Biology/Mathematics/Botany/ Zoology/Physics	Regulation	2024

Objectives of the course:

- Provide knowledge on the basics of first aid.
- Perform first aid during various respiratory issues.
- Demonstrate the first aid to treat injuries.
- ✤ Learn the first aid techniques to be given during emergency.
- ✤ Familiarize the first aid during poisoning

UNITS	Contents	COs	Cognitive Levels
I-LINN	Aims and important rules of first aid, dealing with emergency, types and content of a first aid kit. First aid technique – Dressing and Bandages, fast evacuation technique, transport techniques.	CO1	K1,K2,K3,K4
II-LINN	Basics of Respiration – CPR, first aid during difficult breathing, drowning, choking, strangulation and hanging, swelling within the throat, suffocation by smoke or gases and asthma.	CO2	K1,K2,K3
III-TINU	Common medical aid- first aid for wounds, cuts, head, chest, abdominal injuries, shocks, burns, amputations, fractures, dislocation of bones.	CO3	K1,K2,K3,K4
UNIT-IV	First aid related to unconsciousness, stroke, fits, convulsions - seizures, epilepsy	CO4	K1,K2,K3,K4
A-LINN	First aid in poisonous bites (Insects and snakes), honey bee stings, animal bites, disinfectant, acid and alkali poisoning	CO5	K1,K2

Recommended Text Books

- First aid and health Dr. Gauri Goel, Dr. Kumkum Rajput, Dr.Manjul Mungali 1SBN-978-93-92208-19-5
- The Complete First Aid Pocket Guide Published:13 November 2018 Author: John Furst ISBN:9781507208892
- 3. ACEP First Aid Manual 5th Edition September 2014 Author: American College

Reference Books

- 1. A Comprehensive First Aid Manual and Reference Guide By Nigel Barraclough · 2017
- 2. First Aid and Emergency Care, Jain publication, 1st Edition, January 2024.
- 3. First Aid for the Basic sciences by kendall Krause.
- 4. First Aid made easy by Nigelbarraclough-2017 ISBN 09552294

Website and e-learning source

- 1. First aid training: https://www.redcross.org/take-a-class/first-aid/first-aid-training/first-aid-online
- 2. First aid: https://www.first aid for free.com/

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Discuss on the rules of first aid, dealing during emergency and first aid techniques	K1,K2,K3,K4
CO2	Understand the first aid techniques to be given during different types of respiratory problems	K1,K2,K3,K4
CO3	Provide first aid for injuries, shocks and bone injury	K1,K2,K3,K4
CO4	Detail on the first aid to be given for unconsciousness, stroke, fits and convulsions	K1,K2,K3,K4
CO 5	Gain expertise in giving first aid for insect bites and chemical poisoning	K1,K2

	PO1	PO2	PO3	PO4	PO 5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	-	3	3	3	1	1	3	3	3	-
CO2	2	2	3	1	3	3	3	2	1	3	3	3	-
CO3	2	2	3	2	3	3	2	1	1	3	3	2	1
CO4	2	3	3	1	3	3	3	1	1	3	3	2	-
CO5	2	3	3	1	3	3	2	1	1	3	3	3	1

Title of the Course	BIOMOLECULES	Hours/Week	04
Course Code	AUCBC 31	Credits	04
Category	Core - V	Year & Semester	II & III
Prerequisites	Higher secondary Chemistry/Biology/Mathematics/Botany/ Zoology/Physics	Regulation	2024-25

Objectives of the course:

- 1. Introduce the structure, properties and biological significance of carbohydrates
- 2. Comprehend the classification, functions and acid base properties of amino acids
- 3. Elucidate the various levels of organization of Proteins.
- 4. Impart knowledge on the classification, Properties and characterization of Lipids.
- 5. Acquaint with the classification, structure, properties and functions of nucleic acids.

