Estd. 1962
"A++" Accredited by NAAC (2021)
With CGPA 3.52

SHIVAJI UNIVERSITY, KOLHAPUR - 416004, MAHARASHTRA
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शिवाजी विद्यापीठ, कोल्हापूर -४१६००४,महाराष्ट्र
दूरध्वनी-ईपीएबीएक्स -२६०९०००, अभ्याससमंडळे विभाग दुरध्वनी ०२३१—२६०९०९४
०२३१—२६०९४८७

SU/BOS/Science/09 **Date: 02/01/2024**

To,

The Principal, All Concerned Affiliated Colleges/Institutions Shivaji University, Kolhapur	The Head/Co-ordinator/Director All Concerned Department (Science) Shivaji University, Kolhapur.

Subject: Regarding syllabi of M.Sc. Part-II (Sem. III & IV) as per NEP-2020 (1.0) degree programme under the Faculty of Science and Technology.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the revised syllabi, nature of question paper and equivalence of M.Sc. Part-II (Sem. III & IV) as per NEP-2020 (1.0) degree programme under the Faculty of Science and Technology.

M.Sc.-II (Sem. III & IV) as per NEP-2020 (1.0)			
1.	Mathematics	9.	Gen Microbiology
2.	Mathematics (Distance Mode)	10.	Pharmaceutical Microbiology (HM)
3.	Mathematics (Online Mode)	11.	Alcohol Technology
4.	MSc.(Mathematics With Computer Application)	12.	Sugar Technology
5.	Statistics	13.	Geology
6.	Applied Statistics and Informatics	14.	AGPM
7.	Electronics	15.	Geoinformatics
8.	Microbiology (HM)	16.	Physics

This syllabus, nature of question and equivalence shall be implemented from the academic year 2024-2025 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in,NEP-2020 (Online Syllabus).

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2024 & March/April 2025. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Dy Registrar
Dr. S. M. Kubal

Copy to:

1	The Dean, Faculty of Science & Technology	4	P.G Admission / Eligibility Section
2	The Chairman, Respective Board of Studies	5	Computer Centre/ Eligibility Section
3	B.Sc. Exam/ Appointment Section	6	Affiliation Section (U.G.) (P.G.)

SHIVAJI UNIVERSITY, KOLHAPUR

Established: 1962

A^{++} Accredited by NAAC (2021) with CPA 3.52

Structure and Syllabus in Accordance with

National Education Policy - 2020

with Multiple Entry and Multiple Exit

Master of Science
Agrochemicals and Pest Management (AGPM)

under
Faculty of Science and Technology

(To Be Implemented from Academic Year 2024-25)

5. Programme Structure

Structure in Accordance with National Education Policy - 2020
With Multiple Entry and Multiple Exit Options
M.Sc. (Agrochemicals and Pest Management) Part – II (Level-6.5)

	Course Code	Teaching Scheme			Examination Scheme					
		Theory and Practical			University Assessment (UA)			Internal Assessment (IA)		
		Lectures + Tutorial/ (Hours/ week)	Practical (Hours/ week)	Credit	Maximum Marks	Minimum Marks	Exam. Hours	Maximum Marks	Minimum Marks	Exam. Hours
Semester-III										
Major Mandatory	MMT-301	4	--	4	80	32	3	20	8	1
	MMT -302	4	--	4	80	32	3	20	8	1
	MMPR -303	-	8	4	100	40	3	-	-	-
Major Elective	MET-304	4		4	80	32	3	20	8	1
	MEPR-305		4	2	50	20	2	-	-	-
Research Project	RP-307		-	4	100	40	3	-	-	-
Total				**22**	**490**	**--**	**--**	**60**	**--**	**--**
Semester-IV										
Major Mandatory	MMT-401	4	--	4	80	32	3	20	8	1
	MMT -402	4	--	4	80	32	3	20	8	1
	MMT-403	4	--	4	80	32	3	20	8	1
Major Elective	MET-404	4	--	4	80	32	3	20	8	1
Research Project	RP-405	-	12	6	150	60	-	-	-	-
Total				**22**	**470**	**--**	**--**	**80**	**--**	**--**
Total (Sem. III + IV)				**44**	**960**	**--**	**--**	**140**	**--**	**--**

<table>
<tr><td rowspan="4">• MMT–Major Mandatory Theory
• MMPR–Major Mandatory Practical
• MET–Major Elective Theory
• MEPR–Major Elective Practical
• RM - Research Methodology
• OJT/FP- On Job Training/ Field Project</td><td>• Total Marks for M.Sc.-II:1100</td></tr>
<tr><td>• Total Credits for M.Sc.-II (Semester III& IV): 44</td></tr>
<tr><td>• Separate passing is mandatory for University and Internal Examinations</td></tr>
<tr><td colspan="2">*Evaluation scheme for OJT/FP shall be decided by concerned BOS</td></tr>
<tr><td colspan="2">• Requirement for Entry at Level 6.5:
Students can exit after completion of Level 6.5 with Post graduate in Agrochemicals and Pest Management</td></tr>
</table>

