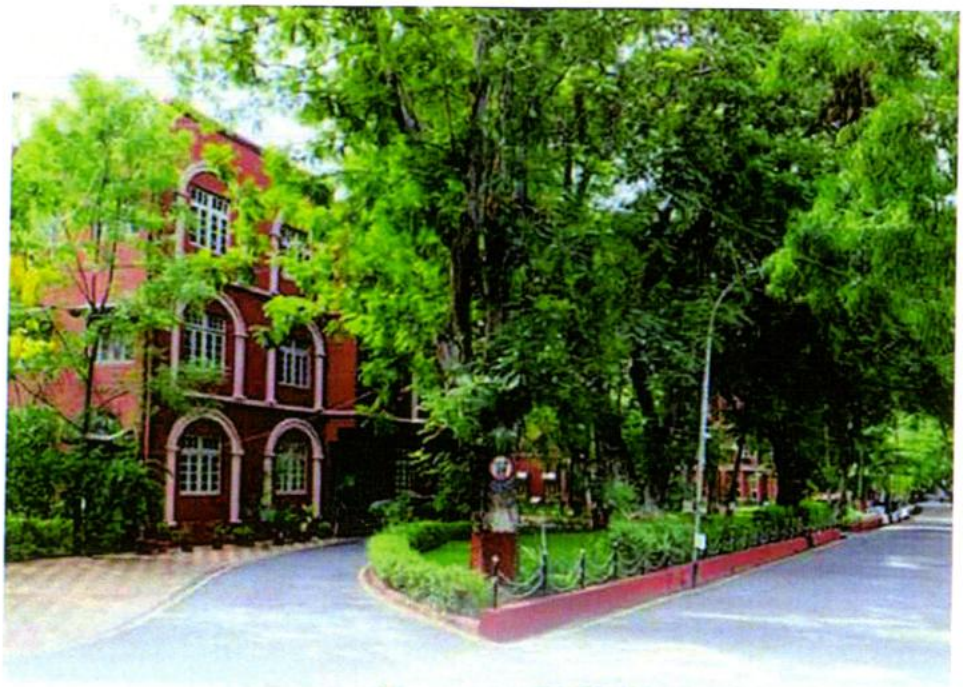

CURRICULUM FOR

"BACHELOR OF SCIENCE

ENVIRONMENTAL SCIENCE (B.Sc. ES)"

w.e.f. Academic Year 2021-'22

॥ तमसो मा ज्योतिर्गमय ॥

VISION

To provide equal opportunities for value based global education for creating an Enlightened Society

MISSION

To establish and facilitate educational institutions in the region for providing affordable value based global education to all who aspire to study and to create opportunities to educators, social workers and philanthropists to serve society

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creating an enlightened society...

UNIVERSITY OFFICE
Dr. R. K. Desai Marg, Athwalines,
Surat-395001, Gujarat, India.
Website: www.sarvajanikuniversity.ac.in
Email: admin@sarvajanikuniversity.ac.in
Email: info@sarvajanikuniversity.ac.in
Mo.:+919979102021 / +9197129 30321
Contact No .+912612660266

Constituent Institute:

SHREE RAMKRISHNA INSTITUTE OF COMPUTER EDUCATION AND APPLIED SCIENCES (SRKI)

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Dr. R.K. Desai Marg, Athwalines, Surat - 395001, Gujarat, India
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Course Curriculum
Bachelor of Science (Environmental Science)

The Course Curriculum of Bachelor of Science(Environmental Science) was proposed and drafted by **Academic and Curriculum Committee of Environmental Science**underthe Faculty of Science in the meeting held on 10-12-2021 and recommended to **'BOARD OF STUDIES'** for approval.

Prof. Ratna Trivedi
Chairman,Academic
& CurriculumCommitteePlace of the meeting
Science Sarvajanik University OfficeSign

The proposed Course Curriculum was approved by **Board of Studies, Science** under the Faculty of Science in the meeting held on 10-12-2021 and was recommended to the '**FACULTY**' for approval.

