



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, अभ्यासमंडळे विभाग दूरध्वनी विभाग ०२३१-२६०९०९४

99



जा.क्र.शिवाजी वि. / अमं / 732

दिनांक. 09 / 10 / 2023

प्रति,

मा. अध्यक्ष व सदस्य,
सर्व अभ्यास / अस्थायी मंडळे (सायन्स)
शिवाजी विद्यापीठ, कोल्हापूर

विषय :- शैक्षणिक वर्षे 2023-24 पासून एम.एस्सी. अभ्यासक्रमाच्या आराखड्या (Structure) बाबत.

महोदय / महोदया,

उपरोक्त विषयास अनुसरून आदेशान्वये कळविण्यात येते की, राष्ट्रीय शैक्षणिक धोरण, 2020 ची राज्यातील अंमलबजावणीच्या अनुषंगाने विद्यापीठ अधिकार मंडळाच्या निर्णयानुसार शैक्षणिक वर्षे 2023-24 पासून एम.एस्सी. अभ्यासक्रमासाठी सोबत जोडलेला कॉमन आराखडा (Structure) व Formatting (Templet) लागू करण्यात आले आहे याची नोंद घ्यावी.

सदरची बाब सर्व शिक्षक, विद्यार्थी व संबंधीतांच्या निदर्शनास आणावी.

कळावे,

आपला विश्वासू

(डॉ. एस. एम. कुबल)
उपकुलसचिव

प्रत:-

प्र.अधिष्ठाता विज्ञान व तंत्रज्ञान विद्याशाखा
मा.संचालक परीक्षा व मुल्यमापन मंडळ
परीक्षक नियुक्ती विभाग-1,2
सर्व परीक्षा विभाग (ऑन)

माहितीसाठी व पुढील योग्य त्या कार्यवाहीसाठी.



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शिवाजी विद्यापीठ, कोल्हापूर - ४१६ ००४, महाराष्ट्र

दूरध्वनी - ईपीएबीएक्स - २६०९०००, अभ्यासमंडळे विभाग दूरध्वनी ०२३१-२६०९०९३/९४



SU/BOS/Science/499

Date: 10/07/2023

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-I (Sem. I & II) as per NEP-2020** 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-I (Sem. I & II) as per NEP-2020 degree programme under the Faculty of Science and Technology.

M.Sc.-Part I (Sem. I & II) as per NEP-2020			
1.	Microbiology (HM)	10.	Data Science
2.	Pharmaceutical Microbiology (HM)	11.	Computer Science
3.	General Microbiology	12.	Information Technology (Entire)
4.	Electronics	13.	Food Science & Technology
5.	Embedded Technology	14.	Food Science & Nutrition
6.	Geology	15.	Biochemistry
7.	Sugar Technology (Entire)	16.	Biotechnology
8.	Alcohol Technology (Entire)	17.	Medical Information Management
9.	Agro Chemical & Pest Management (AGPM)	18.	Environmental Science
		19.	Physics

This syllabus, nature of question and equivalence shall be implemented from the academic year 2023-2024 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2023 & March/April 2024. 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	8	P.G. Admission/Seminar Section
2	Director, Board of Examinations and Evaluation	9	Computer Centre/ Eligibility Section
3	The Chairman, Respective Board of Studies	10	Affiliation Section (U.G.) (P.G.)
4	B.Sc. Exam/ Appointment Section	11	Centre for Distance Education

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 2023-24)

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1. Preamble

Shivaji University since its inception, has successfully tried to meet the regional demands of socio-economic development by introducing need based course. Agrochemicals and Pest Management course is introduced by Shivaji University, Kolhapur. The course is ideally accomplished by having chemical analysis, analytical techniques applied entomology and plant pathology with fairly good knowledge of formulation technology, extension work, marketing of agrochemicals, plant protection equipments, sales and services. Students have one month industrial training especially in pesticide and fertilizer industries, extension and marketing agencies. So that, they have a good knowledge what goes in industries and application of knowledge. Today there is a great demand for this course, as student have realized that it has better chance of getting jobs in this world of competition and initiate the entrepreneurship. Biological control of insect pest is an important component of this course, students have been taught about various entomopathogens like predators, parasites and various bio-pesticides.

2. Duration:

The course shall be a full time course.

The duration of course shall be of Two years four semesters.

3. Eligibility for Admission

Admission to the course for the candidate passing B. Sc. degree with Chemistry/ Botany/ Zoology/ Microbiology/ Biotechnology/ Biochemistry and B. Voc. Agriculture from Non-Agriculture University, and B. Sc. Agriculture and Horticulture from Agriculture University. However, one must be Chemistry/ Botany / Zoology out of three subjects as principal or subsidiary subjects.

Candidate will be selected through entrance exam and fulfilling the conditions laid by as per the University rules.

Merit list will be prepared based on the performance at B. Sc. III level and entrance examination (weightage 50:50), and for other university candidates only entrance exam marks will be considered.