7. Course Codes

Sr. No.		Title of the Paper	Course Code	
		Semester III		
		Major Mandatory	**Lectures**	**Practical**
1	MMT-301	Toxicology and Analysis of Pesticides (4Credits)	**MSU0325MML91I1**	
2	MMT - 302	Diseases of Fruit Trees, Forest Trees, Plantation Trees and Ornamental Plants (4 Credits)	**MSU0325MML91I2**	
3	MMPR-303	MMPR Practical Lab-I MMT(301+302) (4 Credits)		**MSU0325MMP91I1**
		Major Elective		
4	MET-304	Agricultural Insect Pests (4 Credits)	**MSU0325MEL91I1**	
5	MEPR-305	MEP Practical Lab-II (2Credits)		**MSU0325MEP91I1**
6	RP-306	Research Project (4Credits)	**MSU0325RPL91I**	
		Semester IV		
		Major Mandatory		
7	MMT-401	Agricultural Marketing Management (4Credits)	**MSU0325MML91J1**	
8	MMT-402	Manufacturing of Agrochemicals (4Credits)	**MSU0325MML91J2**	
9	MMT-403	Biotechnology and Integrated Disease Management (4 Credits)	**MSU0325MML91J3**	
		Major Elective		
10	MET-404	Insect Pests and their Control (4Credits)	**MSU0325MEL91J1**	
11	RP-205	Research Project (6 Credits)	**MSU0325RP91J**	

8. Syllabus

Department of Agrochemicals and Pest Management

M. Sc. Part II (Semester - III) (Level 6.5)
(NEP-2020)

(Introduced from the Academic Year 2024-25)

Title of Course: Agrochemicals and Pest Management

Course Code: 01

Total Credits: 04

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Introduction of the toxicological study of Pesticides and their analytical techniques
2. Concepts of agricultural marketing and manufacturing process of agrochemicals.

MMT 301: Toxicology and Analysis of Pesticides

Unit No.	Content	No. of lectures
I	**Residues of Agrochemicals** **Pesticides Residues in the Atmosphere:** Pesticides into the Atmosphere and their fate, Transport of vapors, Precipitation, effect of residues on human life, Photochemistry of Pesticides. **Pesticides Residues in Water System:** Nature and origin of pollution of aquatic systems, Point and Non-Point pollution, Dynamics of pesticides in aquatic environment **Pesticides Residues in the Soil:** Absorption, Retention, Transport and Degradation of pesticides in the soil, Effect on micro-organism and Consequent effect on the soil condition, Fertility, Interaction in the soil, Geo-hydrological aspects	15
II	**Pesticide Residue Penetration and their Analysis** Effect of pesticide residue on the quality of Human life, Model ecosystem, Studies of Bio-concentration, bio-magnifications and bio-degradation effect of pesticides on life, in general and consequent effect on human life. The cases and affected societies and starving populations facing problems of health and nutrition, Traditional wisdom and Food security Sample preparation and Pesticide residue analysis methods, Bio-pesticides, Poisoning effects, Symptoms and Treatment, Further prospects of Research and Technology, Development of safe pesticides	15
III	**Separation Techniques:** Principles, instrumentation and application of Gas Chromatography (GC) and High-Performance Liquid Chromatography (HPLC) **Ultraviolet and Fluorescence spectroscopy:** Principles, Instrumentation and Applications, Ultraviolet spectrophotometer in the analysis of agrochemical and pesticide residue and metabolites. **Infrared spectrometry:** Principles, Instrumentation and Applications.	15
IV	**Nuclear Magnetic Resonance spectrometry:** Nuclear spin and Absorption of Radiofrequency, Chemical shift, Application in pesticide residue analysis NMR Spectroscopy. **Mass spectrometry:** Schematic diagram of mass spectrometer, Ionization and Fragmentation of molecules, Interpretation and application in the pesticide residue and metabolites analysis GC- MS techniques	15

Reference Books:

1. Chemical analysis of the environment by Ahuja.
2. Environmental chemistry by A. K. De.
3. Chemistry of our environment by Home (JW).
4. Analysis of pesticides residues by H.A. Moye (JW).
5. Advance in pest control research by R. L. Methcalf (JW).
6. Chemistry of pesticides by K. H. Buchel (JW).
7. Progress in pesticides biochemistry and Toxicology V. I, II, III by D. H. Hutson and T. R.Roberts.
8. Evaluation of pesticides in ground water by W. Y. Garnett, R.C. Honey catt and others.
9. Chemistry of pesticides by Edward.
10. Spectroscopic methods in Organic Chemistry –D. H. Williams and I. Flemming.
11. Instrumental methods of analysis –Willard and Merittee, Dean.
12. Application of spectroscopic techniques inorganic Chemistry-P. S. Kalsi.
13. Concept in analytical Chemistry –S. M. Khopkar.
14. Application of absorption in Spectroscopy – J. R. Dyer.
15. Soil and plant analysis –C.S. Piper (Hans pub.)

