



# Syllabus

## First Semester Courses in MSc (MICROBIOLOGY)

2023-2024

### Contents:

- Syllabus for Elective Courses:
  - PSMIC6001EL1 Cell Biology: Structure, Transport and Junctions
  - PSMIC6002EL1 Building the Entrepreneurial Mindset: Opportunities and Challenges
- Evaluation and Assessment guidelines

**APPROVED SYLLABUS**



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**M.Sc. Part 1, Sem 1 MICROBIOLOGY**

**Course code: PSMIC6001EL1**

**TITLE: CELL BIOLOGY: STRUCTURE, TRANSPORT AND JUNCTIONS**

Credits 4 - Theory 3 (Total 45 hr) and Practical 1 (Total 30 hr)

**Course Objectives:**

- Review the origin of cellular life
- Relate the structure and function of the cell membrane
- Understand protein transport within cells
- Discuss the role of cellular structures involved in cytoskeleton and cell junctions

Number of lectures: 45

**Course Outcomes (COs):**

- Discuss fundamental theories and evaluate the experimental evidence for origin of cellular life
- Evaluate the significance of each membrane constituent and relate their structure to function
- Summarize the principles underlying transport across membranes and classify them in terms of energy and receptor usage
- Map the route that the proteins take from their site of production to the site of their function and predict the machinery required for each of these routes
- Differentiate between the structures and functions of various cytoskeletal elements
- Compare the different cell adhesion junctions in terms of their structures and biological roles in plants and animals

**Unit 1: Origin of cellular life, membrane structure and transport**

**(15 lectures)**

**1. Origin of cellular life**

**2L**

- Origin of basic biological molecules; abiotic synthesis of organic monomers and polymers
- The first cell; evolution of prokaryotes; origin of eukaryotic cells; evolution of unicellular eukaryotes.

**2. Cell membrane structure**

**5L**

- Lipid bilayer
- Membrane proteins
- RBC membrane as an example of membrane
- Multipass membrane proteins
- Bacteriorhodopsin



- 3. Membrane Transport** **8L**
- Principles of membrane transport
  - Transporters and Active Membrane Transport
  - Ion channels
  - Electrical properties of membranes with examples.

**Unit 2: Intracellular traffic** **(15 lectures)**

- 1. Intracellular compartments and protein sorting** **9L**
- Compartmentalization of cells
  - Transport of molecules between the nucleus and cytosol
  - Transport of proteins into mitochondria and chloroplasts
  - Peroxisomes
  - Endoplasmic reticulum
- 2. Intracellular vesicular traffic** **6L**
- Endocytosis
  - Exocytosis
  - Transport from the ER through the Golgi apparatus

**Unit 3: Cytoskeleton and cell junctions** **(15 lectures)**

- 1. Cytoskeleton** **8L**
- Cytoskeletal filaments
  - Microtubules
  - Microfilaments, Actin regulation
  - Intermediate filaments
  - Molecular motors
  - Cell behavior
- 2. Cell Junctions and Cell adhesion** **7L**
- Extracellular matrix (ECM): components and ECM examples- Basal lamina and connective tissue ECM
  - Types of cell-ECM junctions
    - i. Focal adhesions
    - ii. Hemidesmosomes
  - Types of cell-cell junction
    - i. Adherens junction
    - ii. Desmosomes
    - iii. Tight junction
    - iv. Gap junction
  - Cell-cell junctions in plants –plasmodesmata







List Of Recommended Reference Books

Unit 1 to 3

1. Karp's Cell biology, Gerald Karp, 8th ed., 2018, Wiley
  2. Molecular Biology of the Cell – Albert, B.; Johnson, A.; Lewis, J.; Raff, M.; Roberts K. and Walter P.; 6<sup>th</sup>ed, 2015, Garland Science, Taylor and Francis Group
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PRACTICAL

Details of practical sessions:

1. Mitosis in onion root tip
  2. Meiosis in *Tradescantia*
  3. Isolation of mitochondria
  4. Isolation of chloroplast
  5. Study of cell membrane integrity
  6. Study of cell cytology using Phase contrast Microscopy.
  7. Study of cell structure using Confocal Microscopy. Demonstration/visit
  8. Study of cell structure using Fluorescence Microscopy.
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**Evaluation (Theory): Total marks – 100**