UNITS	Contents	COs	Cognitive
			Levels
I-TINU	Carbohydrates-Classification and biological significance, physical properties - stereo isomerism, optical isomerism, annoyers, epimers and mutarotation. Monosaccharides: Occurrence, linear and cyclic structure, Reactions of monosaccharide's due to the presence of hydroxyl, aldehyde and keto groups. Disaccharides: Structure and properties of reducing disaccharides (lactose and mannose), non- reducing disaccharide (sucrose). Polysaccharides: Homopolysaccharides - Occurrence, structure and biological significance of starch, glycogen and cellulose. Heteropolysaccharides - Structure and biological significance of Mucopolysaccharides-Hyaluronic acid, Chondroitin sulphate and Heparin.	CO1	K1, K2, K3, K4
II-TINU	Amino acids -Classification based on composition of side chain and nutritional significance. General structure of amino acids. 3 - and 1- letter abbreviations. Modified amino acids in protein and non - protein amino acids. Physical properties of amino acids, isoelectric point, Zwitter ion, titration curve, optical activity. Chemical reactions due to carboxyl group, amino group and side chains. Colour reactions of amino acids.	CO2	K1, K2, K3

III-LINO	Proteins- Classification based on shape, composition, solubility and functions. Properties of proteins - Ampholytes, Isoelectric point, salting in and salting out, denaturation and renaturation, UV absorption. Levels of Organization of protein structure- Primary structure, Formation and characteristics of peptide bond, phi and psi angle, Ramachandran plot, Secondary structure- α helix, β - pleated sheath, triple helix. Tertiary structure – with reference to myoglobin. Quaternary structure with reference to hemoglobin.	CO3	K1, K2, K3, K4				
UNIT-IV	Lipids -Lipids: Bloor's classification, chemical nature and biological functions. Fatty acids: classification, nomenclature, structure and properties of fatty acids. Simple and mixed triglycerides: structure and general properties, Characterization of fats- iodine value, saponification value, acid number, acetyl number, Polanski number, Reichert–Meissl number along with their significance. Compound lipids – Structure and functions of phospholipids and glycolipids. Derived lipids-Structure and functions of cholesterol, Bile Acids and bile salts.	CO4	K1,K3, K4, K5				
UNIT-V	Nucleic acids- Structure of purine and pyrimidine bases, nucleosides and nucleotides and their biological importance. Watson and Crick double helical model of DNA, Types of DNA: A, B, Z DNA, structure and biological significance. Types of RNA: mRNA, t-RNA, r-RNA, hn-RNA, Sn-RN, Secondary and tertiary structure of t-RNA. Properties of DNA- Hypo chromic and hyper chromic effect, melting temperature. Denaturation and Renaturation of DNA.	CO5	K1,K3, K4, K5				
Recommended Text Books 1. Biochemistry, U.Sathyanarayana & U.Chakrapani, 6 th edition Elsevier India Pvt. Ltd., Books & Allied Pvt.Ltd. 2023. 2. Fundamentals of Biochemistry, J.L.Jain, SunjayJain, Nitin Jain, 7 th edition S.Chand & Company Ltd. 2013. 3. Text book of Medical Biochemistry, MN Chatterjee, Rana Shinde, 8th edition, Jaypee Brothers, 2012							
Referen	ice Books						
1.David L.Nelson, Michael M.Cox, Principles of Biochemistry, 4th edition W.H.Freeman and							
Comp	pany. 2013	** 7*1	o a t				
2.Voet.D, Voet.J.G.and Pratt, C.W, Principles of Biochemistry, 4 th edition John Wiley& Sons, Inc., 2010							
3. Zuba	y G.L, et.al. Principles of Biochemistry, 1 st edition, WMC. Brown Publi	shers. 1	998				

Website and e-learning source

- 1. https://www.britannica.com/science/biomolecule
- 2. https://en.wikipedia.org/wiki/Biomolecule
- 3. https://www.khanacademy.org/science/biology/macromolecules

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Illustrate the structure, the physical and Chemical properties of carbohydrates.	K1, K2, K3, K4
CO2	Indicate the classification, structure, properties and biological Functions of amino acids.	K1, K2, K3
CO3	Explain the classification and elucidate the different levels of structural organization of proteins.	K1, K2, K3,K4
CO4	Understand the classification, structure, properties, functions and characterization of lipids	K1,K3,K4,K5
CO5	Describe the structure, properties and functions of different types of nucleic acids	K1,K3,K4,K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	1	-	-	1	1	3	2
CO2	3	3	3	3	3	3	2	1	3	-	3	2	-
CO3	3	3	2	3	-	3	-	-	-	1	2	-	1
CO4	3	3	2	2	2	3	-	2		3	3	2	1
CO5	3	3	3	2	3	3	2	2	3	1	3	-	1

