



CENTRAL UNIVERSITY OF HIMACHAL PRADESH

[Established under the Central Universities Act 2009]

PO Box: 21, Dharamshala, District Kangra - 176215 (HP)

www.cuhimachal.ac.in

SEMESTER- IV

COURSE CODE: BOT552

COURSE NAME: Plant Genetic Engineering

TEACHER: Dr. SHALINI CHANDEL

Credit: 4

Course Objectives: The course is designed to provide a comprehensive coverage of the plant structure and also introduces, aspects of the mechanism of development of vegetative and reproductive organs.

Attendance Requirement:

Students are expected to attend all the lectures pertaining to the Course. To appear in the examination, a minimum of 75% attendance is compulsory.

Evaluation Criteria:

1. Mid Term Examination: 25%
2. End Term Examination: 50%
3. Continuous Internal Assessment : 25% (Breakup is following)
 - a. Assignment/Quiz/: 40%
 - b. Presentation/Seminar/: 40%
 - c. Class participation: 20%

Course Contents:

UNIT I- Recombinant DNA technology: cloning vehicles; Plasmids, bacteriophages, cosmids, artificial chromosomes. BAC, YAC, gene engineering through cutting and joining DNA molecules, restriction endonucleases, ligases, applications of genetic engineering

UNIT II- Modes of gene delivery in plants: Particle bombardment, electroporation, microinjection; *Agrobacterium* mediated gene transfer, Ti and Ri plasmids;

UNIT III- Screening and selection of transformants, PCR and hybridization methods; Transgene selection and silencing; Generation and maintenance of transgenic plants, Bt cotton, golden rice and some others as examples.

UNIT-IV - How to study gene regulation: Northern blot, primer extension, SI mapping, RNase protection assay, reporter assays.

UNIT-V- Recent developments in plant transformation strategies; Role of antisense and RNAi-based gene silencing in crop improvement; CRISPER-Cas9; GENOME editing tool

Suggested Readings:

1. Principles of gene manipulation (2006) by Sandy Primrose, Richard Twyman, Bob Old, Giuseppe Bertola (Black Well Publication).

2. Molecular cloning: A laboratory manual (2000) by J. Sambrook, E.F. Fritsch and T. Maniatis (Cold Spring Harbor).

DNA cCloning: A practical approach (1995) by D.M. Glover and B.D. Hames (IRL Press, Oxford).

Gene cloning and DNA analysis: An introduction (2006) by TA Brown (Blackwell Sci. Ltd).

Principles of gene manipulations and genomics (2006) by Primrose & Twyman (Blackwell Sci. Ltd).

Molecular biotechnology (1994) by S.B. Primrose (Blackwell, Scientific Publishers. Oxford).



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SEMESTER- IV

COURSE CODE: (BOT-580)

COURSE NAME: Environmental Biotechnology

TEACHER: Dr. SHALINI CHANDEL

Credit: 2

Course Objectives: The course is designed to develop skills associated with screening of industrially important strains and to understand the basics skills applied in fermentation technology.

Attendance Requirement:

Students are expected to attend all the lectures pertaining to the Course. To appear in the examination, a minimum of 75% attendance is compulsory.

Evaluation Criteria:

4. Mid Term Examination: 25%
5. End Term Examination: 50%
6. Continuous Internal Assessment : 25% (Breakup is following)
 - d. Assignment/Quiz/: 40%
 - e. Presentation/Seminar/: 40%
 - f. Class participation: 20%

Course Contents:

Unit -I Environmental pollution monitoring and control. Microbiology of waste water treatment, aerobic processes, activated sludge, oxidation ponds, trickling filters, and rotating biological contactors; Anaerobic processes: Anaerobic digesters, upward flow anaerobic sludge blanket reactors.

Unit -II Bioremediation: Biotechnology for clean environment, Wastewater treatment- Physical, chemical and biological treatment strategies.

Unit -III Biodegradation of xenobiotics in the environment-Ecological considerations, Degradation of hydrocarbons, substituted hydrocarbons, surfactants and pesticides.

UNITIV Biopolymers and Bioplastics: Types, Properties and Practical Applications, Dark side of

Bioplastics, Biopesticides.

Unit -V Bioindicators and biosensors for detection of pollution.

Reference Books:

Hurst, C.J., Crawford, R.L., Knudsen, G.R., MacInerney, M.J., Stetzenbach, L.D., "Manual of Environmental Microbiology", ASM press, Washington, DC, Second edition. 2002.

Metcalf & Eddy, INC, "Wastewater Engineering- Treatment, Disposal and Reuse, 3rd Edition, Tata MacGraw-Hill publishing company Limited, New Delhi. 1995.

Pickup R.W and Saunders J.R., "Molecular approaches to environmental microbiology", Ellis Horwood Limited, First Edition, UK. 1996.