4. Medium of Instruction: The medium of instruction shall be in English.

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 – I (Level-6.0)

	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-I										
Major Mandatory	MMT-101	4	--	4	80	32	3	20	8	1
	MMT -102	4	--	4	80	32	3	20	8	1
	MMPR -103	-	8	4	100	40	3	-	-	-
Major Elective	MET-104	4		4	80	32	3	20	8	1
	MEPR-105		4	2	50	20	2	-	-	-
Research Methodology	RM-106	4	-	4	80	32	3	20	8	1
Total				22	470	--	--	80	--	--
Semester-II										
Major Mandatory	MMT-201	4	--	4	80	32	3	20	8	1
	MMT -202	4	--	4	80	32	3	20	8	1
	MMPR -203	-	8	4	100	40	3	-	-	-
Major Elective	MET-204	4		4	80	32	3	20	8	1
	MEPR-205	-	4	2	50	16	2	-	-	-
OJT/FP	OJ-206	-	-	4	100	40	3	-	-	-
Total				22	490	--	--	60	--	--
Total (Sem I + Sem II)				44	960	--	--	140	--	--

<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • Total Marks for M.Sc.-I : 1100
	<ul style="list-style-type: none"> • Total Credits for M.Sc.-I (Semester I & II) : 44
	<ul style="list-style-type: none"> • <i>Separate passing is mandatory for University and Internal Examinations</i>
*Evaluation scheme for OJT/FP shall be decided by concerned BOS	
<ul style="list-style-type: none"> • Requirement for Entry at Level 6.0: Students can entry after completion of B. Sc degree in Botany/ Zoology/ Chemistry/ Agriculture and qualifying MSc Entrance exam. 	
<ul style="list-style-type: none"> • Requirement for Exit after Level 6.0: Students can exit after completion of Level 6.0 with Post graduate Diploma in Agrochemicals and Pest Management 	
<ul style="list-style-type: none"> • Requirement for Entry at Level 6.5: Students can enter after completion of Level 6.0 with Post graduate Diploma in Agrochemicals and Pest Management 	

6. Programme Outcomes (POs)

- **Domain Specific knowledge:**
 1. Apply the knowledge agrochemicals to the solution of agricultural related issues.
 2. Students trained that they can gain good knowledge of theoretical and practical skill of experimentation.
 3. Assigned on entomology, pathology and it deeply covered most of the aspects of modern pest management and control views. It helps to build their career in various fields like development of pest control, rearing of pest, synthesis of pesticides.
- **Modern tool usage:**
 4. Create, select, use appropriate pesticide techniques with modern tools including forecasting pests and identification of various diseases of crops.
 5. Create, select, and apply appropriate techniques, resources, and modern tools including prediction and modeling to identification of various diseases.
- **Ethics:**
 6. Apply ethical principles and commit to professional ethics and responsibilities and norms of the agricultural practice.

- **Individual and team work:**
7. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- **Communication:**
8. Communicate effectively on basic problems and their solution with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **Life-long learning:**
9. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

7. Course Codes

Sr. No.		Title of the Paper	Course Code	
		Semester I		
		Major Mandatory	Lectures	Practical
1	MMT-101	Chemistry of Soil, Pesticide and Formulation (4 credit)	MSU0325MML91G1	
2	MMT -102	Introduction to Agronomy and Crop Protection (4credit)	MSU0325MML91G2	
3	MMPR-103	MMPR Practical Lab-I MMT(101+102) (4 credit)		MSU0325MMP91G1
		Major Elective		
4	MET-104	Basic Entomology (4 credit)	MSU0325MEL91G1	
5	MEPR-105	MEP Practical Lab-II (2 credit)		MSU0325MEP91G1
6	RM-106	Research Methodology (4 credit)	MSU0325RML91G1	
		Semester II		
		Major Mandatory		
7	MMT-201	Pesticide Formulation and Analytical Techniques for Agrochemistry (4credit)	MSU0325MML91H1	
8	MMT-202	Plant Diseases and its Management (4credit)	MSU0325MML91H2	
9	MMPR-203	MMP Practical Lab-III MMT(201+202) (4credit)		MSU0325MMP91H1
		Major Elective		
10	MET-204	E 201: Economic Entomology	MSU0325MEL91H1	
11	MEPR-205	MEP Practical Lab- IV (2 credit)		MSU0325MEP91H1
12	OJ-206	On Job Training	MSU0325OJ91H	

8. Syllabus

Department of Agrochemicals and Pest Management

M. Sc. Part I (Level 6.0) (Semester - I)

(NEP-2020)

(Introduced from Academic Year 2023-24)

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 fundamental concepts in Pesticides and their formulation techniques
2. Basic concepts of Chemistry of soil and different fertilizers and manures, micronutrients

