Jaypee Institute of Information Technology

M.Tech Biotechnology

Semester II

Course Descriptions

Detailed Syllabus
Lecture-wise Breakup

Course Code	**17M11BT114**	**Semester** Even	**Semester** VIII (Integrated) / II Sem (M.Tech) **Session** 2020 -2021 **Month from** January to June
Course Name	**Diseases and Healthcare**		
Credits	3	**Contact Hours**	3

Faculty (Names)	**Coordinator(s)**	Dr. Reema Gabrani
	Teacher(s) (Alphabetically)	Dr. Reema Gabrani

COURSE OUTCOMES	
CO1	Explain the etiology, pathogenesis of infectious diseases and genetic disorders.
CO2	Choose and apply the strategies of different diagnostic tests.
CO3	Utilise expression systems and mutagenesis techniques for biopharmaceuticals production
CO4	Appraise biotechnology principles for production of recombinant proteins and nucleic acids as therapeutic agents

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction to diseases	Infectious diseases caused by bacteria, viruses, opportunistic fungi and parasites; pathology	3
2.	Genetic diseases	Medical genetics; Genetic mechanisms leading to diseases such as thalassemia, cancer	3
3.	Diagnosis of bacteria and virus	Challenges of pathogen detection; Pathogen Detection using Cytological, biochemical and molecular methods; Molecular cytogenetics, PCR variants	8
4.	Immunodiagnostics	Immuno-diagnostics: immunofluorescence, Chemiluminescence, Microparticle Enzyme immunoassay, Fluorescence polarization immunoassay Applications in bacteriology, medicine, forensic sciences	4
5.	Cancer diagnostics	Cancer cytology analysis, genetic and epigenetic biomarkers	3
6.	Diagnosis in Forensic science	Forensic DNA typing and data analysis, Next generation sequencing technology and applications	3
7.	Engineering of Therapeuticals	Scientific and technological innovations in biopharmaceuticals production, Mutagenesis techniques	3
8.	Manipulating Host systems	Prokaryotes, yeast, baculo-virus and mammalian cells for production of recombinant proteins	5
9.	Therapeutic applications	Recombinant blood related products, hormones, interleukins, Vaccines, Monoclonal antibodies and Therapeutic enzymes	8
10.	Nucleic acid therapeutics	Antisense oligodeoxynucleotides, ribozyme, small interfering RNAs, aptamers as therapeuticals	2
		Total number of Lectures	**42**
Evaluation Criteria			

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignments, Case Study)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Yi-Wei Tang & Charles W Stratton, "Advanced techniques in Diagnostic microbiology", 2nd Ed. Springer 2013
2.	G. Walsh, "Biopharmaceuticals: Biochemistry and Biotechnology", 2nd Ed. John Wiley & Sons publication 2013
3.	Rodney J. Y. Ho Ph.D., FAAAS, FAAPS, Milo Gibaldi Ph.D. "Biotechnology and Biopharmaceuti Transforming Proteins and Genes into Drugs" John Wiley & Sons Inc. 2013
4.	Refereed papers from scientific journals for case studies

Detailed Syllabus
Lecture-wise Breakup

Course Code	17M12BT113	**Semester** Even **(specify Odd/Even)**	**Semester** II **Session** 2020-21 **Month from** January to June
Course Name	BIOPROCESS & INDUSTRIAL BIOTECHNOLOGY		
Credits	3	**Contact Hours**	3

Faculty (Names)	**Coordinator(s)**	DR. ASHWANI MATHUR
	Teacher(s) (Alphabetically)	DR. ASHWANI MATHUR DR INDIRA P SARETHY