Prof. Chaulami Desai
Chairman,
Board of Studies-Place of the meeting
Science Sarvajanik University OfficeSign

The Course Curriculum approved by the **Faculty of Science** in the meeting held on 10-12-2021 and was recommended to '**ACADEMIC COUNCIL**' for approval.

Prof. Chaulami Desai
Chairman&
Dean, Faculty ofPlace of the meeting
Science Sarvajanik University OfficeSign

The Course Curriculum approved bythe '**Academic Council of Sarvajanik University**'in the meeting held on 10-12-2021.

Prof. Persi Engineer
Chairman, Academic Council
&Hon'ble Provost,Place of the meeting
Sarvajanik University Sarvajanik University OfficeSign

- *The approved curriculum of Bachelor of Science(Environmental Science)is with effect from the Academic year 2021 – '22 and to be reviewed before 2024 – '25*

[Estb. : 1999]
Accredited "B" Grade (2.67 CGPA) By NAAC
Accredited "B" Grade (2.92 CGPA) By AAA
GSIRF '4 STAR' (3.5 CGPA)

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Faculty of Science
Shree Ramkrishna Institute of Computer Education & Applied Sciences

M.T.B. College Campus, Athwalines, Surat-395 001. Phn. 7228018499, 722801500 E-mail : info@srki.ac.in

Ref :~~RK~~ES/01/2021-22 Date :- 27.09.2021

પ્રતિ,
ફેકલ્ટી ડીન,
SRKI
સાર્વજનિક યુનિવર્સિટી,
સુરત.

વિષય :- ACC ની મીટીગ તથા અભ્યાસક્રમો બાબતે

સુજ્ઞશ્રી,

ઉપરોકત વિષયના અનુસંધાનમાં સવિનય જણાવવાનું કે, Environment Science ના ACC ની મીટીગ ૨૫/૦૭/૨૦૨૧ ના રોજ મળેલ છે. તથા તેમાં B.Sc.,M.Sc. તેમજ Ph.D. entrance ના અભ્યાસક્રમોને ચર્ચા કરી, ફેરફાર બાદ, આગળના કાર્યવાહી માટે બહાલી આપેલ છે.

આપને નમ્ર અરજ છે કે, ઉપરોકત વિષયને ધ્યાનમાં રાખી આગળની કાર્યવાહી કરવા ઘટતું કરશોજી.

આભાર સહ,

લિ.
આપની વિશ્વાસુ,

R.A.Trivedi)
ડૉ.રત્ના એ ત્રિવેદી
ACC Chairman – Environmental Science

બિડાણ :-
૧) Minutes of Meeting - ACC
૨) B.Sc. અભ્યાસક્રમ
૩) M.Sc. અભ્યાસક્રમ
૪) Ph.D. Entrance test અભ્યાસક્રમ

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Sarvajanik University
Shree Ramkrishna Institute of Computer Education & Applied Sciences

M.T.B. College Campus, Athwalines, Surat-395 001. Ph : 2240172

Department of Environmental Science
Academic Year: 2020-2021

Academic and Curriculum Committee in Environmental Science

Minutes of Meeting

Date of Meeting: 25.09.2021 Time: 05.30 pm

Persons in meeting:

Sr.No.	Name and designation of member	Presence/Absent
1	Dr. Ratna Trivedi, Chairman	Present
2	Dr. Bhavin Bhatt, Member	Present
3	Dr. Pratik Patel, Member	Present
4	Mr. Manoj Kamliya, Vice President -GFL, Nominated Member from industry	Present
5	Mr. Krunal Suthar, CVM University, Nominated Member from other University	Present

Agenda: 1. Welcome and Introduction of Sarvajanik University.

Resolutions:

At the onset, Chairman, ACC thanked all members for giving their valuable time and suggestions for drafting syllabus. She explained genesis of Sarvajanik University and also gave an idea of admission process. She discussed about different faculties of Sarvajanik University along with inclusive, integrated and innovative approach by Sarvajanik University, Surat.

