## Course Syllabus

1. **Name of Curriculum** Bachelor of Science (Biological Science)
   **Faculty/Institute/ College** Mahidol University International College.

2. **Course Code** ICBI 464
   **Course Title** Cell Technology

3. **Number of Credits** 4 (4-0-8) (Lecture/Lab/Self-study)

4. **Prerequisites** ICBI 216

5. **Type of Course** Elective

6. **Trimester/ Academic Year**
   Third trimester/ every academic year

**7. Course Condition**
Number of students is 20-30.

**8. Course description**
To understand structure, growth and function of plant and animal cells. Technology involved in cell and tissue culture, cell preservation, protoplast culture and fusion, cell cloning and fusion, monoclonal antibody production, breeding and genetic engineering. Applications of stem cells for agriculture and therapeutic purposes.

**9. Course objectives**
By the end of the course, students should be able to
1. Understand plant forms and functions.
2. Be able to monitor plant growth and development.
3. Know techniques in plant cell and tissue culture, *in vitro* conservation, protoplast culture, micropropagation and genetic engineering.
4. Understand terminologies on animal cell cultivation.
5. Describe the differences between primary vs continuous culture, normal cells vs transformed cells, monolayer vs suspension culture.
6. Explain how to set up and maintain animal cells in *in vitro* culture.
7. Describe the use of cell cultures in the production of biologicals.
8. Explain certain technologies such as monoclonal antibody production, production of genetically-engineered cells and their applications.
9. Compare the differences between stem cells and differentiated cells.
10. Explain how stem cells develop.
11. Describe the characteristics of ES cells and adult stem cells.
12. Explain how stem cells differentiate *in vitro*.
13. Describe the possible applications of ES cells in agriculture.
14. Describe the using of ES cells and adult stem cells for therapy.

**10. Course Outline**

| week | Topics/Seminar | Hours | | | Instructor |
|---|---|---|---|---|---|
| | | Lecture | Lab | Self-study | |
| 1 | Introduction to Plant Sciences | 4 | 0 | 8 | Dr. Kunyarut Supaiboonwat |
| 2 | Plant forms and functions; Plant cell technology; Cell and tissue culture | 4 | 0 | 8 | Dr. Kunyarut Supaiboonwat |
| 3 | *In vitro* conservation | 4 | 0 | 8 | Dr. Kunyarut Supaiboonwat |
| 4 | Protoplast culture;<br>Micropropagation | 4 | 0 | 8 | Dr. Kunyarut Supaiboonwat |
| 5 | Genetic engineering in plant | 4 | 0 | 8 | Dr. Kunyarut Supaiboonwat |
| 6 | MIDTERM EXAM | 4 | 0 | 8 | Dr. Kunyarut Supaiboonwat |
| 7 | -Introduction to animal cell cultivation<br>-Preparation of medium and sterility test<br>-Basic requirement for growing animal cells<br>-Basic principles and techniques<br>-Monolayer and suspension culture<br>-Passage or subcultivation/ cell growth | 4 | 0 | 8 | Dr. Suparurk Bowornpinyo. |
| 8 | Cell preservation<br>Cell cloning and fusion<br>Hybridoma technology | 4 | 0 | 8 | Dr. Suparurk Bowornpinyo. |
| 9 | Genetically engineered cells<br>Mass cell cultivation<br>Application of cultured animal cells | 4 | 0 | 8 | Dr. Suparurk Bowornpinyo. |
| 10 | Stem cells and application I | 4 | 0 | 8 | Dr. Yindee Kitiyanant |
| 11 | Stemcells and application II | 4 | 0 | 8 | Dr. Yindee Kitiyanant |
| **FINAL EXAM** | | | | | |
| | Total | 44 | 0 | 88 | |

**11. Teaching Method *(s)***

1. Lecture
2. Suggested readings
3. Discussion in class

**12. Teaching Media**

1. Powerpoint Presentations

2. Texts and teaching materials

**13. Measurement and Evaluation of Student Achievement**

Student achievement is measured and evaluated by

13.1 The ability to describe the plant forms and functions.

13.2 The ability to monitor plant growth and development.

13.3 The ability to describe the techniques in plant cell and tissue culture, *in vitro* conservation, protoplast culture, micropropagation and genetic engineering.

13.4 The ability to explain the terminologies on animal cell cultivation.

13.5 The ability to describe the differences between primary vs continuous culture, normal cells vs transformed cells, monolayer vs suspension culture.

13.6 The ability to explain how to set up and maintain animal cells in *in vitro* culture.

13.7 The ability to describe the use of cell cultures in the production of biologicals.

13.8 The ability to explain certain technologies such as monoclonal antibody production, production of genetically-engineered cells and their applications.

13.9 The ability to compare the differences between stem cells and differentiated cells.

13.10 The ability to explain how stem cells develop and describe the characteristics of ES cells and adult stem cells.

13.11 The ability to explain how stem cells differentiate *in vitro*.

13.12 The ability to describe the possible applications of ES cells in agriculture.

13.13 The ability to describe the using of ES cells and adult stem cells for therapy.

Student's achievement will be graded according to the college and university standard using the symbols: A, B+, B, C+, C, D+, D and F. Minimal passing level is 60%. Student who earns 85% up will have Grade A, 80-84% Grade B+ , 75-79% Grade B, 70-74% Grade C+, 65-69% Grade C, 60-64% Grade D+, 55-59% D, less than 55 Grade F. Students must attend at least 80% of the total class hours of this course.

Ratio of mark

| | |
|---|---|
| Midterm examination | 40 % |
| Final examination | 50 % |
| Assignments and attendance | 10 % |
| Total | 100% |

**14. Course evaluation**

14.1 Students' achievement as indicated in number 13 above.

14.2 Students' satisfaction towards teaching and learning of the course using questionnaires

**15. References:**

Campbell, N. A. and Jane B. Reece. Biology. 6th Edition. USA. Pearson Education, Inc. 2002.

Freshney, R.I. Culture of Animal Cells: A Manual of basic techniques. 5th Edition. USA. Wiley-Liss Inc. 2005.

Gamborg, O. L. and G. C. Phillips. Plant cell, tissue, and organ culture: fundamental methods. Germany. Springer-Verlag. 1995.

**16. Instructors**

Assist. Prof. Kunyarut Supaiboonwat
Dr. Suparurk Bowornpinyo.
Assoc. Prof. Yindee Kitiyanant

**17.Course Coordinator**

Assoc. Prof. Dr. Saovanee Dharmsthiti