COURSE OUTCOMES		**COGNITIVE LEVELS**
CO1	Relate role of economic principles in biomanufacturing processes	Understanding (C2)
CO2	Apply knowledge of engineering principles in designing of bioreactors for prokaryotic and eukaryotic systems	Applying (C3)
CO3	Analyze the role of bioprocess conditions in eukaryote cell culture	Analyzing (C4)
CO4	Evaluate various strategies used for production of primary and secondary metabolites	Evaluating (C5)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction to Industrial Bioprocesses	Concept of sustainability and sustainable manufacturing, Economic assessment and concept of cost and Lang factor; Non-ideal systems of cultivating microorganism and economic process scale-up	3
2.	Microbial Process Development: Solid state fermentation	Cell growth kinetics of bacteria and fungi in non-ideal reactors; Concepts of solid state fermentation; mechanism of cell growth and indirect methods of estimating cell growth kinetics, Comparison of solid *versus* submerged fermentation; water activity; bioprocess parameters regulating solid stste fermentation	8
3.	Animal cell fermentation	Animal cell metabolism: Basic understanding of substrate and by-poduct stoichiometry, Concept of primary cells, cell lines and cancerous cells; growth characteristics and kinetics, methods and reactors for scalable production of animal cells and derived products; Biomaterial properties for anchorage dependent cell lines; Graf reactor; Concept of 2D and 3D culture, Bioreactors in Tissue Engineering, reactor design consideration	7
4.	Plant Cell Fermentation	Importance of plant cell cultivation, Plant cell / hairy root culture, callus and shoot propagation, kinetics of cell growth and product formation, Reactors for plant	8

		cell culture- type of reactors, comparison of reactor performance, immobilized plant cell reactor.	
5.	Algal Fermentation	Basic classification of algae, Morphology and physiology; Algal derived metabolites, methods of studying growth kinetics of chemotropic and phototropic algae, type of reactors; Lab scale photo-bioreactors- Design and engineering principles, Large scale pond reactors	6
6.	Production of Primary & Secondary Metabolites	Isolation, preservation and propagation of microbial culture- An industrial perspective, Process technology for production of organisc acids, amino acids, alcohols, antibiotics, vitamins, nucleotide and steroids, flavours; production of industrial enzymes: protease, cellulose, amylase, lipase; Enzyme inhibitors: inhibitors of cholesterol synthesis; biopesticides, biofertilizers, biopreservatives; biopolymers; plant derived therapeutically important metabolites	10
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Class Test-1, Presentation / Report)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	P. M. Doran. *Bioprocess Engineering Principles*. Academic Press, USA, 2002
2.	S. J. Pirt. Principles of Microbe and Cell Cultivation. Blackwell Scientific Publications, Oxford Press, London, 1975
3.	P.F. Stanbury, A. Whittakar and S. J. Hall. *Principles of Fermentation Technology.* Butterworth-Heinemann, Oxford Press, London, 1994
4.	S. Aiba, A.E. Humphrey and N. F. Millis. *Biochemical Engineering.* University of Tokyo Press, Toyko, Japan, 1973
5.	A. H. Scragg. *Bioreactors in Biotechnology: A practical approach.* Ellis Horwood Publications, New York, USA, 1991
6.	Wulf Cruger and Anneliese Crueger. *Biotechnology: A Textbook of Industrial Microbiology.* Panima Publishing Corporation, New Delhi, India, 2003

Detailed Syllabus
Lab-wise Breakup

Course Code	**17M15BT112**	**Semester** Even **(specify Odd/Even)**	**Semester** II **Session** 2020-21 **Month from** January to June
Course Name	**Biotechniques Lab-II**		
Credits	3	**Contact Hours**	6

Faculty (Names)	**Coordinator(s)**	Prof. Pammi Gauba
	Teacher(s) (Alphabetically)	Dr. Chakresh K. Jain, Prof. Indira P. Sarethy, Prof. Pammi Gauba, Prof. Reema Gabrani, Dr. Shweta Dang

COURSE OUTCOMES	
C170.1	Experiment with high end analytical techniques in biotechnology
C170.2	Develop basic and applied skills in cell culture
C170.3	Examine and analyse disease-specific drug targets
C170.4	Analyse bioactive compounds from plant and microbial systems