MMT 302: Diseases of Fruit Trees, Forest Trees, Plantation Trees and Ornamental Plants

Unit No.	Content	No. of lectures
I	**Diseases of Fruit Trees** **Mango:** Anthracnose, Powdery mildew and Blight of Mango. Apple: Apple scab and Powdery mildew. **Banana:** Sigatoka leaf spot and Panama disease. **Cashew nut:** Damping off seedlings and die back. **Citrus:** Gummosis, Powdery mildew and Anthracnose. **Custard Apple:** Anthracnose and Fruit rot. **Grape:** Downy mildew, Powdery mildew and Black rot. **Guava:** Anthracnose and sooty mould. **Pomegranate:** Bacterial blight and Fruit cracking. **Sapota:** Leaf spots (*Phaeophleospora indica*) and Sooty mould. **Fig:** Fig rust and Fig mosaic.	15
II	**Forest Tree diseases** **Teak:** Leaf blight, leaf rust and Powdery mildew. **Sissoo:** Powdery mildew and Rust. **Bamboo:** Leaf blight, little leaf, Rust, Tar spot and culm rot. Eucalyptus: Anthracnose, Phytophthora and Powery mildew. **Santalum:** Sooty mould, Powdery mildew and MLO disease. **Acacia:** Powdery mildew, sooty mould and Phyllode spot. **Mahagani:** Leaf spot and Canker	15
III	**Plantation Tree diseases** **Areca nut:** Leaf spot and Fruit rot (Koleroga). **Cocoa:** Seedling die back, *Colletotrichum* pod rot, and Sickle leaf of Cocoa. **Coconut:** Bud rot, Root rot or wilt and *Helminthosporium* leaf spot. **Coffee:** Rust, Black rot, Anthracnose and Brown eye spot. **Rubber:** Abnormal leaf fall, Powdery mildew and *Glomerella* leaf disease. **Tea:** Red rust, Blister blight and *Cercospora* leaf spot.	15
IV	**Diseases of Ornamental plants.** **Aster:** Wilt, Downy mildew, Powdery mildew. **Begonia:** Powdery mildew, Root and Stem rot. **Marigold:** Powdery mildew and Leaf spots. **Canna:** Rust, Bud rot and Spots leaf. **Carnation:** Leaf spots, Powdery mildew and Rusts. **Chrysanthemum:** Brown rust, Powdery mildew and Septoria leaf spot. **Dahlia:** Sclerotinia rot, leaf spot and Powdery mildew. **Geranium:** Leaf spot, Blossom blight and Bacterial spot. **Gladiolus:** Botrytis rot, Dry rot, and Fusarium dry rot. **Rose:** Black spot, Rust, Powdery mildew and die back. **Jasmine:** Leaf spot, Crown gall and Rust. **Lily:** Leaf spot, Foot rot and Stump rot.	15

Reference Books:

1. Plant pathology 5th Edition by G. N. Agrios.
2. Diseases of fruit crops, by R. S. Singh.
3. Textbook of Pomology: 4, by T. K. Chattopadhyay
4. Fungire and plant diseases, by Mundkur B.B.1995.
5. Tropical plant diseases by Turston H.D.
6. Plantation crops and their management, by D. Jhon Christopher, V Jaiganesh, R. Sutha Raja Kumar and D. E. Kavi Newton.
7. Diseases of forest trees and their management, by S. Parthasarthy.
8. Diseases of forest and ornamental trees, by D. H. Philips
9. Plant Diseases by Singh, R.S. 1963.
10. Diseases of Crop Plants in India 4th Edition by Rangaswami, G. & Mahadevan, A.2008.
11. Diseases of fruits and plantation crops and their management, by Shamrao Jahagirdar.