Scragg, A," Environmental Biotechnology", First Edition, Pearson Education Limited, UK. 1999 Evans, G.M., Furlong, J C.," Environmental Biotechnology- Theory and application", John Wiley & Sons, Ltd, USA. 2003.

Wastewater engineering–Treatment, disposal and reuse (2009) by Metcalf and Eddy, Inc. (Tata Mc Graw Hill, New Delhi).

Comprehensive biotechnology (2004) by Murray Moo Young, Alan T Bull, Howard Dalton, Set 4 Vol (Elsevier India P Ltd).

Comprehensive biotechnology: The principles and regulation of biotechnology in industry, agriculture and medicine (1985) by Charles L Cooney, Arthur E Humphrey, Vol.2 (Pergamon Press).

Environmental chemistry (2006) by Aniol Kumar De (New Age International (P) Ltd). 5. Introduction to biodeterioration (2004) by D. Allsopp, Kenneth J. Seal, Christine C. Gaylarde (Cambridge University Press).



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SEMESTER- IV

COURSE CODE: (BOT-581)

COURSE NAME: Fundamentals of Biochemistry

TEACHER: Dr. Kanika

Credit: 2

UNIT-1 (4 Lectures)

Carbohydrate- classification, occurrence, structure and function of monosaccharides and oligosaccharides.

Biosignaling: G-protein coupled receptors, secondary messengers, receptor tyrosine kinases, gated ion channels, regulation of cell cycle by protein kinases.

UNIT-2 (4 Lectures)

Lipids- classification, occurrence, structure and importance of acyl lipids and phosphates, biosynthesis of fatty acids, β - oxidation and role of polyunsaturated fatty acids.

Genes and Chromosomes: Chromosomal elements, DNA supercoiling, Structure of chromosome.

UNIT-3 (4 Lectures)

Proteins: amino acids, peptides, structure of proteins-primary, secondary and tertiary, protein denaturation and folding.

Regulation of Gene Expression: Principles of gene regulations, regulation of gene expression in prokaryotes and eukaryotes.

UNIT-4 (4 Lectures)

Nucleotides and Nucleic acid: Structure and function of nucleic acids and different kinds of RNA.

Biological Membranes and Transport: Composition and architecture of membrane, membrane dynamics and solute transport across membrane.

UNIT-5 (4 Lectures)

Enzymes- classification, mode of action, enzyme kinetics (Michaelis- Menten Constant), enzyme inhibition, coenzymes, cofactors, ribozymes.

Biosynthesis and function of secondary metabolites: phenolics, flavonoids, terpenoids, alkaloids, steroids and suberins.

Suggested Readings:

- Zubay, G. 1988, Biochemistry (2nd ed.) Macmillan Publ. House N. Y.
- Mahler, H. R. and codes E. H. 1971. Biologist chemistry, Harper International
- Lehinger A. 1. 1978. Biochemistry Kalyani Publishers, Ludhiana
- Goodwin T.W. and Meriar L. e. I. 1989 Introductory plant Biochemistry pergamon press VY.
- Moore, T. C. 1989 Biochemistry and Physiology of plants hormones (2nd edition) Springer Verlag, New York, USA.



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SEMESTER-IV

Course code: BOT-577

Course Name: Economic Botany and Medicinal Plants

Name of Teacher: Dr.REENA SHARMA

CREDIT-02

Objectives

To understand and know the features related to origin, botanical description and uses of various economically and medicinally important plants.

Attendance Requirement:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75 percent attendance is a must, failing which a student may not be permitted to appear in examination.

Evaluation Criteria:

Mid-term Examination: 25%

End-term Examination: 50%

Continuous Internal Assessment: 25%

Course contents

Economic Botany and medicinal plants

Unit-1: Importance and History of plants:(4 Lectures)

Economic importance of plants and their products; History of food plants; New world : Centers of origin; Old world: Centers of origin; History of plants use as a source of medicine.

Unit-II: Food Plants: Cereals and Legumes: (4 Lectures)

Cereals; origin, history, distribution, cultivation, botanical description, breeding, high yield varieties, uses and diseases of wheat, Rice, Barley, Oats, Bajra and Maize, Legumes; Origin, cultivation, botanical description, uses and diseases of Gram, Peas, Pigeon Pea, Soyabean, and Groundnut.

Unit-III: Food Plants: vegetables, nuts and spices:(4 Lectures)

Botanical description, cultivation and uses of vegetables; Carrot, Beets, Potato, onion and eggplant, Nuts; Cashewnut, Spices; ginger, turmeric, cinnamon, cloves, saffron and cardamom.

Unit-IV: Sources of beverages and wood:(4 Lectures)

Origin, cultivation, botanical description and uses of coffee, tea, coca and chocolate, Uses of wood and wood product; from Deodar, Shisham, Semal and Pine.