COURSE DESCRIPTORS	
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Title of the Course	PRACTICAL -III BIOMOLECULES	Hours/Week	03
Course Code	AUCPBC 32	Credits	03
Category	Core – VI	Year & Semester	II & III
Prerequisites	Higher secondary Chemistry/Biology/Mathematics/Botany/ Zoology/Physics	Regulation	2024-25

Objectives of the course:

- 1. Identify the biomolecules Carbohydrates and Amino acids by Qualitative test
- 2. Determine the quality of Lipids by titrimetric methods
- 3. Isolate nucleic acids from plant and animal source.

UNITS	Contents	COs	Cognitive
			Levels
I-LINU	Qualitative test for Carbohydrates a) Glucose b) Fructose c) Arabinose	CO1	K1, K2, K3, K4
II-LINU	Qualitative test for Carbohydrates a) Maltose b) Sucrose c) Lactose d) Starch.	CO2	K1, K2, K3
III-TINU	 Qualitative test for Amino acids a) Arginine b) Cysteine c) Histidine d) Proline e) Tryptophan f) Tyrosine g) Methionine 	CO3	K1, K2, K3, K4
AI-TINU	 Titrimetric methods 1) Determination of Saponification value of edible oil. 2) Determination of Iodine number of edible oil. 3) Determination of Acid number of edible oil. 4) Estimation of Glycine. 	CO4	K1,K3, K4, K5
V-TINU	 Group Experiments 1) Isolation of DNA from plant/animal source. 2) Isolation of RNA from rich source.(Yeast) 	CO5	K1,K3, K4, K5

Recommended Text Books

1. David T Plummer, An Introduction to Practical Biochemistry, 3 rd edition Tata Mc Graw-Hill Edition 2017.

2. J.Jayaraman Laboratory Manual in Biochemistry, New Age International (P)

Limited second edition 2020.

3. S.SadasivamA. Manickam Biochemical Methods, Newage International Pvt Ltd publisher's third edition 2018.

Reference Books

1. Rageeb, KiranPatil, M.Bakshi Rahman, Sufiyan Ahmad Raees house,1st Edition, A

Practical book on Biochemistry Everest publishing 2019.

2. Introductory practical Biochemistry–S.K.Sawhney,Randhir Singh,2nd Ed,2005.

3. Biochemical Tests–Principles and Protocols .AnilKumar, Sarika Gargand Neha Garg.Vinod Vasishtha Viva Books Pvt Ltd, 2015.

4. Harold Varley, Practical Clinical Biochemistry, CBS.6edition, 2006.

5. Keith Wilson and John Walker. Principles and Techniques of Practical Biochemistry, 4th edition, Cambridge University press, Britain.1995

Website and e-learning source

1.https://www.pdfdrive.com/instant-notes-analytical-chemistry-e912659.html14

2.https://www.pdfdrive.com/analytical-biochemistry-e46164604.html

3.https://www.pdfdrive.com/biochemistry-books.html

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Qualitatively analyze the carbohydrates –Monosaccharides and report the type of carbohydrate based on specific tests	K1, K2, K3, K4
CO2	Qualitatively analyze the carbohydrates –Di, Polysaccharides and report the type of carbohydrate based on specific tests	K1, K2, K3
CO3	Qualitatively analyze amino acids and report the type of Amino acids based on specific tests	K1, K2, K3,K4
CO4	Determine the Saponification, Iodine and acid number of Edible oil and Estimation of Glycine	K1,K3,K4,K5
CO5	Isolate the DNA and RNA from biological sources	K1,K3,K4,K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	1	1	1	3	1	2
CO2	3	3	3	3	3	3	3	-	-	-	2	2	1
CO3	3	3	3	2	2	2	-	1	-	1	2	1	-
CO4	3	3	3	3	3	3	-	-	2	1	2	2	2
CO5	3	3	2	3	2	3	2	2	-	-	3	-	3