MET 304: Agricultural Insect Pests

(Classification, Biology, Nature of damage Control measures)

Unit No.	Content	No. of lectures
I	**Pests of cereals and millets** **Rice:** Brown Plant hopper (*N. lugens),* Zigzag leafhopper *(R. dorsalis),* Yellow stem borer *(S. incertulas),* Rice leaf folder *(C. medinalis),* Rice bug *(L. acuta).* **Maize:** Fall armyworm *(S. frugiperda),* Stem borer (*C. partellus),* European corn borer *(O. nubilis),* Pink Stem borer *(S. inferens).* **Sorghum:** Ear head bug (*Calcoris angustatus),* Shoot fly *(Antherigona soccata),* Shoot bug *(Peregrinus maidis),* Midge *(Sorghicola stenodiplosis),* R. hairy caterpillar *(Amsactaalbi striga).* **Wheat:** Armyworm **(***M. separata),* G. weevil *(Tanymecus indicus).* **Pearl and Finger millets:** White stem borer (*Saluria inficita)* Red headed caterpillar (*Amsactaalbi striga),* Ash weevils *(Myllocerus maculosus*),Grasshopper (*Hieroglyphus banian*), Cutworm (*Spodoptera exigua)*	15
II	**Pests of pulses and sugarcane** **Pulses:** Bollworm (*H. armigera),* Lentil pod borer *(E. zinckenella),* Blister beetle*(M. pustulata),* Tur pod bug *(C. gibbose),* Green potato bug *(N. viridula),*Plume moth *(E.atomosa),*Pea blue butterfly*(L. boeticus),* Bean fly *(O. phaseoli).* **Sugarcane:** Sugarcane pyrilla *(P.perpusilla),*White fly*(A. barodensis),* Sugarcane wooly aphid *(C.lanigera*), Sugarcane early shoot borer*(C. infuscateus),*Root borer *(E.depressella),*Sugarcane mite *(O.indicus)*	15
III	**Pests of oil seed crops** **Groundnut:** Groundnut aphid *(A. crraccivora),* Groundnut leaf miner *(A. modicella),* Red hairy caterpillar *(A. albistriga),* Stem borer *(S. perotetti).* **Soya-bean:** Bihar hairy caterpillar *(S. obliqua),* Jassids *(A. maculosa).* **Castor:** Castor semilooper **(***A. janata),* Castor capsule borer *(C. punctiferalis).* **Safflower:** Safflowercaterpillar (*P. capensis),* Bud fly *(A. helianthin).* **Mustard:** Aphid (*L. erysimi),* Painted bug *(B. hilaris),*Sawfly *(A.lugens),* Diamondback moth *(P. xylostella).* **Sesame:** Pod caterpillar (*A. catalaunalis),* Til hawk moth *(A. styx),* Gall fly *(A. sesame)* **Linseed:** Bud fly (*D.lini)* **Cotton:** Jassid *(A. biguttala),* White fly*(B. tabaci),* Spotted bollworms *(E.insulana),* Grey weevil *(M. undecimpustulatus),* Cotton Semilooper *(T. notabilis),* Leaf roller *(S. derogate)*	15
IV	**Pests of vegetables** **Cabbage, Cauliflower, Radish:** Cabbage Caterpillar *(P. brassicae),* Diamond back moth *(P. xylostella)* Cabbage flea Beetles *(P. cruciferae),* Leaf webber *(C. binotalis)* Cabbage bores *(H. undalis).* **Potato:** Tuber moth *(P. operculella)* **Brinjal:** lacewing bug *(U. sentis)***,** Brinjal hadda beetle *(H. dodecastigma),* Brinjal fruit & shoot borer *(L. orbonalis)* **Cucurbits:** Melon fruit fly (*B. cucurbitae*) Red Pumpkin beetle *(R. foveicollis)* **Okra:** Dusky cotton bug *(O. laetus)* **Water nut:** Singhara beetle *(Galerucella birmanica).* **Sweet Potato:** Sweet Potato weevil *(C. formicarius).* **Peas:** Pea leaf miner *(C. horticola),*Pea stem fly *(O. phaseoli)*	15

Reference Books:

1. Text of Applied Entomology Vol I & II -K. P. Srivastava.
2. Agricultural Pests of India and South East Asia – A. S. Atwal, 2023.
3. Insect Toxicology. R. P. Srivastav and R. C. Saxena
4. Principles of Insect Pest Management. –G.S.Dhaliwal and R. Arora.
5. Entomology and Pest Management –Larry P. Pedigo.
6. Elements of Economic Entomology –B.V. David and T. Kumaraswammy.
7. Insect Pest Management –David Bent.
8. Critical issues in Insect Pest Management –G. S. Dhaliwal and E.A. Heinrich