MMT 101: Chemistry of Soil, Pesticide and Formulation

Unit No.	Content	No. of lectures
I	<p>Soil Science, Fertilizers and Manures:</p> <p>Soil Science: Importance of Soil formation, Properties and Composition of Soils, Soil profile, Organic matter in soil, Soil micronutrients, Acidic and Alkaline soils, Absorption of toxic metals and chemicals by soil, Effects of modern agrotechnology and pesticides on soil.</p> <p>Fertilizers: Classification and types of fertilizers, Essential fertility requirements: Nitrogenous fertilizers: Ammonium nitrate, Urea, Calcium Ammonium Nitrate, introduction, Raw materials and Mode of action of the fertilizers. Phosphate fertilizers: Normal Super Phosphate, Triple Super Phosphate, Ammonium Phosphate. Potassic fertilizers, Mixed fertilizers and positions of Fertilizer Industries in India.</p> <p>Manures: Humus and decomposition of organic matter in soils, Compost, composting of agriculture and city wastes, Manures, Role of Micro-organisms in the process. Types and Chemical properties of Manures. Application of Organic Manures, Soil fertility and Vermi-culture and Vermi-composting.</p>	15

II	<p>Chemistry of Pesticides:</p> <p>Introduction: History of pesticides, Innovation in pesticide chemistry, Development of Pesticides, Classification of Pesticides with respect to their Synthesis, Chemistry, Metabolites, Environmental fate. Insect attractants, Chemosterilants and Repellents.</p> <p>Organic Pesticides: Malathion, Monocrotophos, Dimethoate, Phosphamidon, Chlorpyrifos, Quinolphos, Acephate, Ethephon, Temephos and Triazophos.</p> <p>Inorganic pesticides: Fungicides, Fumigants, Rodenticide, Herbicides</p>	15
III	<p>Formulation: Introduction of pesticide formulations: Definition, History, Purpose, Types and Codes, Brief account of main types. Study of conventional formulations: Dusting, Powders/ Dust Formulations (DP), Granules (GR), Water Dispersible Powders/Wettable powders (WDP/WP), Soluble Concentrates (SC), Emulsifiable concentrates (EC), Ultra Low volume (ULV) with respect to their ingredients, advantages and disadvantages, Role of adjuvants in pesticide formation, Introduction to controlled release of pesticide formulation.</p>	15
IV	<p>Formulation Packaging: Introduction and current trends in packaging, Packaging for liquid Formulations: Rigid plastics (HDPE, PET), EVOH, PA, Packaging for Solid Formulations: Polyethylene, laminates (LDPE, aluminum foil, LDPE plus ether, PP, PET, PA), paper, Water-soluble films and paper for pesticide packaging (Dust, EC, SC, WP, WDG).</p> <p>Pesticide Application and Devices Dusters and Sprayers for Pesticide Application, Types of Nozzles, Calculating Formulation Amount for Field Application.</p>	15

Reference Books:

1. Bear: Chemistry of the Soil (ACS Remhold).
2. M. B. Green, G. S. Hartley and T. F. West: Chemicals for crop improvement and pest management (Pergamon).
3. D. N. Shreve: The Chemical process Industries.
4. W. L. Badger and J. T. Bandhiro: Introduction to chemical Engineering (McGraw Hill).
5. B. K. Sharma: Industrial Chemistry by B. K. Sharma.
6. Outline in Chemical Technology by Gopal Rao.
7. Handbook of Pest Management in Agriculture Vol. I, II D. Pimentel.
8. N. N. Melnikov: Chemistry of Pesticides (English) Springer.
9. M. B. Green, G. S. Hartley, T. F. West, Chemical for Crop Improvement and Pest Management (Pergamon).
10. R. Clemlyn: Pesticides.
11. K. H. Buchel: Chemistry of Pesticides
12. Chemistry of insecticides and fungicides by Sree Ramulu.
13. Pesticides – Ed. G.S. Dhaliwal and B. Singh.
14. Agro-bases industries & pesticide formulations (Modern pesticides industry & their formulations): S. B. Shrivastava & V. K. Agrawal – Small Business Pub.

15. Pesticide formulations & Agro based, chemical, food & paper product: R. K. Goel & R. K. Gupta - Small Business Pub.
16. Pesticide formulation- recent development and their application in developing countries: Wade Van Valkenburg, B. Sugavanam, Sushil K. Khetan, UNIDO, Year 1998 Edition: Ist Reprint: 2008.
17. Pesticide Formulation and Adjuvant Technology: Foy C. L. and Pritchard D. W. CRC Press(2008).

MMT 102: Introduction to Agronomy and Crop Protection

Unit No.	Content	No. of lectures
I	Agronomy of crop plants: Introduction, Cultivation of important crops, Cereals and Millets: Paddy, Wheat Sorghum and Maize. Pulses: Chick pea, green gram, Black gram and Pigeon Pea. Oil Seeds: Soybean, Sunflower and Ground nut. Cash crops: Sugar cane, Tobacco and cotton. Vegetables: Tomato, Capsicum, Cabbage and Cauliflower with respect to soil, climate, varieties, fertilizer requirement and management of pests and diseases.	15
II	Seed Technology: Introduction, Characteristics of improved of seeds, seed production technology in cereals, pulses, vegetables oil seeds and Cash crops (Any two examples each), seed certification act, seed certification procedure and seed certification agencies in India.	15
III	Weed Science: Definition, Characteristics of weeds, classification of weeds, morphology of weeds (any Ten weeds associated with crops studied for agronomy), dispersal of weeds, assessment of losses by weeds, Allelopathic effect on crop plants and physical, chemical and biological methods of weed control.	15
IV	Introduction to Pathology: Introduction, Classification, Plant pathogens (Bacterial, Fungal, viral, mycoplasma, nematodes), Pathogenesis, symptoms and symptomology, Identification of Plant diseases and epidemiology, survival of pathogen. Modern techniques of disease diagnosis-immunological assay and disease forecasting models.	15