Title of the Course	TISSUE CULTURE	Hours/Week	02
Course Code	AUSBC34	Credits	02
Category	Skill Enhancement	Year & Semester	II & III
Prerequisites	Higher secondary Chemistry/Biology/Mathematics/Botany/ Zoology/Physics	Regulation	2024-25

Objectives of the course:

1. Introduce the tools and techniques used in tissue culture technique.

2. Acquire knowledge on preparation of growth medium for culture techniques.

3. Impart knowledge on procedures involved gene transfer.

4. Acquaint with the process of tissue culture technique.

5. Understand the importance of plant and animal tissue culture for the production and evaluation of bioactive compounds

UNITS	Contents	COs	Cognitive Levels			
I-LINU	Introduction to Tissue culture, Types-seed, embryo, Callus, Organ, Protoplast culture, Advantages and importance of tissue culture, Tools and techniques.	CO1	K1, K2, K3, K4			
II-LINU	Media and Culture Preparation-pH, temperature, solidifying agents. Role of Micro and macronutrients. Maintenance of cultures.	CO2	K1, K2, K3			
UNIT III	Methods of gene transfer in plants and animals-direct and indirect Gene transfer methods, Cell culture applications.	CO3	K1, K2, K3, K4			
UNIT-IV	Cell culture technique - Explants selection, sterilization and Inoculation. Tissue culture labs.	CO4	K1,K3, K4, K5			
UNIT- V	Transgenic plants for crop improvement. Transgenic plants for molecular farming. Animal Cloning- an overview- Applications of animal cell culture.	CO5	K1,K3, K4, K5			
M.G. College of Arts and Science (Autonomous), Gudiyattam. Page 4						

Recommended Text Books

- 1. Trivedi, P.C. Applied Biotechnology: Recent Advances, panima Publishing corporation, 2016
- 2. Ignacimuthu Applied Plant Biotechnology. Tata McGraw Hill, 2012.
- 3. Lycett, G.W and Grierson, D.(ed). Genetic Engineering of crop plants, 2013.
- 4. Chawla, H.S.,"Introduction to Plant Biotechnology", 3rd Edition, Science Publishers, 2009.

Reference Books

1. Stewart Jr., C.N., "Plant Biotechnology and Genetics: Principles, Techniques and Applications" Wiley- Interscience, 2008.

2. Freshney, R.I Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications. Wiley-Blackwell, 6th Edition. 2010.

- 3. Davis, J.M. Basic Cell Culture. Oxford University Press. New Delhi. 2008
- 4. Davis, J. M. Animal Cell Culture. John Willy and Sons Ltd. USA, 2011
- 5. Butler, M. Animal Cell Culture and Technology. Taylor and Francis. Key work USA. (2004).

Website and e-learning source

1. https://www.britannica.com/science/tissue-culture

 $2.https://en.wikipedia.org/wiki/Plant_tissue_culture$

3. https://microbeonline.com/animal-cell-culture-introduction-types-methods-applications/

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level
CO1	Tools and techniques of plant tissue culture.	K1, K2, K3, K4
CO2	Acquire knowledge on preparation of tissue culture media	K1, K2, K3
CO3	Understanding on different methods of gene transfer	K1, K2, K3,K4
CO4	Preparation of plant and animal cell culture techniques	K1,K3,K4,K5
CO5	Study of applications of genetically modified plants and animals.	K1,K3,K4,K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	-	-	1	3	3	3
CO2	3	3	3	3	3	3	1	2	1	-	3	2	1
CO3	3	3	3	2	2	2	-	-	-	1	1	2	3
CO4	3	3	3	2	3	-	-	1	-	1	2	1	2
CO5	3	3	3	3	3	3	2	-	2	1	1	1	3

COURSE I	DESCR	IPTORS
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Title of the Course	PLANT BIOCHEMISTRY AND PLANT THERAPEUTICS	Hours/Week	02
Course Code	AUSBC 35	Credits	02
Category	Skill Enhancement	Year & Semester	II & III
Prerequisites	Higher secondary Chemistry/Biology/Mathematics/Botany/ Zoology/Physics	Regulation	2024-25

Objectives of the course:

- 1. Convey the knowledge of photosynthesis.
- 2. Detail the structure and types of secondary metabolites.
- 3. Impart the idea on various plant hormones.
- 4. Emphasize the effects of free radicals and the importance of antioxidants
- 5. Understand the role of medicinal plants in treating diseases.