M. Sc-II, Semester- III
MMPR 303-Practical (MMT301+302)

Chemistry practical

1. Saponification and acid values of oil
2. Estimation of phosphate from super phosphate.
3. Estimation of sulphate from super phosphate.
4. Determination of Caffeine from tea leaves.
5. Isolation of lactose from milk.
6. Analysis of soil samples: Estimation of Ca, Mg, carbonate (CO_3^-) and bicarbonate (HCO_3^-) by Titrimetric analysis.
7. Estimation of Malathion content in a given sample.
8. Detection of pesticides residue in food stuffs.
9. Detection of pesticides from plants.
10. Determination of bulk density of pesticidal WP/WDG/Dust/SP.
11. Determination of wettability of pesticidal WP/WDG/Dust/SP.
12. Performing wet sieve test of pesticidal WP/WDG/Dust/SP.
13. Determination of suspensibility of pesticide formulation WP/WDG/SC.
14. Preparation of granules/WDG formulation.
15. Any suitable experiment may be added whenever necessary.
16. Synthesis: a) 2, 4-D, b) Phthalamide, c) Phthalanilic acid, d) Phenyl benzoate, e) Acetanilide, f) Ziram, g) 1-Napthoxy acetic acid h) Dimethyl phthalate, i) Nabam/ Ferbam/ Zineb/ Maneb
17. Isolation of Eujenol from clove oil.
18. Any suitable experiment may be added whenever necessary.

Pathology practical

1. Study of Diseases of Fruit Trees, Forest trees, Plantation Trees and Ornamental plants (As per theory)
2. Colorimetric estimation of free fatty acids under pathogenesis.
3. Estimation of protein under pathogenesis
4. Estimation of tannins by F. D. Method.
5. Estimation of Amylose under pathogenesis.
6. Preparation of culture media, Sterilization technique, inoculation techniques.
7. Culture of different explants on nutrient media.
8. Protoplast isolation and culture.
9. Preparation of synthetic seeds.
10. Isolation and Estimation of DNA under pathogenesis.
11. Estimation of cellulose under pathogenesis.
12. Estimation of proline under pathogenesis
13. Study of enzyme peroxidase and Acid phosphatase under pathogenesis by
14. Spectrophotometer method
15. Visit to tissue culture (Biotech) laboratory/Horticultural University/ Nursery/Agricultural University/ College.
16. Any suitable experiment may be added whenever necessary.

MMPR 305- Entomology Practical

1. Rearing of pest species. (2 to 3 species).
2. Study of life cycle of important insect pests of crop plants
3. Study of the detection of damage caused by pests.
4. Identification of different castes of termites.
5. Determination of LC_{50} and LC_{90} from insect mortality.
6. Mass production of *Bacillus thuriengenisis*, *Metarhizium*, *Apenteles* sps & *Bracon* sps.
7. Field collection of pests stages and its submission.
8. Field visits (minimum four) & Preparation of field diary.
9. Statistical Methods of Research
10. Any suitable experiment may be added whenever necessary.

M. Sc. Part II (Semester - IV)

MMT 401- Agricultural Marketing Management

Unit No.	Content	No. of Lectures
I	**Introduction to Agricultural Marketing** Agricultural Marketing Meaning, definition, scope and subject matter of agricultural marketing. New role of Agricultural Marketing. Market and Market Structure Meaning and definition of market, Components of a market, Classification of markets.	15
II	**Agricultural Marketing in India** Agricultural Marketing in India Characteristics of agricultural commodities. Defects of agricultural marketing in India and its remedial measures. Indian marketing environment: Challenges, Economy Scope, Importance, Scenario Agricultural growth, Development, Policy, Role of NABARD, APEDA, RBI**.**	15
III	**Analyzing Consumer & Selecting Market**: Buyer's behavior, Indian consumer, Target marketing, STP Segmentation, Target, Positioning. **Distribution channels:** Types, Definition, Channels. **Direct marketing:** Globalization & consumer behavior, 4Ps – Product, Price, Place, Promotion. Product life cycle & pricing, new product development, Advertising / Promotion. **Sales & Distribution:** Demand measurement, Market Research & Methodology, Market evaluation & Controls, Sales Characters Definition, Types. **Small Scale Industry:** Pesticides industries in India, Norms, Governments policy, Benefits regulations, Administration, Marketing and management, Planning of small-scale units' economics, Licenses marketing of Agrochemicals, Marketing research know-how, Man- Power, HRD.	15
IV	**Marketing ethics & Audit:** Storage, After & before sales service **Rural marketing in India cooperatives in Agribusiness Marketing.** **Agriculture export & import process:** Policies, Taxation, Laws, Packing Norms, etc. Use of It or export market. **International marketing:** WTO, GATT, etc. Laws. **Details studies on marketing process** in the Netherlands, Israel, Japan USA, Australia. Present status of Indian export in comparison to developed countries. **Agricultural project analysis** Agri-food, Service, Industry**.** **Case studies:** Agri. Input industry, Food, Whole selling, Retailing, mall**.**	15

Reference Books

1. Marketing: Philip Kofler
2. Marketing: V.S Management by Ramaswami
3. Marketing of – Richard L.
4. Agricultural Kohls & Products Joseph N. D.