Reference Book:

1. Principales of Agronomy (2011), Reddy and Reddy: Kalyani Publication.
2. Principales of Agronomy (2012), S. R. Reddy: Kalyani Publication.
3. Handbook of Agriculture (2013) Indian council of Agriculture research new delhi.
4. Dry land horticulture, Deshmukh and Ingale.
5. Handbook of Horticulture (2013), K. L. Chadha.
6. Handbook of Horticulture, Mangala Rai, Indian council of Agriculture research new Delhi.
7. Fundamentals of Agriculture, Vol 1 and 2, Arun Katayan: Kushal Publication.
8. Seed Technology (2013), Rattanlal Agrawal, Oxford and IBH publishing company.
9. Seed Technology and Horticultural crops, Greetharani: Narendra publication new Delhi.
10. Seed Technology. Karanth Aprova, Black prints India INC New Delhi.
11. Seed programming management system and concepts (1997), Dadheek.
12. Weed Sciences basics and applications (2016), P. K Das: Jain Brothers.
13. Text book on weed science principles and practices (2019), A. Veeramani.
14. Principles of weed science (2000), V.S. Rao.
15. Weed science and management (2016), N. P. Yaduraju, A. R. Sharan, T. K. Das: Indian society of agronomy.

MET 104: Basic Entomology

Unit No.	Content	No. of lectures
I	Introduction to Entomology: Introduction, Distribution and diversity of insects, Insect collection, mounting, preserving and labelling, Classification of insects up to family, Structure and chemistry of integument, Cuticular modifications, moulting, Sclerotization.	15
II	Morphology, Anatomy and Physiology of Insects: General characters, description and morphology of the model insect (Grasshopper /Cockroach) Head, Thorax and Abdomen. Anatomy and Physiology of the Insect: Digestive system, Nervous system, Excretory system, Reproductive system and Circulatory system.	15
III	Pest population and crop losses: Definition of pest, why insects assume pest status, Abiotic and biotic factors influencing pest populations, Measurement of pest population, Changing status of pests, classification of pests based on damage and feeding habitat, Economic threshold level, Economic injury level.	15
IV	Pest surveillance and forecasting: Introduction, Pest surveillance and their objectives, Components of pest surveillance, Factors affecting survey, Pest forecasting and their types, Methods of forecasting, Systems analysis and modelling, Database management and computer programming, Simulation techniques.	15

Reference Books:

1. A textbook of Entomology by A. D. Imm.
2. Modern entomology by Tembhare, D. B.
3. Introduction to Entomology by M. S. Mani.
4. A textbook of Applied Entomology by K. Shrivastava.
5. Agriculture Entomology by K. M. Smith.
6. Principles of Forest Entomology by Graham & Night.
7. Agricultural Entomology by S. Pradhan.
8. Agricultural pests of South Asia and their management by Atwal, A. S. and Dhaliwal, G. S.
9. Physiological systems in Insects – M. Klawdon.

Research Methodology (RM-106)

Unit No.	Content	No. of lectures
I	Instrumentation Techniques: pH Metry: Introduction, Instrumentation of pH Meter; glass electrode, reference electrode, Measurement of pH and its application in the pH soil and water sample. Electrical conductivity: Electrical conductivity of electrolyte, Conductivity meter, Specific and Equivalent conductance, Applications of conductivity measurement in the analysis of salinity and salt content of the soil.	15
II	Potentiometry: Introduction, Types of electrodes, Instrumentation, Working and measurement of EMF, Applications for measurement of pH. Kjeldahl Nitrogen Analysis Method: Introduction, Principle, Instrumentation, Applications related to Agrochemicals. Flame Photometer: Introduction, Principle, Instrumentation, Applications related to Agrochemicals.	15
III	Toxicity Test of Insecticides Toxicity terms, Toxicity tests, Principles of bioassay, Factors affecting toxicity, Criteria for bioassay, Preparation of stock solutions, Bioassay procedures, Utility of bioassay, Limitation of bioassay, Toxicity test against higher animals, Acute and chronic toxicity.	15
IV	Biostatistics in Research Collection of data, Tabulation, Frequency distribution, Graphical presentation of data, Measure of central tendency, measure of dispersion, standard deviation, standard error. Probability and Probability distribution, Binomial, Poisson and Normal distribution. Correlation and Regression, Hypothesis testing and test, Student t-test, Chi- square test, Analysis of Variance.	15

References:

1. A text of Inorganic Quantitative analysis by A. I. Vogel.
2. Methods of pesticide analysis by Shree Ramulu.
3. A text book practical organic chemistry including qualitative and quantitative analysis by A. I. Vogel.
4. Instrumental methods of chemicals analysis by Willard, Meritt & Dean.
5. Analytical agricultural chemistry by Chopra & Kanwar.
6. Fundamentals of Statistics- Gupta S. C.
7. Basic Biostatistics and its applications- Datta A. K
8. Biostatistics and Biometry- Parihar and Parihar.
9. An Introduction to statistical Methods- C. B. Gupta.
10. Introduction to Biostatistics by Larry Winner, Department of Statistics, University of Florida.