UNITS	Contents	COs	Cognitive Levels
I -TINU	Photosynthesis- Photosynthesis apparatus, pigments of photosynthesis, photo chemical reaction, photosynthetic electron transport chain, path of carbon in photosynthesis- Calvin cycle, Hatch–lack pathway (4ways) CAM pathway, Significance of photosynthesis.	CO1	K1, K2, K3, K4
II -TINU	Secondary metabolites: Structure, Types, Sources, Biosynthesis and function of phenolics, tannins, lignins, terpenes and Alkaloids. Medicinal properties of secondary metabolites.	CO2	K1, K2, K3
UNIT-III	Plant hormones Structure and function of plant hormones such as ethylene, cytokinins, auxins, Absicicacid, Florigin and Gibberlins.	CO3	K1, K2, K3, K4
UNIT- IV	Free radicals, types, production, free radical induced damages, lipid peroxidation, reactive oxygen species, antioxidant defense system, enzymatic and non-enzymatic antioxidants, role of antioxidants in prevention of disease, Phytochemical as antioxidants.	CO4	K1,K3, K4, K5

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Plant therapeutics: Bioactive principles in herbs, plants with anti		
Diabetic, anticancer, antibacterial, antiviral, anti-malaria and anti-	CO5	K1,K3, K4,
inflammatory properties		K5

1. Singh M.Pand Panda. H.Medicinal Herbs with their formulations, Day a publishing house, Delhi, 2006

2. Plant Physiology-Devlin N.Robert and Francis H. Witham, CBS Publications, 2017.

3. Text Book of Plant Biochemistry and Molecular Biology Publisher: Kalyani, 2024.

Reference Books

Recommended Text Books

1. Khan, I.A and Khanum. A. Role of biotechnology in medicinal and aromatic plants,

Vol.1and Vol.10, Ukka2 publications, Hyderabad. 2004

2.Plant Biochemistry and Molecular Biology-Hans Walter Heldt, Oxford University, 4th Edition, 2010

3. Plant biochemistry Caroline bowsher, Martinsteer, Alyson Tobin, garland science. (2008),

4. Plant physiology and development (sixth edition) by Lincoln Taiz, Eduardo Zeiger, IanMax Moller and Angus Murphy publisher; Oxford university press, 2015.

Website and e-learning source

- 1. https://www.intechopen.com/books/secondarymetabolies-sources-and- applications/ an introductory-chapter-secondary-metabolites
- 2. https://www.toppr.com/guides/biology/plant-growth-and development/plant growth

Course Learning Outcomes (for Mapping with POs and PSOs)

On completion of the course the students should be able to

COs	CO Description	Cognitive Level		
CO1	Briefly on photosynthetic apparatus, pigments present, pathways, and significance of photosynthesis	K1, K2, K3, K4		
CO2	Discuss about the structure, types, sources, biosynthesis and functions secondary metabolites.	K1, K2, K3		
	Understand the structure and functions of plant hormones.	K1, K2, K3,K4		
CO3				
	Discuss about free radicals, types and its harmful effects. Role of	K1,K3,K4,K5		
CO4	Enzymatic and non-enzymatic antioxidant in defence mechanism, prevention in disease.			
	Identify the plants with anti diabetic, anticancer, antibacterial,	K1,K3,K4,K5		
CO5	anuvirai, anu-maiaria and anu-initammatory properties.			

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	2	3	1	2	1	3	2	1
CO2	3	3	2	3	3	1	-	1	-	2	2	1	2
CO3	3	3	2	3	2	-	2	-	2	-	3	2	-
CO4	3	3	3	2	3	3	-	2	-	-	-	3	2
CO5	3	3	3	2	3	1	1	-	2	-	2	3	2