MMT 402- Manufacturing of Agrochemicals

Unit No.	Content	No. of lectures
I	**Quality control and R&D:** Quality control concept, Specification and analytical procedures, Control of Quality of raw material, Intermediates and Finished goods, Batch inspection, R&D laboratory specifications, WHO, FAO, ASTM, BIS, ISI Specification and Standards **Occupational Health Hazard and their control in Agrochemical Industries:** Handling of chemicals and Pesticides Hazards, Asthma and Pulmonary diseases, Dermatitis & Cancer, First Aid Emergency, Importance and Various kinds of First Aids, Medical organization for major accident hazard control, Health Education for workers, Occupational Health Management, Industrial safety	15
II	**Types of Unit Operations and Study:** **Extraction:** Principles, Equipment of Solid-Liquid and Liquid-Liquid extraction. **Evaporation:** Purpose, Operation of multiple effect Evaporators. **Distillation:** Fractional distillation, Plate and packed columns, Steam distillation of Azeotropes. **Absorption:** Gas absorption in towers. **Filtration:** Types of filters, Working of Centrifuge. **Crystallization:** Purpose, Batch and Contaminates Crystallizes. **Drying:** Types of dryers, Working of compartment tray and spray dryers. **Reactors:** Diagrams and working of batch reactor.	15
III	**Designing and synthesis of pesticides:** Retrosynthetic analysis, Synthon approaches, Synthetic equivalence, Types of disconnection, Chemo selectivity, Retrosynthesis of agrochemicals, pheromones and Synthetic plant products	15
IV	**Manufactures of Pesticides and other Agrochemicals: (Unit processes are to be discussed as they occur in the sequences):** Manufacture of Captan, Dimethoate, Parathion, Agro-grade sulphur, Dimethyl phthalate, Ethylene oxide, Copper Sulphate, Simazine, Regulatory Requirements of for Transportation of Agrochemical Products: Transport Worthiness Test (TWT), Container Compatibility Test (CCC)	15

Reference Books

1. Industrial organic chemistry
2. Unit Operations: W. L. Badger.
3. Unit processes in organic synthesis: P. H. Groggins.
4. Encyclopedia of chemical technology: Kirk and Othmar.
5. A text book of chemical technology: S. D. Shukla & G. N. Pendey.
6. Industrial chemistry by James Kent & Reigel.
7. Survey of industrial chemistry 2 Ed. by P. J. Chenier
8. Industrial chemicals: F. A. Lowheim and M. A. Moran.
9. Encyclopedia of pesticides Manufacture.

MMT 403: Biotechnology and Integrated Disease Management

Unit No.	Content	No. of lectures
I	**Tissue Culture** Tissue Culture: Definition, Historical events, Basic requirement for tissue culture laboratory, Maintenance of aseptic condition, Totipotency of cell, Nutrient media, Method of tissue culture, Meristem culture, Anther culture, Pollen culture, Embryo culture, Suspension culture. Protoplast isolation, fusion culture and Cybrids Micro-propagation, Somatic embryogenesis, Somaclonal variation and Artificial seeds, Secondary metabolites, Biotransformation in plant cells, Elicitor-dependent Biosynthesis, and Immobilization of plant cells.	15
II	**Genetic Engineering** Genetic Engineering: Definition, concept, Principles of Recombinant DNA technology, Methodology of Genetic Engineering: Gene cloning Vectors –Plasmid, Cosmid, Lambda phase, YAC, Molecular probes, Molecular markers, Southern blotting and Northern Blotting, preparation of desired DNA, rDNA construction, Recombinant gene transfer, Screening of recombinants Southern blotting and Northern Blotting. Transgenic plants: Herbicide (Glyphosate)resistant plants. Insect resistant plants- Bt Cotton, Transgenic Rice with Vit-A. Application of Genetic Engineering.	15
III	**Genetics of resistance** Types of disease resistance, Interaction between resistant genes andMolecular marker assisted selection, Breeding for disease resistance- Back cross method, Escape method. Genetics of host-pathogen interaction, gene for gene concept, Adaption of fungi to differenthosts. Antigen, antibody reaction. Immunoglobulins and its application. Defense mechanism inplants-Biochemical defense, induced synthesis of protein and enzyme, Formation of substrates resisting the enzyme of the pathogen. Detoxification of pathogen toxin, altered respiration.	15
IV	**Integrated Disease Management** Cultural, biological and chemical methods. VAM Technology: *Trichoderma viridae*, *T. harzianum*, *Pseudomonas fluorescens*, *Glomus sp*. Phytopesticides: concept and application (Neem, Tulsi, Karanj, Marigold, Tobacco, Turmeric, Chrysanthemum, Nirgudi). Biofertilizers: Definition, Mass production of Rhizobium and Azotobacter and field application. Azospirillium- Production and application of inoculants. Blue-Green algae- Production of BGA inoculants. Nostoc- Massproduction and utilization of Nostoc inoculants, Phosphate solubilizing bacteria production and applications. Bio-fertilizer producing industries in India.	15