Semester-I Practicals (MP101 & MP 102)
(MMPR 103) Chemistry (Based on MMT 101)

1. To estimate amount of Copper from Copper Fungicide.
2. To estimate amount of sulfur from given Sulfur Fungicide.
3. Determination of amount of Nitrogen from given fertilizer sample.
4. Estimation of Calcium from superphosphate sample.
5. Determination of salinity of given soil sample by conductometrically.
6. Estimation of amount of phosphorous from given soil sample by calorimetrically.
7. Determination of concentration of sulphate ions from water by nephelometrically.
8. Estimation of nitro group by stannous chloride method.
9. Estimation of Simazine by colorimetric method.
10. Estimation of Ziram by hydrolysis method.
11. Analysis of organic manures.
 - A) Moisture content.
 - B) Organic matter and ash content.
12. Determination of total sulphur in soil sample.
13. Determination of apparent specific gravity or bulk density, particle density or true density of the soil, water holding capacity of the soil.
14. Analysis of mixed fertilizers and micronutrients.
15. Submission of quality analysis of three inorganic and three Major nutrients N, P, K.
16. Any Suitable experiment may be added whenever necessary.

(MMPR 103) Plant Pathology (Based on MMT 102)

1. Agronomic study of cereals and millets (As per theory)
2. Agronomic study of pulses and oilseeds (As per theory)
3. Agronomic study of Vegetables and cash crops (As per theory)
4. Analysis of certified seed qualities –seed viability and germination test
5. Estimation of carbohydrates, proteins and lipids from seeds
6. To study morphological characters of weeds (As per theory)
7. To study allelopathic effect of weeds on crops seed germination
8. To study assessment of crop losses by weeds
9. To study structural defence mechanism in plants against pathogen infection
10. To study biochemical defence mechanism in plants against pathogen infection

Any Suitable experiment may be added whenever necessary.

(MEPR 105) Basic Entomology Practicals (Based on MET-104)

1. Methods of diagnosis and detection of various insect pests
2. Methods of insect pests sampling
3. Monitoring of insect pest population
4. Dissection of insect (Cockroach/ Grasshopper) digestive, excretory, reproductive and nervous system
5. External features of grasshopper
6. Types of insect antennae, mouthparts and legs.
7. Collection of various crop pests, identification, and submission
8. Study the characters of orders Orthoptera, Dictyoptera, Odonata, Neuroptera, Isoptera, Thysanoptera and their families
9. Any suitable experiment may be added, whenever necessary.

M. Sc. Part I (Semester - II)

MMT 201: Pesticide Formulation and Analytical Techniques for Agrochemistry

Unit No.	Content	No. of lectures
I	<p>Carbamate Pesticides Study of following compounds bases on Synthesis, Mode of action, Structure - Activity relationship. Carbamates, Thiocarbamic acids, Oximecarbamates, Pendimethalin, Aldicarb, Primicarb, MBC, Zineb, Carbaryl and Carbofuran,</p> <p>Pyrethroids and Other Natural Pesticides: Introduction, History, Synthesis of Alicyclic Carboxylic acids and derivatives, Pyrethrins and their synthetic analogues, Fenvalerate, Fluvalinate, Permethrin, Deltamethrin, Cypermethrin, Bio-allethrin, Resmethrin etc.</p>	15
II	<p>Important parameters of pesticides formulations: Factors affecting quality of pesticides: Particle size, Bulk density, Flowability, Electrostatic charge, Sorptivity, Compatibility and their effects on the stability, rainfastness and shelf life of formulation, Rheological properties</p> <p>Tests for quality control: A brief introduction on specifications of pesticides: Technical and formulations (WHO/ FAO/BIS), Methods of analysis, Physical properties of formulations- Suspensibility, Wettability, Emulsion stability, Wet sieve test, Acidity, Alkalinity, Moisture content, Flash Point, Specific gravity, Persistent foaming, Water runoff test, Dry sieve test etc. and their significance during the field application.</p>	15
III	<p>Non-Instrumental Techniques: Acid-base Titrations: Acid base titrations, acid-base indicators, Redox titrations, Determination of halide ions by Complexometric titration, Precipitation titrations, Gravimetric estimation of SO₄ and Fe .</p> <p>Separation Techniques: Sampling of solids, liquids and gases; Principle, Instrumentation and application of thin layer chromatography, Paper chromatography, Column Chromatography, Ion exchange and ion chromatography.</p>	15
IV	<p>Instrumentation Techniques: Flame Photometry: Principle, Instrumentation, Components, Emission measurement techniques, Atomization, Applications in the estimation of Na, K, Ca;</p>	15