Agenda: 2. Introduction to Department of Environmental Science programs and faculty members.

Resolutions:

Dr. Ratna Trivedi, Chairman, ACC in subject of Environmental Science, gave formal introduction of all members of ACC. She gave short introduction of departments, its activities and milestones achieved so far. In her discussion, she also explained about the road-map and targets to achieve for the department.

Dr. Bhavin Bhatt, Assistant Professor, gave an introduction about IIRS- ISRO outreach program. Members appreciated this outreach activity.

Dr. Pratik Patel, Assistant Professor, gave an introduction about Rio+25 outreach program offered by UNEP. Current situation of pandemic had set up new dimension for education. Department of Environmental Science arranged various educational quizzes, expert lecture series, knowledge sharing, etc. to give broad spectrum of education to students. It was explained by him.

Mr. Manoj Kamaliya, Vice-president, GFL introduced himself and shown readiness for establishment of safety related courses and his unconditional support for centre of excellence project.

Mr. Krunal Suthar, CVM University, introduced himself and appraised efforts taken by department and suggest to expand outreach activities in multiple domains of society. Specially he is suggesting for Geo-spatial Applications of environment science in other different areas of subject.

Agenda: 3. Programme structure, regulation, syllabus, examination format and passing criteria for undergraduate program.

Resolutions:

Programme structure, regulation, syllabus, examination format and passing criteria for under-graduate program in Environmental Science was reviewed by members and discussed. Their suggestions were incorporated and programme was referred to Sarvajanik University, Surat for kind approval. (Enclosure 1)

Agenda: 4. Programme structure, regulation, syllabus, examination format and passing criteria for post-graduate programs.

Resolutions:

Programme structure, regulation, syllabus, examination format and passing criteria for postgraduate program in Environmental Science was reviewed by members and discussed. Their suggestion were incorporated and programme was referred to Sarvajanik University, Surat for kind approval. (Enclosure 2)

Agenda: 5. Syllabus for Ph. D. Entrance Test (PET) in Environmental Science program.

Syllabus for Ph.D. in Environmental Science was reviewed by members and discussed. Their suggestion were incorporated and syllabus was referred to Sarvajanik University, Surat for kind approval. (Enclosure 3)

The meeting of ACC in subject of Environmental Science, Faculty of Science, Sarvajanik University, Surat was concluded with vote of thanks by Dr. Bhavin Bhatt.

Signature of Members:

Sr.No.	Name and designation of member	Signature
1	Dr. Ratna Trivedi, Chairman	R.A.Trivedi
2	Dr. Bhavin Bhatt, Member	
3	Dr. Pratik Patel, Member	
4	Mr. Manoj Kamliya, Vice President -GFL, Nominated Member from industry	
5	Mr. Krunal Suthar, CVM University, Nominated Member from other University	

Enclosures:

1. B.Sc. Environmental Science Curriculum, Credit Structure and Evaluation Scheme

2. M.Sc. Environmental Science Curriculum, Credit Structure and Evaluation Scheme

3. Curriculum for Ph.D. Entrance Examination in Environmental Science

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Faculty of Science

B. Sc. Environment Science

SARVAJANIK UNIVERSITY

Faculty of Science

B. Sc. Environment Science

Introduction:

This program is an exploration into the science that directly affects us all on a daily basis, and that will likely increase in its significance to us in field of Environment. Student will be introduced to the scientific study of our environment, as well as the technological, social, political and economic challenges required for the understanding and critical examination of related issues.

Some important features of the program are as below:

1. B. Sc. Environmental Science Programme will run on Credit Base Choice System.
2. The programme run on semester system and each semester will be of fifteen (16) Weeks.
3. The whole programme will be of three years (Six Semesters).
4. Proposed Teaching and Examination Scheme will be as per Annexure-I.
5. Syllabus of B. Sc. Environmental Science course will be as per Annexure-II.
6. Examination system and passing standards will be as per Sarvajanik University and UGC-CBCS Norms.