- I. Formative Assessment 'for' Learning (continuous internal assessment - CIA to improve learning).  
CIA – 40 marks  
CIA 1: Test – 20 marks  
CIA 2: Written assignment – 20 marks
- II. Summative Assessment 'of' Learning (focus on outcomes, quantitative data for outcomes of instruction).  
End Semester Examination – 60 marks  
One question from each unit for 20 marks, with internal choice. Total marks per question with choice – 25-30 marks

**Evaluation (Practical): Total marks – 50**

CIA: 20 marks  
End Semester Practical Examination – 30 marks



Template for the End Semester examination

UNITS	KNOWLEDG E	UNDERSTANDIN G	APPLICATION and ANALYSES	TOTAL MARKS- Per unit
1	6	6	8	20
2	6	6	8	20
3	6	6	8	20
-TOTAL – Per objective	18	18	24	60
% WEIGHTAGE	30%	30%	40%	100%

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**M.Sc. Part 1, Sem 1 MICROBIOLOGY**

**Course code: PSMIC6002EL1**

**TITLE: BUILDING THE ENTREPRENEURIAL MINDSET: OPPORTUNITIES AND CHALLENGES**

Credits 4 – Theory 4 (Total 60 hr)

**Course Objectives:**

- Equip students with practical insights and hands-on experience, enabling them to apply their knowledge and skills to convert their ideas into successful ventures.

Number of lectures: 60

**Course Outcomes (Cos):**

- Achieve a comprehensive understanding of entrepreneurship and its fundamental aspects.
- Comprehend the various skill sets needed and activities undertaken by an entrepreneur.
- Master the skill to conduct a good techno-commercial analysis of an idea.
- Develop an understanding of various funding opportunities for creating/establishing a proof of concept or prototyping an idea.
- Acquire practical experience in entrepreneurship through various real-world activities.
- Create a professional business plan for an idea, make a good business pitch, and evaluate entrepreneurship as a career.

**Unit 1: Introduction to entrepreneurship**

**(15 lectures)**

1	Definition and essence of entrepreneurship	1L
2	Innovation and Invention in Indian knowledge systems, such as Ayurveda, Yoga, mathematics, astronomy, and metallurgy, to create practical solutions and products, traditional industries such as textiles, handicrafts, pottery, metalwork, and agriculture, applying “Dharma” – ethical conduct honesty, integrity, and social responsibility in their business ventures.	2L
3	Motivations driving individuals to become entrepreneurs.	1L
4	Key qualities and characteristics of successful entrepreneurs, such as vision, passion, focus, confidence, knowledge-seeking, creativity, resilience, leadership, and adaptability.	2L
5	Essential skill sets for entrepreneurs, including communication, networking, time management, and personnel management.	2L
6	Support systems required by entrepreneurs, such as emotional support from family and friends, institutional support from government and	2L

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incubators, financial backing from silent partners, banks, angel investors, and venture capitalists, as well as mentorship.

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|---|--|----|
| 7 | Different types of entrepreneurs, including innovative, market-making, imitating, social, cultural, and intra-generational entrepreneurs, with an understanding that some entrepreneurs may fall into multiple categories. | 2L |
| 8 | Understanding risk factors in entrepreneurship, including safety, health, environmental hazards, market competition, financial challenges, and other potential obstacles.  | 3L |

**Unit 2 : Setting up the business**

**(15 lectures)**

- |   |   |    |
|---|---|----|
| 1 | Select appropriate associates, partners, and directors based on their strengths and contributions to the business.  | 1L |
| 2 | Choosing the right product or service and assessing its potential market demand and receptiveness.  | 1L |
| 3 | Evaluating the ability to meet market needs, considering factors like product availability, technology, raw materials, trained manpower, business space, and regulatory requirements.   | 2L |
| 4 | Assessing economic viability by analyzing production costs, research expenses, labor requirements, regulatory compliance, risks, and fixed expenses, as compared to market prices.  | 2L |
| 5 | Creating a comprehensive business plan and engaging in various simulations to test its effectiveness.   | 3L |
| 6 | Securing financial resources and maintaining accurate bookkeeping for financial transactions and inventory management.  | 2L |
| 7 | Setting up the business entity, including business name, logo, website, email, premises lease, deed/ MOA & AOA, obtaining necessary permissions from local authorities, opening a bank account, obtaining utility connections, engaging with tax and legal experts, and obtaining relevant regulatory permissions | 4L |