	Atomic Absorption Spectroscopy: Principle, Instrumentation, production of atoms, ions and their applications in the analysis of Soil, Water and Pesticides.	
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Reference Book:

1. N. N. Melnikov: Chemistry of Pesticides (English) Springer.
2. M. B. Green, G. S. Hartley, T. F. West, Chemical for Crop Improvement and Pest Management (Pergamon).
3. R. Clemlyn: Pesticides.
4. K. H. Buchel: Chemistry of Pesticides.
5. H. B. Scher: Advances in pesticides formulation Technology. ACS, NO.254.
6. J. Miyamoto & P.C. Jearney: Pesticide Chemistry Vol. IV (Pergamon).
7. W. Valukenburg: Pesticide formulations (Dekker).
8. Chemistry of Insecticides by U. S. Sree Ramulu
9. Agrow Reports: New Developments in Crop Protection Product Formulation - Alan Knowles DS243, Pub: T & F Informa UK, 2005.
10. CIPAC Hand Book Volume F Analysis of Technical and Formulated Pesticides Editors: W Dobrat A Martijn Pub: Collaborative International Pesticides Analytical Council Limited England 1994.
11. Pesticide Formulations: Van Wade. Velkenburg Marcel & Delker, Published by Marcel Dekker, New York, ISBN 10: 0824716957 / ISBN 13: 9780824716950, 1973.
12. Pesticide Formulation: Theory: B. S. Parmar, S. S. Tomar, CBS Publishers and Distributors. (2008).
13. A text of Inorganic Quantitative analysis by A. I. Vogel.
14. Methods of pesticide analysis by Shree Ramulu.
15. A text book practical organic chemistry including qualitative and quantitative analysis by A. I. Vogel.
16. Instrumental methods of chemicals analysis by Willard, Meritt & Dean.
17. Analytical agricultural chemistry by Chopra & Kanwar.
18. Analysis of pesticide residues by H. A. Moye.
19. Instrumental Methods of Chemical Analysis- Willard, Merrit and Dean.
20. Pesticide Analysis- K.G. Das.

MMT 202: Plant Diseases and its Management

Unit No.	Content	No. of lectures
I	<p>Diseases of cereals and millets: Casual organism, symptoms, life cycle and control measures offollowing crops.</p> <p>Paddy: Bacterial leaf blight, Sheath blight, Blast of rice and False smut Wheat: leaf blight, Black and Brown rust, Powdery mildew and Loose smut. Sorghum: Bacterial leaf spot, Bacterial leaf streak, Anthracnose and Rust. Maize: Leaf blight, Leaf spot, Rust and Downey mildew</p>	15
II	<p>Pulses: Casual organism, symptoms, life cycle and control measures offollowing crops. Chick pea: Wilt, Rust and Powdery mildew Green gram: Anthracnose, Rust and Yellow mosaic virus Black gram: Leaf spot, Blight, Rust and Yellow mosaic virus Pigeon Pea: Anthracnose, Leaf spot and Blight.</p>	15
III	<p>Oil Seeds and Cash crops: Casual organism, symptoms, life cycle and control measures offollowing crops.</p> <p>Soybean: Rust, Downey mildew and Bacterial blight Sunflower: Leaf spot, Downey mildew and Bacterial blightGround nut: Early and late leaf spot and rust Sugarcane: Red rot, Grassy shoot, Red stripe and RustCotton: Bacterial Blight, Leaf spot and leaf curl Tobacco: Dumping off, frog eye leaf spot and Tobacco mosaic disease</p>	15
IV	<p>Diseases of Vegetables: (Bacterial Fungal, Viral) Causal organism, symptoms, life cycle and control measures offollowing vegetable crops. Tomato: Damping off of seedling, Late and early blight, Fusarium andbacterial wilt. Brinjal: Leaf spot (Alternaria and Cercospora) and Blight Bhendi: Powdery mildew, Cercospora Leaf spot and Fusarium wilt. Chillies: Cercospora Leaf spot, Powdery mildew and mosaic of chilli Cluster Beans: Powdery mildew, Anthracnose and Bacterial blight Bitter guard and Ridge guard: Cercospora and bacterial leaf spot, Powdery mildew and cucurbit mosaic.</p>	15

Reference Book:

1. Plant Pathology (2012), Gorge and agriose: ELESEVAR.
2. Diseases of crop plants in India, Rangaswami: PHL learning publisher pvt.
3. Plant Pathology, Mehrotra and Agrawal. MC graw hill edu new Delhi.
4. Plant Diseases. R.A Singh: Oxford and IBH publishing company.
5. Plant Pathology, Pande BP: S Chand and company new Delhi.
6. Pathological problems of economical crop plants and their management by paul khurana, S. M. (1998).
7. Fungi and plant diseases by Mundkur B. B. (1995).
8. Tropical plant diseases by turston H.D.
9. Integrated disease management and palnt health by gupta V.K. and Sharma R.C.
10. Diseases of millets by Ramkrishnan, T.S. ICAR. Publication new Delhi.
11. Fungal diseases of rice in India by padmanavhal S. Y. ICAR. Publication new Delhi.
12. Plant diseases (1963) by sing R.S.