Objectives of programme:

1. To aware the student about how science and the scientific method address environment systems and issues.
2. To acquire students about the Earth's major natural systems, how these systems function, and how they are affected by human activity.
3. To provide knowledge the sustainability, and unsustainability, of various interactions between human society and the Earth's natural systems (i.e. energy use and generation, resource consumption and economics, food production).

Eligibility Criteria:

The candidate must have passed 10+2 or equivalent examination having Biology as one of subject.

OR

➢ Candidate who has passed 2/3 years diploma (after S.S.C.) of Technical Education Board of various State Governments in subjects of Chemical, Environmental, Biomedical engineering and equivalent will also be eligible.

➢ The candidate who has passed equivalent exam from other subjects or boards need to avail eligibility certificate for this programme from the Board of Equivalence (BoE) of the Sarvajanik University.

Credit Structure: (Annexture-1)

Semester	Subject group	Group credits	Total credit/semester	Total credit/year
1 & 2	Life Skills/ NSS/ NCC	2	20	40
	DSC-1	12		
	DSC-2			
	DSE-1	2		
	PAECC-1	2		
	TDE-1	2		
3 to 6	Life Skills/ NSS/ NCC	2	24	96
	DSC-1	12		
	DSC-2			
	SEC-1	6		
	DSE-1	2		
	TDE-1	2		
Total				**136**

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Faculty of Science

B. Sc. Environment Science

Evaluation Scheme:

Semester	Subject group	Internal					External	Grand Total
		CCE	Assign.	Attend.	Int. Exam.	Total Int.		
1 & 2	Life Skills/ NSS/ NCC							
	DSC-1	50	10	10		70	30	100
	DSC-2	50	10	10		70	30	100
	Practical		10	10	50	70	30	100
	DSE-1	50	10	10		70	30	100
	PAECC-1	50	10	10		70	30	100
	TDE-1							
					Total	**350**	**150**	**500**
3 to 6	Life Skills/ NSS/ NCC							
	DSC-1	50	10	10		70	30	100
	DSC-2	50	10	10		70	30	100
	Practical		10	15	80	105	45	150
	SEC-1	50	10	10		70	30	100
	DSE-1	50	10	10		70	30	100
	TDE-1							
					Total	**385**	**165**	**550**

SARVAJANIK UNIVERSITY

Faculty of Science

B. Sc. Environment Science

B.Sc. Programme subject list:

Semester	Paper type	Paper No.	Env Sci. Paper Title
1	Core course	DSC-1	Ecology and Ecosystems
		DSC-2	Cell structure & Anatomy
		DSC-3	Natural resources
	AECC	AECC-1	Professional Communication
2	Core course	DSC-1	Geology & Earth Science
		DSC-2	Microbial Diversity
		DSC-3	Microbial Ecology
	AECC	AECC-1	Environmental Science (UGC)
3	Core course	DSC-1	Pollution & Control
		DSC-2	GIS & Remote Sensing
		DSC-3	Environmental Microbiology
	Skill Enhancement. Course	SEC-1	Agriculture and forestry
4	Core course	DSC-1	Nanosciences & Nano technology
		DSC-2	Environmental Biotechnology
		DSC-3	Atmosphere, climate and disaster risk assessment
	Skill Enhancement. Course	SEC-2	Biofertilizers, Biopesticides & Mushroom cultivation
5	Skill Enhancement. Course	SEC-3	QC & QA in Env. Lab
	Core course	DSE-1	Instrumentation & Techniques
		DSE-2	Waste analysis & management
		DSE-3	Eco tourism & Sustainable Development
6	Skill Enhancement. Course	SEC-4	Environmental Legislation & Policy
	DSE	DSE-1	Eco toxicology
		DSE-2	Health & Epidemiology
		DSE-3	Essential skills in computing