**Unit 3: Running up the business** (15 lectures)

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|---|---|----|
| 1 | Devising and implementing a production plan, marketing strategy, and sales tactics.   | 1L |
| 2 | Managing the production process, including plant layout, equipment sourcing, installation, standard operating procedures (SOPs), quality control, waste disposal, and HR policies.                                    | 2L |
| 3 | Encouraging research and development activities to enhance product competitiveness and improve production processes and packaging.  | 2L |
| 4 | Crafting effective marketing campaigns through advertising, social media, workshops, conferences, and customer engagement.  | 3L |
| 5 | Implementing sales strategies, including online platforms, distributorship, logistics, and after-sales services.  | 3L |
| 6 | Understanding financial management, including business valuations, pitching to investors, tax planning, maintaining financial records, cash flow regulation, and efficient allocation of resources for profitability. | 2L |
| 7 | Acquiring technical knowledge in relevant areas such as manufacturing processes, financial management, chemistry, biology, safety protocols, pollution control, labor laws, and tax procedures.                       | 2L |

**Unit 4: Real-world analysis** (15 lectures)

- |   |   |    |
|---|---|----|
| 1 | Engaging with successful entrepreneurs from different categories to understand their experiences and challenges.                            | 5L |
| 2 | Participating in mock business pitch presentations to simulate real-world scenarios.  | 3L |
| 3 | Undertaking an independent group project involving business plan creation, product development, and marketing.                              | 5L |
| 4 | Continuous self-study to prepare a business pitch for a unique business idea, running in parallel with other modules throughout the course. | 2L |

List Of Recommended Reference Books

1. Academic Entrepreneurship- How to Bring Your Scientific Discovery to a Successful Commercial Product (2017) M. Marcolongo, Wiley



2. Bottled for Business- The less gassy guide to entrepreneurship (2007) K. Bilimoria, Capstone
3. Business Sutra- A Very Indian Approach to Management (2013) D. Pattanaik, Aleph Book Co.
4. Disciplined Entrepreneurship Workbook (2017) B. Aulet, Wiley
5. Entrepreneurship Is a Beautiful Thing- A Must Read for Aspiring and Seasoned Business Owners (2020) Y. Adeyeye, The Book Surgeons International
6. Entrepreneurship- The Practice and Mindset (2018) H. M. Neck, C. P. Neck, E. L. Murray, SAGE
7. Entrepreneurship- Theory, Process, and Practice, 4th ed (2016) D. F. Kuratko, H. Frederic, A. O'Connor, Cengage Learning Australia Pty Ltd
8. From Science to Startup- The Inside Track of Technology Entrepreneurship (2016) A. Sethi, Springer
9. Industry Immersion Learning- Real-Life Industry Case-Studies in Biotechnology and Business (2009) L. Borbye, et. al., Wiley

**Evaluation: Total marks – 100**

- I. Formative Assessment ‘for’ Learning (continuous internal assessment - CIA to improve learning).  
CIA- 40 marks  
CIA 1: Case Studies - 20 marks  
CIA 2: Assignment- 20 marks
- II. Summative Assessment ‘of’ Learning (focus on outcomes, quantitative data for outcomes of instruction).  
End Semester Examination - 60 marks  
One question from each unit for 15 marks, with internal choice. Total marks per question with choice -20 to 22.

Template for the End Semester examination

UNITS	KNOWLEDGE	UNDERSTANDING	APPLICATION and ANALYSES	TOTAL MARKS- Per unit
1	5	5	5	15
2	3	5	7	15
3	2	3	10	15
4	1	2	12	15
-TOTAL - Per objective	11	15	34	60
% WEIGHTAGE	18%	25%	57%	100%

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