Module No.	**Title of the Module**	**List of Experiments**	**CO**
1.	Analytical techniques	To run High-performance liquid chromatography (HPLC); prepare and analyse curcumin extract by HPLC; purification of plant extract	3
2.	Cell culture techniques	Preparation and sterilization of media for cell culture; subculture of animal cell lines; analysis and counting of adherent cells; cell cytotoxicity determination	3
3.	Drug target analyses	SDS-PAGE analysis and fluorescent staining	3
4.	Natural product analyses	Extraction of antioxidant compound from *in vitro* grown plant and bacteria; purification of compound; antioxidant capacity analyses of extracts	3

Evaluation Criteria

Components	**Maximum Marks**
Mid-Term Viva	20
Day-to-Day (Lab record, attendance, performance)	60
Final Viva	20
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Biotechnology Procedures and Experiments Handbook http://site.iugaza.edu.ps/mwhindi/files/BIOTECHNOLOGY-PROCEDURES-AND-EXPERIMENTS-HANDBOOK.pdf
2.	Cornelia Kasper, Verena Charwat, Antonina Lavrentieva, "Cell Culture Technology" Springer, 2018
3.	ChukwuebukaEgbuna, Jonathan ChinenyeIfemeje, Jaya VikasKurhekar, Stanley ChidiUdedi,

	Shashank Kumar, “Phytochemistry Volume 2” Apple Academic Press, 2019
4.	Methods standardized in lab
5.	Lab manual on Biotechniques http://inpressco.com/lab-manual-on-biotechniques/

Detailed Syllabus
Lecture-wise Breakup

Course Code	**17M17BT112**	**Semester** EVEN	**Semester** II sem **,** XI (Dual) **Session** 2020-21 **Month from** January to June
Course Name	**Project Based Learning-I**		
Credits	2	**Contact Hours**	2

Faculty (Names)	**Coordinator(s)**	Dr Ashwani Mathur
	Teacher(s) (Alphabetically)	Dr Ashwani Mathur

COURSE OUTCOMES		**COGNITIVE LEVELS**
CO1	Select biotechnological problems based on literature	Applying Level Level III
CO2	Interpret scientific data to address the biotechnological problem	Evaluate level Level V
CO3	Demonstrate an ability to function in a task oriented team with distribution of roles	Understanding Level 2
CO4	Analyze the research finding and conclude through presentation and project report	Analyzing Level 4

Detailed Syllabus

Course Code	14M1NBT235/18 M12BT113	**Semester :** Even	**Semester** II **Session** 2020-21 **Month from** January to June
Course Name	Nutraceuticals		
Credits	3-0-0	**Contact Hours**	3

Faculty (Names)	**Coordinator(s)**	Dr. Smriti Gaur
	Teacher(s) (Alphabetically)	Dr. Smriti Gaur

COURSE OUTCOMES	
CO1	Compare the traditional and modern trends in the nutraceutical Industry.
CO2	Evaluate the mechanism of action of micronutrients and phytochemicals in prevention of chronic diseases.
CO3	Explain the health benefits of microbial and algal nutraceuticals.
CO4	Compare nutraceuticals and health food products in Indian and international market.

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	**Nutraceuticals and Functional Food: An Introduction**	Historical perspective, classification, scope & future prospects. Applied aspects of the Nutraceutical Science. Sources of Nutraceuticals, The link between nutrition and medicine.	**4**
2.	**Nutrient Components of Food**	Bioactive Carbohydrates: Polysaccharides, Soluble Fibers, Insoluble Fiber, Resistant Starch, Prebiotics, Slowly Digestible Starch. Bioactive Lipids: MUFA, PUFA, Omega 3 and 6 Fatty Acid, Conjugated Linoleic Acid(CLA). Bioactive Peptides: Sources, Isolation and Purification methods. Antihypertensive, Antioxidant, Antimicrobial, Anticancer and immunomodulating Peptides.	**10**
3.	**Nutraceuticals of Plant Origin**	Plant secondary metabolites, classification and sub-classification -	**5**