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Faculty of Science

B. Sc. Environment Science

Semester - 1

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Faculty of Science

B. Sc. Environment Science

Faculty: Science	**Department:** Environmental Science
Program: B. Sc. Environmental Science	**Type of Subject:** Theory + Practical
Subject: Ecology and Ecosystem Services	
Semester- 1	

Student Learning Outcomes (SLOs):

- The course is designed to provide the basic understanding of ecosystem and its structural and functional aspects.
- It will explore the interconnectedness among all the biotic and abiotic components of environment and the dynamic nature of the ecological processes in maintaining equilibrium in nature.

References and Textbooks: (With Author, Edition, Publishers, ISBN)

1. P. D. Sharma (Rastogi Publications, New Delhi), Ecology and Environment. ISBN: 8171338143.
2. Junaid Jazib, (Iqra Publications, New Delhi). Basics of Environmental Science. ISBN: 9788193046050.
3. R. Rajagopalan. (Oakbridge Publication). Environment and Ecology: A complete guide. ISBN: 9789350357583

UNIT-1: Basic Concepts in Ecology (7 hours)

1.1 Ecology - Introduction, Definition, History and Terminology

1.2 Major divisions of Ecology, Concept of holism

1.3 Effect of light on plants and animals, Photoperiodism

1.4 Effect of temperature on plants and animals

UNIT-2: Ecological Types and Adaptations (7 hours)

2.1 Concept of SPAC, Water balance problems, Types of water in soil

2.2 Ecological groups of plants: Hydrophytes, mesophytes and Xerophytes

2.3 Ecological adaptations in plants: morphological, physiological and anatomical features

2.4 Ecological adaptations in animals: Hydrocoles, Mesocoles and Xerocoles

2.5 Concept of mimicry and echolocation

UNIT-3: Biotic Interactions (7 hours)

3.1 Ecological pyramid, food web and importance of interactions in ecological system

3.2 Types of Interactions

3.3 Positive interactions: Mutualism, Commensalism, Symbiosis and Protocoperation

3.4 Negative interactions: Exploitation, Competition, Antibiosis, Parasitism, Interference competition

3.5 Gause's principle, Competitive Exclusion theory and concept of microclimate

UNIT-4: Autoecology of Species and Ecological Amplitude (7 hours)

4.1 Ecological clocks and circadian rhythms

4.2 Liebig's law of minimum, Shelford's law of tolerance

4.3 Genecology, Ecological amplitude, Ecads and Ecotypes

4.4 Ecological equivalents and Character displacement

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UNIT-5: Ecosystem Types, Structure and Functions (7 hours)

5.1 Habitat Ecology, Freshwater Ecology, Marine Ecology, Estuarine Ecology and Terrestrial Ecology

5.2 Types of Ecosystems: Natural and Man-made, Biotic and Abiotic components of ecosystem

5.3 Ecological Pyramids

5.4 Productivity of ecosytems

5.5 Structure of some Ecosystem: Pond, Marine, Grassland, Forest, Cropland and Desert

UNIT-6: Population Ecology (7 hours)

6.1 Population Ecology- Introduction, Definition and Importance, Characteristics of Population

6.2 Theories of population growth, plant growth dynamics, Yoda's self-thinning law

6.3 Concept of community and community characteristics

6.4 Analytical and Synthetic characters for community studies

6.5 Methods of community studies, Classification of communities, Concept of Ecotone

UNIT-7: Ecological Succession (7 hours)

7.1 Types, Causes and Trends of succession

7.2 Process of Ecological Succession

7.3 Hydrosere, Lithosere and Heterotrophic succession

7.4 Concept of climax in ecological succession

UNIT-8: Soil Types and Formation (7 hours)

8.1 Formation of soil

8.2 Soil profile development and soil classification

8.3 Soil complex

8.4 Soils of India

Practicals:

1. Study of effect of light and temperature on seedling growth.
2. Study of synthetic (Presence, Constance, Fidelity) and analytical (frequency, density and abundance) characters of vegetation.
3. Study of Raunkiaer;s normal frequency distribution of vegetation.
4. Study of anatomical adaptations of hyrophytes (Roots and petiole), Xerophytes (Stem and Root), Mesophytes (monocot and dicot leaf, stem and root).
5. Determination of porosity, bulk density, water holding capacity and field capacity of soil.
6. Determination of soil color by Munshell chart.