MET 204: Economic Entomology

Unit No.	Content	No. of lectures
I	Household and stored grain insect pests Household pests: House fly, Mosquitoes Bed bug, Head louse, Rat flea, Black ants, Sliver fish, Cockroach, and Stored grain insect pest: Rice weevil, Pulse beetle, Khapra beetle, Red floor beetle, Lessor grain borer, Angoumois grain moth, Rice moth Indian meal moth Classification, Biology, damage/nuisance and control measures.	15
II	Nematodes and vertebrates pests Introduction, Cereal cyst nematodes (<i>Heterodera spp</i>), Root knot nematode, Root lesion nematodes Seed gall nematode and Stem nematode biology, economic importance and control measures. House sparrow, Green bee-eater, Rose ringed parakeet, Rats and mice, Fruit bats, Monkey, Jackal, Indian porcupine, Wild boar damage and control, Snail and slugs damage and management.	15
III	Beneficial insects Sericulture: Mulberry cultivation and Rearing of Silkworms; Pest and Disease management of Mulberry and Silkworm, Economics of Sericulture. Apiculture: Types of honey bees, Life cycle, Bee keeping equipment's, Honey quality, Pest and disease management Agriculture and Non-Agricultural Flora and Bee keeping. Lac culture: Host plants, Life cycle, Lac culture practice.	15
IV	Bio-control agents: Introduction of biological control agents, Predators and Parasitoids, Biological control approaches, Classical biological control, Augmentation, Conservation, Role and impact strategies of biological control, Conservation and Habitat management. Microbial control: History, Principal groups of pathogens, Bacteria (<i>Bacillus thuringiensis</i>), Fungi (<i>Beauveria bassiana</i>), Viruses (NPV), Protozoa (<i>Nosema</i>) and applications methods, <i>Trichogramma chilonis</i> , <i>Cryptolaemus montrouzieri</i> mass production and uses.	15

Reference Books:

1. A textbook of applied entomology by Srivastava.
2. Sericulture and pest management by Sathe & Jadhav.
3. Modern Entomology by Tembhare.
4. Integrated Pest Management: Concept and Approaches by Dhaliwal & Arora
5. Pests of Stored grain products Burgess by R. T. Cotton.
6. A textbook of Applied Entomology by K. Shrivastava.
7. Store grain pests and their management, Khare, S. P., Kalyani Publications
8. A text book of Plant Nematology, Upadhyay and David – Aman Publishing.
9. General and Applied Entomology, David & Ananthakrishnan
10. Bio-pesticides and pest management by Dhaliwal & Koul
11. Agricultural pests of South Asia and their management by Atwal & Dhaliwal.
12. A text book of plant nematology by Upadhyay & Dwivedi

Semester-II Practicals

(MMPR 203) Chemistry: Practical (Based on MP 201)

1. Determination of total hardness of water.
2. Determination of sulphate ion from given water.
3. Determination of amount of Calcium from given lime sample.
4. Determination of percentage purity of given sample of soda ash.
5. Determination of chloride ion in water sample by precipitation method.
6. Determination of percentage purity of boric acid using supplied sodium hydroxide.
7. To estimate copper from given soil sample by colorimetrically.
8. To determine phosphate from given water sample by colorimetrically.
9. To determine alkalinity of water sample.
10. Determination of percentage purity of 2, 4-D using alkali sodium hydroxide.
11. Determination of calcium carbonate in soil sample.
12. Determination carbonate and bicarbonate in given water sample titrimetrically.
13. Determination of emulsion stability and cold test of pesticide.
14. Determination of acidity or alkalinity of given pesticide sample.

Any Suitable experiment may be added whenever necessary.

Reference Books

- a. A Textbook of inorganic qualitative analysis by A. I. Vogel.
- b. Method of pesticide analysis by Shree Ramulu.
- c. Textbook of practical organic analysis including qualitative and quantitative analysis by A. I. Vogel

(MP 203) Pathology: Practicals (Based on MP 202)

1. Study of Agronomy of crop plant – As mentioned in theory.
2. Study of weeds-Dicot weeds, monocot weeds, poisonous weeds, noxious weeds, weed dispersal.
3. Seed viability test by TTC method (At least 3-4 diff seeds)
4. Seed scarification methods
5. Study of diseases from cereals, millets, fiber crops (As mentioned in theory syllabus)
6. Bio-stat: mean, median, mode S.D. with graphical presentation.
7. Determination of organic carbon in soil
8. Determination of calcium in soil.
9. Separation of amino acid by paper chromatography.
10. Determination of soluble sulfates from soil.
11. Estimation of sucrose percentage by Refractometer.
12. Any Suitable experiment may be added whenever necessary.