		phenols, Terpenoids, uses and Preventive role in diseases	
4.	**Nutraceuticals of Animal Origin**	Animal metabolites - Examples: Chitin, Chitosan, Glucosamine, Chondroitin Sulphate, uses and applications in preventive medicine and treatment.	**5**
5.	**Microbial and Algal Nutraceuticals**	Concept of probiotics - principle, mechanism, production and technology involved and health benefits of probiotics. Synbiotics for maintaining good health. Algae as source of omega - 3 fatty acids, proteins, fibers, antioxidants, vitamins and minerals – examples: Chlorella, Haematococcus, Spirulina, Dunaliella	**6**
6.	**Nutraceuticlas and Diseases (specific foods and food products)**	Tea, Garlic, Honey, Flaxseed, Mushroom, Barley, Grape seed extract and Lycopene and their preventive role in cardiovascular diseases, Metabolic disorders, Cancer, Bone health, skin diseases etc.	**8**
7	**Nutraceutical Industry and Market Information**	Concept of cosmoceuticals and aquaceuticals, Nutraceutical industries in India and abroad (study of 5 reputed Indian and International industries involved in production and development of nutraceuticals and functional foods).	**4**
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignment, report and viva)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Wildman, R.E.C. ed. Handbook of Nutraceuticals and Functional Foods, CRCPress, Boca Raton, 2000.
2.	R. E. Aluko, Functional foods and Nutraceuticals, Springer, 2012
3.	Yashwant V Pathak, Handbook of Nutraceuticals, CRC Press, 2010
4.	Shibamoto T. Functional food and health, Oxford University Press, 2008.
5.	Goldberg, I. Functional Foods: Designer Foods, Pharma foods, Nutraceuticals, Chapman & Hall, 1994.
6.	Robert E.C. Handbook of Nutraceuticals and Functional Foods. 2nd Ed. Wildman, 2006.

Detailed Syllabus
Lecture-wise Breakup

Course Code	19M12BT111	**Semester** EVEN	**Semester II Session** 2020-21 **Month from** January to June
Course Name	Natural Products and Bioprospecting		
Credits	3	**Contact Hours**	3

Faculty (Names)	**Coordinator(s)**	Dr. Garima Mathur
	Teacher(s) (Alphabetically)	Dr. Garima Mathur

COURSE OUTCOMES		**COGNITIVE LEVELS**
CO1	Explain various natural products sources	**Understand level (C2)**
CO2	Identify appropriate method for production of natural products and characterization of compounds	**Apply level (C3)**
CO3	Examine Bioprospecting potential of natural resources	**Analyze level (C4)**
CO4	Assess the products as per national and international agreements and regulations	**Evaluate level (C5)**

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	**Introduction to natural products and bioprospecting**	Introduction to natural products science, History of the field, primary and secondary metabolites, characteristics of natural products	**5**
2.	**Plant derived natural products and their classification**	Biogenetic classification of natural products (Alkaloids, Phenylpropanoids, Polyketides and fatty acids, Terpenoids), therapeutically important natural products with interesting bioactivities	**10**
3.	**Bioactive compounds from microorganisms and marine sources**	Antibiotic and non-antibiotic drugs from microorganisms and marine sources, microbial phytotoxins, Genetically engineered natural products	**5**
4.	**Industrial applications of natural products**	Case studies on production and applications of important natural products: Vinka alkaloids, morphine, cocaine, cyclopamine, Reseveratrol, Genistein, tea catechins	**8**
5.	**Bioprospecting in development of natural products**	current aspects of bioprospecting in development of natural products from medicinal plants, marine ecosystem and microbial population, Screening concepts, extraction, isolation of natural products, Bioassay-directed fractionation of natural products depicting examples.	**8**
6.	**Conventions and regulations in Bioprospecting**	legal issues with bio-prospecting, understanding biopiracy, International law regulating bio-prospecting (Convention on Biological Diversity, Rio Earth Summit, Declaration on the Rights of Indigenous Peoples, Nagoya Protocol), Indian law regulating bio-prospecting, Prior approval from the National Biodiversity Authority, Prior Intimation to the State Biodiversity Board, critical analysis of bio-	**6**

		prospecting regime in India	
Total number of Lectures			**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignment 1, Assignment 2, Quiz)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Leland J. Cseke, Ara Kirakosyan, Peter B. Kaufman, Sara Warber, James A. Duke, Harry L. Brielmann. Natural Products from Plants, CRC Press, 2006
2.	Sujata V. Bhat, Bhimsen A. Nagasampagi, Meenakshi Sivakumar. Natural Products: Chemistry and Applications. Narosa Publishing house, 2014.