Unit-V: Plants of medicinal value: (4 Lectures)

Origin, distribution, botanical description, active constituents, parts used and uses of Neem, Ashoka, Ashwagandha, Babool, Garlic, Aleo, Calotropis, Guggul, Kher, Palas, Chamomile, Tulsi, Amala.

Suggested Readings

1. Bawa, R and Khosla, P. K. 1998. Biodiversity of Forest Species (A Community Forestry Approach) Bishen Singh Mahendra Pal, Dehradun, 218pp.
2. Cotton, C. M. 1996. Ethnobotany- Principles and applications John Heywood, Wiley, V.(ed.) 1995. Global Biodiversity Assessment . Cambridge Univ. ,Camb.
3. Pub, Dehradun Swaminathan, M. S &Kocchar, S. L.(eds.) 1989. Plants and Society
4. Macmillan, Wagner, H., Hikino, H &Farnswarth, N. 1989. Economic and Medicinal Plant Research. Vils.1-3. Academic Press, London.
5. Bedi, Y.S., Dutt, H.C. and Kaur, H. (2011). Plants of Indian System of Medicine (Vol. I &II). Lambert Academic Publishing, Germany.
6. Bose, T.K. and Som, M.G.V. (1986). Vegetable crops in India. NayaProkash, Calcutta
7. Bose, T.K. (1985). Fruits of India tropical and subtropical. NayaProkash, Calcutta.
8. Chrispeels, M.J. and Sadava, D.E. (1994). Plants, Genes and Agriculture. Jones and Bartlett Publishers, London
9. Furry S.M. and Viemont V.M. (1935). Home Dyeing with Natural Dyes. Thresh Publications. California
10. Hanson, H. Borlaug N.E. and Anderson, R.G. (1982). Wheat in the Third World. Westbiew Press, Colorado.
11. Maiti, R.K. and Singh R.K. (2006). An Introduction to Modern Economic Botany. Agrobios (India).
12. Metcalfse, D.S. and Elkins, D.M. (1980). Crop Production: Principles and Practices (IV ed.). Macmillan Publishing Co. Inc. New York.
13. Pradhan S. (1995). Economic Botany. Har Anand Publication, New Delhi



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SEMESTER-IV

Course code: BOT-576

Course Name: Biosafety, IPR and Patenting

Name of Teacher: Dr. REENA SHARMA

Credit: 02

Objectives:

To be familiar with the Biosafety rules, IPR system and Patenting techniques.

Attendance Requirement:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75 percent attendance is a must, failing which a student may not be permitted to appear in examination.

Evaluation Criteria:

Mid-term Examination: 25%

End-term Examination: 50%

Continuous Internal Assessment: 25%

COURSE CONTENTS

Unit-I: Introduction to Biosafety and IPR: (4 Lectures)

Overview of Biosafety, Risk Assessment, Protocol on Biosafety, Regulatory Measures, Biosafety Guidelines in India Evolved by DBT. Concept of IPR, Designs, Trademarks™, Trade Secret (TS), Domain Names, Geographical Indications, Copyright©,

Unit-II : Patent Law: (4 Lectures)

Evolution of Patent Laws, History of Indian Patent System, International Conventions and Treaties, Eligibility Criteria, Ownership of Patent, Rights of Patent Holder and Co-owners, Duties of Patent Holder and Co-owners

Unit-III: Patents in India: (4 Lectures)

Classification of Patents in India, Classification of Patents by WIPO, Categories of Patent, Special Patents, Patenting Biological Products, Transfer of Patent Rights, Limitations of Patent Rights

Unit-IV:Protection of Plant Varieties and Farmers' Rights Act, 2001:(4 Lectures)

Methods of Protection of Plant and Plant Products, Essentialities of Plant Protection, Plant Variety Protection and Farmer's Right Act, UPOV Convention (Plant Varieties) 1961

Unit-V:Case Studies in IPR and Biosafety:(4 Lectures)

Neem Patent Case, Turmeric Patent Case, BtBrinjal, Bt Cotton and Golden Rice.

Suggested Readings

1. Singh R. Law relating to intellectual property (A complete comprehensive material on intellectual property covering acts, rules, conventions, treaties, agreements, case-Law and much more). Vol. 1. New Delhi: Universal Law Publishing Co. Pvt. Ltd.; 2004.
 2. Anonymous. Research and development statistics. New Delhi: Department of Science and Technology (DST), Government of India; 2002.
 3. Bainbridge DI. Intellectual property. New York: Longman; 2002.
 4. Anonymous. WIPO intellectual property handbook. policy, law and use. New York: WIPO Publication; 2001.
 5. Gutterman AS, Anderson BJ. Intellectual property in global markets: A guide for foreign lawyers and managers. London: Kluwer Law International; 1997.
 6. Bently L, Sherman B. Intellectual property law. Oxford: Oxford University Press; 2001.
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