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Faculty of Science

B. Sc. Environment Science

Faculty: Science	**Department:** Environmental Science
Program: B. Sc. Environmental Science	**Type of Subject:** Theory + Practical
Subject: Ecology and Ecosystem Services	
Semester- 1	

Student Learning Outcomes (SLOs):

- This course will develop student's exploring capacity in natural resources including biomes, land, air, water, energy.
- The course integrate principles of biological, chemical, physical, and social sciences and apply them to resource and environmental issues using a systems approach.

References and Textbooks: (With Author, Edition, Publishers, ISBN)

1. Francois Ramade 1984. Ecology of Natural Resources. John Wiley & Sons Ltd, ISBN-13: 978-0471906254.
2. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA**(Library)**

Unit-1: Introduction to Natural resources (7 Lecture)

1.1 concept of natural resources & classification

1.2 Factors influencing natural resources

1.3 Interrelationship among different types of natural resources

1.4 Ecological and socioeconomic dimension of resource management.

UNIT-2: Land resources (7 Lecture)

2.1Classification and types of land resources

2.2 Land degradation, soil erosion and desertification

2.3 Landscape impact analysis

2.4 Principle and methods of soil conservation

UNIT-3 Water resources (7 Lecture)

3.1 Use of surface and ground water

3.2 Over utilization of water resources

3.3 Water storage and problems

3.4 Principle and methods of water conservation

UNIT-4 Energy resources (7 Lecture)

4.1 Types and need of energy resources

4.2 Use and exploitation of renewable energy resources

4.3 Use and exploitation of non-renewable energy resources

4 .4 Principle and methods of conservation energy resources

UNIT-5 Forest resources(7 Lecture)

5.1 Types and characteristics of forest resources

5.2 nutrient cycle and carbon storage in forest

5.3 Deforestation and afforestation

5.4 Principle and methods of conservation of forest resources

UNIT-6 Agricultural resources (7 Lecture)

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6.1 Sources of agriculture resources: animal and crops
6.2 overgrazing and effect of modern agriculture
6.3 effect of fertilizer and pesticides
6.4 Principle and methods of conservation of agricultural resources

Unit-7 Marine resources(7 Lecture)

7.1 Products from marine sources
7.2 dependence of fish and other resources.
7.3 unsustainable harvesting and resource supply
7.4 issues and challenges

Unit-8 Approaches in natural resource management (7 Lecture)

8.1 Ecological and economic approach
8.2 Ethanologicalapproach
8.3 implication of approach
8.4 Integrated resource management strategies

Practicals:

1. Study of vegetation by Chart Quadrant, Frequency and Relative Frequency methods.
2. Estimation of species diversity by Shannon - Weiner diversity index method.
3. Study of fauna of local area/college campus.
4. Preparation of field report based on the survey of local flora.

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Faculty of Science

B. Sc. Environment Science

Faculty: Science	**Department:** Environmental Science
Program: B. Sc. Environmental Science	**Type of Subject:** Theory + Practical
Subject: Cell Structure and Anatomy	
Semester- 1	

Student Learning Outcomes (SLOs):

On completion of course students will be able to:

- Explain structure of cells and cellular organelles
- Understand the importance of organization of components inside the cell
- Know the processes of cell division and regulation: their significance.