Detailed Syllabus
Lecture-wise Breakup

Course Code	**19M13HS111**	**Semester** Even (specify Odd/Even)	**Semester** II**,** DD VIII **Session** 2020-21 **Month from** January to June
Course Name	**English For Research Paper Writing**		
Credits	2 (2-0-0)	**Contact Hours**	2

Faculty (Names)	**Coordinator(s)**	Ms. Rashmi Jacob
	Teacher(s) (Alphabetically)	Ms. Rashmi Jacob

COURSE OUTCOMES	
CO1	To understand the aspects of grammar and language needed to write a paper.
CO2	To have improved Writing Skills with proper grammar usage
CO3	To have knowledge of what to write in each section of a paper after careful analysis of Literature Review
CO4	To be adept in skills needed to write a title, abstract and introduction, methods, discussion, results and conclusion
CO5	To be capable of drafting a refined research paper after editing and proofreading

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Grammar & Usage	Structure of English Language Voice &Tense SVOCA Sense & Sense Relations in English Enhancing Vocabulary Connotation, Denotation & Collocation	6
2.	Elements of Paper Writing	Planning & Preparation Word Order Breaking Long Sentences Structuring Paragraphs Being Concise and Removing Redundancy	6
3.	Paraphrasing & Writing	Highlighting Your Findings Paraphrasing and Plagiarism Sections of a Paper Abstracts; Introduction	4
4.	Process of Writing	Review of Literature Methods Results Discussion	4

		Conclusion	
5.	KeySkills Needed	Key skills needed when writing a Title Key skills needed when Writing an Abstract Key skills needed when writing an Introduction Key skills needed when writing a Review of the Literature Key skills needed when writing Methods & Results Key skills needed when writing Discussion & Conclusion	4
6.	Refining the Paper	Incorporating useful phrases Editing Proofreading References Annexures Ensuring good quality in submission	4
Total number of Lectures			**28**

Evaluation Criteria

Components	**Maximum Marks**
Mid Term Examination	30
End Semester Examination	40
TA	30 (Assignments & Test)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)
1.

Detailed Syllabus
Lecture-wise Breakup

Course Code	**18M12BT116**	**Semester** Even **(specify Odd/Even)**	**Semester** M.Tech Sem II, Integrated Sem IX **Session** 2020-21 **Month from** January to June
Course Name	**IPR in Biotechnology**		
Credits	3	**Contact Hours**	3

Faculty (Names)	**Coordinator(s)**	Dr. Indira P. Sarethy
	Teacher(s) (Alphabetically)	Dr. Indira P. Sarethy

COURSE OUTCOMES		**COGNITIVE LEVELS**
CO1	Explain and interpret the types of intellectual property rights, related laws and systems	**Understand (C2)**
CO2	Apply specific IPR issues pertaining to medical biotechnology	**Apply (C3)**
CO3	Evaluate plant and traditional knowledge protection	**Evaluate (C5)**
CO4	Appraise commercialization of intellectual property, infringements and laws applicable	**Evaluate (C5)**