Reference Books

1. Introduction to Entomology by M. S. Mani.
2. A textbook of Entomology by A. D. Imm.
3. Agricultural pest of India and South East Asia by Atwal.
4. Agriculture Entomology by K. M. Smith.
5. A textbook of Applied Entomology by K. Shrivastava.
6. Plant Pathology 5th Edition by G. N. Agrios
7. Pathological problems of economic crop plant and their management by Paul and Khurana S. M., 1998.
8. Fungi and plant diseases by Mundkar B. B., 1972.
9. Soil and Plant Analysis by C. S. Piper (Hans Publisher).

(MEPR 205) Entomology Practicals (Based on MET 204)

1. Rearing of stored grain pests.
2. Rearing of silkworms.
3. Identification of biocontrol agents.
4. Mass production of Biocontrol agents.
6. To study the Pesticide appliances and their maintenance.
7. To study the characters of order Coleoptera and its families.
8. To study the characters of order Hymenoptera and Diptera and their families.
9. To study of characters of order Lepidoptera and its families.
10. To study of characters of order Hemiptera and its families.
11. Visit to Apiculture, Sericulture and Agriculture centers.
12. Collection of various crop pests, identification, and its submission.
13. Any suitable experiment may be added, whenever necessary.

9. Scheme of Teaching

	Course Code	Teaching Scheme		
		Theory and Practical		
		Lectures + Tutorial/ (Hours/ week)	Practical (Hours/ week)	Credit
	SEMESTER I			
Major Mandatory	MMT-101	4	--	4
	MMT -102	4	--	4
	MMPR -103	-	8	4
Major Elective	MET-104	4		4
	MEPR-105		4	2
Research Methodology	RM-106	4	-	4
Total				22
SEMESTER II				
Major Mandatory	MMT-201	4	--	4
	MMT -202	4	--	4
	MMPR -203	-	8	4
Major Elective	MET-204	4		4
	MEPR-205	-	4	2
OJT/FP	OJ-206	-	-	4
Total				22
Total (Sem I + Sem II)				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-I										
Major Mandatory	MMT-101	4	--	4	80	32	3	20	8	1
	MMT - 102	4	--	4	80	32	3	20	8	1
	MMPR - 103	-	8	4	100	40	3	-	-	-
Major Elective	MET-104	4		4	80	32	3	20	8	1
	MEPR-105		4	2	50	20	2	-	-	-
Research Methodology	RM-106	4	-	4	80	32	3	20	8	1
Total				22	470	--	--	80	--	--
Semester-II										
Major Mandatory	MMT-201	4	--	4	80	32	3	20	8	1
	MMT-202	4	--	4	80	32	3	20	8	1
	MMPR - 203	-	8	4	100	40	3	-	-	-
Major Elective	MET-204	4		4	80	32	3	20	8	1
	MEPR-205	-	4	2	50	16	2	-	-	-
OJT/FP	OJ-206	-	-	4	100	40	3	-	-	-
Total				22	490	--	--	60	--	--
Total (Sem I + Sem II)				44	960	--	--	140	--	--

11. Nature of Question Paper and Scheme of Marking

Theory:

There will be five descriptive questions, each question carrying 16 marks.

Question No.	Type of questions	Total marks (80)
01	Descriptive questions (Unit I)	16
02	Descriptive questions (Unit II)	16
03	Descriptive questions (Unit III)	16
04	Descriptive questions (Unit IV)	16
05	Write a note on (Any four out of six) (All Units)	16

Practical:

Question No.	Type of question	Total marks (50)
1	Experiment performance	20
2	Experiment performance	20
3	Certified Journal	05
4	Viva-voce	05

12. Equivalence of courses**M. Sc. Part I (Semester I and II)**

Old Course				Equivalent Course		
Sem No.	Course Code	Title of Old Course	Credit	Course Code	Title of New Course	Credit
I	CC-101	Chemistry of pesticides and their Formulations–I	4	MMT 101	Chemistry of Soil, Pesticide and Formulation	4
I	CC-102	Soil science, Fertilizers And Micronutrients	4			
	CC-104	Basic Concepts in plant pathology	4	MMT 102	Introduction to Agronomy and Crop Protection	4
I	CC-103	Introductory and Industrial Entomology	4	MET 104	Basic Entomology	4
				RM 106	Research Methodology	4
I	CCPR-105	Practical	8	MMPR	Practical	4
I				MEPR	Practical	4
II	CC-201-	Chemistry of pesticides and their Formulations–Ii	4	MMT 201	Pesticide Formulation and Analytical Techniques for Agrochemistry	4
II	CC-202-	Analytical techniques For agrochemicals	4			
II	CC-203-	Economic Entomology	4	MET 204	Economic Entomology	4

II	CC-204	Agronomy, Seed technology, Pathology, Weed Science And biostatistics	4	MMT 202	Plant Diseases and its Management	4
II	CCPR-205-	Practical	8	MMPR	Practical (MMT201+MMT202)	4
				MEPR	Practical (MET-204)	2
				OJ	On Job Training	4