Reference Books:

1. Plant pathology 5th Edition by G.N.Agrios.
2. Principles of insect pest management by Dhaliwal and Arora.
3. Pathological problems of economics crop plants & their management by Paul Khurana, S.M.1998.
4. Introduction to plant tissue culture, by M. K. Razdon
5. Plant tissue culture theory and techniques, by Sailesh Kumar, Sweta Mishra, A. K. Mishra.
6. Genetic Engineering, by Smita Rastogi and Neelam Pathak
7. Plant Biotechnology: Methods in Tissue Culture and Gen transfer, by R. Keshavchandran and K. V. Peter
8. Biotechnology, by V. Kumaresan 2013
9. Elements of Biotechnology, by P. K. Gupta.
10. Integrated Disease Management, R. C. Sharma and J. N. Sharma
11. Integrated Disease Management and Plant health, by V. K. Gupta and R. C. Sharma

MET 404: Insect Pests and their Control

(Classification, Biology, Nature of damage and Control measures)

Unit No.	Content	No. of Lectures
I	**Pests of plantation crops and spices: Coconut:** Black headed caterpillar *(O. arenosella)*, Rhinoceros beetle *(O. rhinoceros)*, Red Palm weevil *(R. ferrugineus)*, Coconut weevil *(D. frumenti)*. **Cashew:** Cashew tree Borer *(P. ferrugineus)* Cashew leafminer *(A. syngramma)* **Coffee:** Coffee green bug *(C. viridis)* Coffee stem borer *(X. quadripes)*. **Tea:** Tea mosquito bug *(H. theivora)* Bunch caterpillar (*A. bipunctata*), Yellow tea mite *(P. latus)*. **Cardamom:** Banana aphid *(P. nigronervosa)* Rhizome weevil *(P. haematicus)* **Chillies:** Chilliesthrips *(S. dorsalis)*. **Black Pepper:** Pollu beetle *(L. nigripennis)* **Turmeric:** Skipper Butterfly *(U. folus)* Bihar Hairy caterpillar *(S. obliqua)* **Coriander:** Cotton whitefly (*B. tabaci)*, Cinnamon butterfly *(Chilasiaclytia)* **Onion and Garlic:** Onion thrips *(T. tabaci)*, Onion maggot *(D. antiqua).*	15
II	**Pests of fruits and fruit tree** **Mango:** Mango hopper *(I. niveospaurus)***,** *Stem borer (B. rufomaculata),* fruilt fly *(B. dorsalis)* **Grapevine:** Thrips *(R. cruentatus)*, Grapevine girdler *(S. grisator)*. **Pomegranate:** Pomegranate butterfly *(D. isocrates)* **Banana:** Bananascale moth *(N. octasema)* Banana Weevil *(C. sordidus)* Banana stem barer *(O. longicollis)*. **Citrus:** Diaphorinacitri *(C. psylla)*, Citrus caterpillar *(P. demoleus)* Citrus mite *(O. citri)*, Citrus leafminer *(P. citrella).* **Guava:** Guava mealy scale (*C. psidii*), Bark caterpillar *(I. tetraonis).* **Ber:** Ber Fruit Fly *(C. vesuviana)***,** Ber Beetles *(A. Pallens)*. **Fig:** Fig midge *(A. peshawarensis).* **Jackfruit:** Pink waxy scale *(C. rubens)* Jackfruit leaf webber *(P. nuda).* **Pineapple:** Pineapple thrips *(T. tabaci)* Slug caterpillar *(P. lepida)* **Litchi:** Litchi bug *(L. chinensis)*, Litchi Bug *(C. stolii)* **Apple:** Wooly apple aphid *(E. lanigerum)* Codling moth *(C. pomonella).* **Papaya:** Ak grasshopper *(P. pictus)*, Red spider mite *(T. urticae)*	15
III	**Biological insect pests' control**: Introduction, Role and impact of Predators, Parasitoids, Biological characteristics, Role and impact strategies of biological control, Conservation and Habitat management. **Microbial control of insects:** Introduction, History, Principal groups of pathogens, *Bacillus thuringiensis*, Fungi, Viruses, Protozoa application methods and their mode of actions.	15
IV	**IPM and Bio-rational control measures:** IPM Need of IPM, Tactics and strategies of pest management (IPM)Concept and tools of pest management, Methods and principles of IPM, Natural and Applied, Preventive & Curative methods: Cultural, Mechanical, Physical, Legal, and Biological.Bio-rational: Introduction, chemicals based on insect cuticle chitin, Protein chemicals based on endocrine system, Use of insect growth regulators Juvenile and Moulting hormones, Chemicals based on communication system: Allelochemicals, Semiochemicals Pheromones, Light & Pheromone traps and green pesticides	15