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	**Introduction**	Intellectual Property Rights - their Relevance, Importance and Business Interest to Industry, Academia, Protection of Intellectual Property, Relationship of IPRs with biotechnology	**2 [CO1]**
2.	**Types of Intellectual Property Rights**	Patents, Trademarks, Copyrights, Industrial Designs, Geographical Indications, Trade secrets, non-disclosure agreements	**2 [CO1]**
3.	**Patents**	General Introduction to Patents, Patent Terminology, Patent Claims, Patent Life and Geographical Boundaries, Utilization of Intellectual Patents, Licensing of patents	**4 [CO1, CO2]**
4.	**Elements of patentability**	Invention/Discovery, What constitutes Patentable subject matter, the Utility, novelty and non-obviousness of an invention, Patentability in Biotechnological Inventions: Case studies	**2 [CO2, CO3]**
5.	**Preparation and Process for Patenting**	Procedural steps to grant of a patent, Process of filing patents in India, PCT application, protocols of application, pre-grant & post-grant opposition	**3 [CO2, CO3]**
6.	**Patent Search**	Invention in context of "prior art", Patent Search methods, Patent Databases & Libraries, online tools, Country-wise patent searches (USPTO, EPO, India etc.), patent mapping	**2 [CO2, CO3]**
7.	**IPR laws**	Basic features of the Indian Patent Act, the Indian Copyright Act, and the Indian Plant Varieties Protection	**2 [CO1,**

		and Farmers' Rights Act, A brief overview of other Patent Acts & Latest Amendments of Indian, European & US patent systems	**CO2, CO3]**
8.	**Patent issues in Drugs and Pharmaceuticals**	Generics, Compulsory Licensing, Exclusive Marketing Rights (EMR), Bolar provision, Bayh-Dole act, Second medical use	**2 [CO2, CO3]**
9.	**Worldwide Patent Protection, WTO & TRIPS Agreement**	Brief Background of different International conventions such as Paris convention, TRIPS, WTO, PCT and Patent Harmonisation including Sui-generis system, The relationship between IPRs and international trade, Overview of WTO & TRIPS Agreement, Enforcement and dispute settlement under the TRIPS Agreement, The implication of TRIPS for developing countries in the overall WTO system	**2 [CO1, CO2, CO3]**
10.	**Gene patents**	Introduction & overview, what constitutes gene patents, Bayh-Dole Act, ESTs, Cohen-Boyer technology, PCR patents, EPO case, BRCA gene, Types of IPR involved, Genetic Use Restriction Technologies, Patenting of biologics, Hatch Waxman Act	**9 [CO3, CO4]**
11.	**Protection of Plant Varieties /Seeds**	The interface between technology and IPRs in the context of plants, Key features of UPOV 1978, UPOV 1991 and TRIPS with respect to IPRs on plants, Indian Law on Protection of Plant Varieties, DUS criteria, patenting of genetically modified plants, The significance of IPRs in agricultural biotechnology, Biodiversity, Conventions & Treaties, plant patents, Plant Varieties Protection Act, Plant Breeders' Rights, UPOV, benefit sharing, *sui generis* systems Case studies	**4 [CO3, CO4]**
12.	**Traditional Knowledge and Intellectual Property Rights**	The importance and relevance of Traditional Knowledge for developing nations, The various approaches to protecting TK, The local, national and global dimensions of the issues in TK and IPRs, Traditional Medicine & IP Protection, Folklore, Patenting of Health Foods: Case studies	**4 [CO3, CO4]**
13.	**Patent Infringement and Commercializing Intellectual Property Rights**	What all are considered as patent Infringement: Case studies, defenses to infringement including experimental use, patent misuse, legal considerations, Patent Valuations, Competition and Confidentiality issues, Assignment of Intellectual Property Rights, Technology Transfer Agreements	**4 [CO4]**
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignments 1, 2. Presentation 1)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	USPTO Web Patent Databases at: www.uspto.gov/patft
2.	Government of India's Patents Website: patinfo.nic.in

3.	Intellectual property India: www.ipindia.nic.in
4.	"Indian Patent Law : Legal and Business Implications" by Ajit Parulekar, Sarita D'Souza Macmillan India publication, 2006
5.	"Agriculture and Intellectual Property Rights", edited by: Santaniello,V., Evenson, R.E., Zilberman, D. and Carlson, G.A. University Press publication, 2003
6.	Research papers and Reports provided from time to time