References and Textbooks: (With Author, Edition, Publishers, ISBN)

1. Karp, G. (2016). Cell and molecular biology: concepts and experiments. John Wiley & Sons, ISBN-978- 1- 118- 88614- 4
2. Cooper, G. M., & Hausman, R. E. (2004). The cell: a molecular approach .ISBN-0878932143
3. Verma, P. S., & Agarwal, V. K. (2004). Cell Biology, Genetics, Molecular Biology, Evolution and Ecology: Evoloution and Ecology. S. Chand Publishing. ISBN-978-8121924429

UNIT-1: Introduction to Cell Biology (8 hours)

1.1 Origin and Evolution of Cells (First Cell, Evolution of Metabolism, Origin of Eukaryotes-Endosymbiont Theory, Development of Multicellular Organisms)

1.2 Cell Diversity (Prokaryotic Cell v/s Eukaryotic Cells, Viruses)

1.3 Discovery of Cells (Cell Theory)

1.4 Basic Properties of Cells

UNIT-2: Structure and Function of Cell Components-I (8 hours)

2.1 Cell Wall: Bacterial and Eukaryotic Cell Wall

2.2 Plasma Membrane: Structure (Membrane Lipids: Membrane Fluidity, Membrane Carbohydrates, Membrane Proteins and Mobility of Proteins, Glycocalyx)

2.3 Nucleus (Nuclear Envelope, Nuclear Pore Complex, Sub-compartments within Nucleus)

2.4 Mitochondria (Mitochondrial Membranes, Mitochondrial Matrix)

UNIT-3: Structure and Function of Cell Components-II (8 hours)

3.1 Chloroplast and other Plastids (Chloroplast Structure and Function, Plant Cell Vacuoles)

3.2 Endoplasmic Reticulum (Smooth ER, Functions of Rough ER)

3.3 Golgi Complex/Apparatus (Organization of Golgi)

3.4 Lysosomes: (Lysosomal Enzymes, Endocytosis and Lysosome Formation)

3.5 Peroxisomes (Peroxisome Assembly, Functions of Peroxisomes)

UNIT-4: Structure and Function of Cell Components-III (10 hours)

4.1 Cytoskeleton : (Major Functions of Cytoskeleton, Bacterial Cytoskeleton)

4.2Microtubules-(Structure and Composition, Motor Proteins : Kinesin and Dynein, Dynamic Properties of Microtubule)

4.3Intermediate Filaments- (Types and Functions)

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4.4 Microfilaments (Actin and Myosin)- Structure of Actin Filaments, Myosin: Molecular Motor in Actin Filaments)
4.5 Structure of Cilia And Flagella
4.6 Centrosomes

UNIT-5: Extracellular Matrix and Cell Interactions (5 hours)

5.1 ECM: (Matrix Structural Proteins, Polysaccharides, Adhesion Proteins)
5.2 Cell-matrix Interactions
5.3 Cell-cell Interactions (Adhesion Junctions, Tight Junctions, GapJunctions, Plasmodesmata)

UNIT-6: Cellular Processes (10 hours)

6.1 Transport of Small Molecules (Passive Diffusion, Facilitated Diffusion and Carrier Proteins, Ion Channels, Active Transport- Driven by ATP Hydrolysis and Driven by Ion Gradients)
6.2 Vesicular Transport (Transport from ER to Golgi Apparatus, Movement of Materials through Golgi Complex)
6.3 Role Of Nuclear Pore Complex In Nucleocytoplasmic Trafficking

UNIT-7: Cell Cycle And Regulation (5 hours)

7.1 Cell Cycle and Phases of Cell Cycle
7.2 Regulation of Cell Cycle
7.3 Control of Cell Cycle

UNIT-8: Cell Division (6 hours)

8.1 Overview of Mitosis
8.2 Overview of Meiosis
8.3 Stages of Meiosis
8.4 Genetic Recombination During Meiosis

Practicals:

1. To perform Staining of DNA by Schiff's reagent.
2. To study Mitosis in onion root tip.
3. To study Lipid solubility of membranes using hypotonic solution and RBCs.

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