Reference Books:

1. Bio-pesticides and Pest Management, G. S. Dhaliwal and Opendar Koul, 2007
2. Biological Insect Pest suppression by H. C. Cooper (Spingle verlag)
3. Agriculture use of Antibiotics by W.A. Moats.
4. Pesticide chemistry by J. Miyamoto and P. C. Kearney (Pergamum)
5. Hand Book of Pest Management in Agriculture, by D. Pimentel.
6. Biological pest control by N.W. Hussey and N. Scopes (Gland ford press)
7. Safer pesticides by E. Hodgson and R. J. Kuber (Dekker)
8. Insect sex pheromones by M. Jacobson (AP).
9. Control mechanisms in plant development by A.W. Gloston and P. J. Davies.

9. Scheme of Teaching

	Course Code	Teaching Scheme		
		Theory and Practical		
		Lectures + Tutorial/ (Hours/ week)	Practical (Hours/ week)	Credit
	SEMESTER III			
Major Mandatory	MMT-301	4	--	4
	MMT -302	4	--	4
	MMPR -303	-	8	4
Major Elective	MET-304	4		4
	MEPR-305		4	2
Research Project	RP-306	4	-	4
Total				**22**
	SEMESTER IV			
Major Mandatory	MMT-401	4	--	4
	MMT -402	4	--	4
	MMT-403	4	--	4
Major Elective	MET-404	4	--	4
Research Project	RP-405	--	--	6
Total		--	--	**22**
Total (Sem.- III + Sem.- IV)				**44**

10. Examination Pattern

	Course Code	Teaching Scheme			Examination Scheme					
		Theory and Practical			University Assessment (UA)			Internal Assessment (IA)		
		Lectures + Tutorial/ (Hours/ week)	Practical (Hours/ week)	Credit	Maximum Marks	Minimum Marks	Exam. Hours	Maximum Marks	Minimum Marks	Exam. Hours
Semester-III										
Major Mandatory Theory	MMT-301	4	--	4	80	32	3	20	8	1
	MMT - 302	4	--	4	80	32	3	20	8	1
	MMPR -303	-	8	4	100	40	3	-	-	-
Major Elective Theory	MET-304	4		4	80	32	3	20	8	1
	MEPR-305		4	2	50	16	2	-	-	-
Research Project	RP-306	4	-	4	100	40	3	--	8	1
Total				22	490	--	--	60	--	--
Semester-IV										
Major Mandatory Theory	MMT-401	4	--	4	80	32	3	20	8	1
	MMT - 402	4	--	4	80	32	3	20	8	1
	MMT - 403	4	--	4	80	32	3	20	8	1
Major Elective Theory	MET-404	4	--	4	80	32	3	20	8	1
Research Project	RP-405	--	12	6	150	60	5	--	--	--
Total		--	--	22	470	--	--	80	--	--
Total (Sem III + Sem IV)		--	--	44	960	--	--	140	--	--

11. Equivalence of courses

M. Sc. Part I (Semester III and IV)

Old Course				Equivalent Course		
Sem. No.	**Course Code**	**Title of Old Course**	**Credit**	**Course Code**	**Title of New Course**	**Credit**
III	CC-301	Pesticide Residues and Toxicology	4	**MMT 301**	Toxicology and Analytical Techniques of Pesticides	4
	CC-303	Analysis of Agrochemicals	4			
	CC-304	Diseases of Vegetables, Fruit Trees, Plantation Trees, Forest trees and Ornamental Plants	4	**MMT 302**	Diseases of Fruit Trees, Forest Trees, Plantation Trees and Ornamental Plants	4
	CC-302	Pests of Crop Plants and Their Control-I	4	**MET 304**	Agricultural Insect Pests	4
				RP- 306	Research Project	4
IV	CC-401	Agro-based Marketing Management	4	**MMT 401**	Agricultural Marketing Management	4
	CC-403	Manufactures of Agrochemicals	4	**MMT 402**	Manufacturing of Agrochemicals	4
	CC-402	Pests of Crop Plants and Their Control-II	4	**MET 404**	Insect Pests and Their Control	4
	CC-404	Agricultural Biotechnology and Integrated Disease Management	4	**MMT 403**	Biotechnology and Integrated Disease Management	4