SEMESTER –V			
Core Integral - I – Microbial Nanotechnology			
Code: 18UMII51	**Hrs/Week: 4**	**Hrs/Sem: 60**	**Credit: 4**

Vision:

To create the ability to be multi-skilled in the field of nanotechnology with good technical and instrumentation knowledge on various concepts and providing standard education and enabling the students to become entrepreneurs and socially responsible.

Mission:

To aware the basic knowledge about the basic nanotechnology and developing young students with active and creative minds in the field of nanotechnology.

Course Outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO- 1	acquire basic knowledge on nanotechnology	4	Un
CO -2	explain the basics of microbial applications of nanotechnology.	4	Un
CO -3	appreciate the structural and functional principles of nanomatreials.	4	An
CO- 4	grasp the fundamental knowledge about synthesis of nanomaterials.	4	Un
CO- 5	acquire basic knowledge about biosensors and types.	2	Ap
CO- 6	get knowledge about analysis of biomolecular nanostructures.	4,2	Un
CO -7	acquire knowledge on cancer diagnosis and treatment.	2,4	Ap
CO- 8	get knowledge about drug designing and delivery	2,4	Ap

SEMESTER –V			
Core Integral - I – Microbial Nanotechnology			
Code: 18UMII51	**Hrs/Week: 4**	**Hrs/Sem: 60**	**Credit: 4**

Unit I

Introduction to nanotechnology - Structural and functional principles of nanotechnology - Applications of nanotechnology. Bionanoparticles – Carbon nanotubes, Carbon nanocones.

Unit II

Nanotechnology : Nanoparticle synthesis by plants, bacteria and yeast. Methods of Nanobiotechnology - Analysis of bimolecular Nanostructures by Atomic Force Microscopy, Scanning Probe Electron Microcopy and XRD.

Unit III

Biosensors – optical nanosensors, multi-functional biochip (MFB) and Detection of the *Mycobacterium by MFB.*

Unit IV

Application of Nanobiotechnology in medicine – Cancer diagnosis and treatment, Drug designing and delivery.

Unit V

Nanotechnology and Food safety – Food Packaging and Processing. Nanotechnology in Agriculture – crop improvement and Pest management. Bio security

Text Books:

1. David. S. Goodsell. Jhonwiley 2006.*Bionanotechnology*: Lessons from Nature.
2. R. K. Rathi, 2009, *Nanotechnology* 1st Edition. S. Chand & Company Ltd, New Dehli.

Books for Reference:

1. Bernd Rehm, 2006.*Microbial Bionanotechnology*: *Biological Self-assembly Systems and Biopolymer-based Nanostructures*, Horizon Scientific Press.
2. Buddy D. Ratner, Allan S. Hoffman, Frederick J. Schoen and Jack E.Lemons. *Biomaterials Sciences: An Introduction to Materials in Medicine* 2nd Edition.
3. Christof M. Niemayer, Chad A. Mirkin, 2004. *Nanobiotechnology:* Concepts, Applications and perspectives, Wiley VCH publishers.
4. Fulekar M.H., 2010, *Nanotechnology: Importance and Applications*, I. K. International Pvt Ltd, New Delhi
5. JainK.K., Tailor L.,*Nanobiotechnology: Molecular Diagnosis*. Francis Group.

SEMESTER – V			
Core Integral – II- Vermitechnology			
Code:18UMII52	**Hrs/ Week: 4**	**Hrs/ Sem: 60**	**Credit:4**

Vision

To educate the students by ensuring the production of healthy food in a healthy way, we want to contribute to live in a healthy world.

Mission:

To contribute to global ecological economic recovery, profitable and sustainable way to produce high quality organic products and a healthy and positive results in agriculture is to be achieved.

Course Outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO- 1	select from, use and interpret results of descriptive vermi technology methods effectively.	6	Ev
CO -2	demonstrate an understanding the scientific and technological benefits to the rural sector by equipping them with the latest technology and to create the model for the nation	6	Ev
CO- 3	gain knowledge about the various morphology of earthworms	1	An
CO -4	communicate the awareness of field sampling using vermi compost	5	Un
CO- 5	make appropriate awareness of parasites and predators in vermi composting	5	Un
CO- 6	understand the awareness among the present status and importance of composting methods and vermi composting	4	An
CO- 7	understand the waste reduction in vermi composting	4	Un
CO -8	explain the nutrient availability in the vermi compost	6	Ev

SEMESTER – V			
Core Integral – II- Vermitechnology			
Code:18UMII52	**Hrs/ Week: 4**	**Hrs/ Sem: 60**	**Credit:4**

Unit-I:

Earth worm classification – Morphology and Anatomy. Biology of *Lumbricus terrestris*.Vermicomposting - Definition, introduction and scope - The nature of earthworms-soil environment - basic environmental requirements.

Unit-II:

Vermicomposting materials and their classification. Physical, chemical and biological changes brought by earth worm in soil structure-carbon, nitrogen and phosphorous transformations

Unit-III:

Vermicomposting methods - Optimal conditions for Vermiculture - temperature, moisture, pH, soil type, organic matter. Nutrient availability in vermi Compost.

Unit-IV:

Vermicomposting in Homes, Maintenance of vermicomposting beds. Harvesting the worms. Earth worm predators, parasites and pathogens. - Vermi wash. Vermi culture for waste reduction.

Unit-V:

Composting - Vermicomposting - Required conditions - Advantages - Role of vermicompost in plant growth and other applications, Field sampling- passive methods.

Text Book:

Mary Violet Christy. A., 2014, *Vermi Technology* - MJP Publishers, Chennai.

Books for Reference:

1. Edwards, C.A. and Bohlen, P.J. 1996, *Ecology of earthworms*-3rd Edition, Chapman and hall.
2. Jsmail, S.A., 1970, *Vermicology. The Biology of Earthworms.* Orient Longman, London.
3. Lee, K.E., 1985. *Earthworms - Their ecology and relationship with soil and land use*, Academic Press, Sydney.
4. Ranganathan L.S. 2006. *Vermibiotechnology from soil health to human health*.Agrobios India.
5. Gupta P.K. 2008. *Vermicomposting for sustainable Agriculture*. Agrobios. India.

SEMESTER-VI			
Core Integral–III- Cosmetic Microbiology			
Code :18UMII61	**Hrs/Week:4**	**Hrs/Sem: 60**	**Credit:4**

Vision:
To impart basic level information in the novel subject of Cosmetic microbiology.

Mission:
To enhance the knowledge on the applications of Cosmetic microbiology in various fields.

Course Outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO- 1	recall the history of cosmetic microbiology.	1	Re
CO- 2	explain about sanitary manufacturing in cosmetic manufacturing	2,5	Un
CO -3	infer practical knowledge about the microbiological targets of preservation	1,2,4	Un
CO- 4	explain the recent techniques on good manufacturing techniques in cosmetic microbiology	3,4,6	Un
CO- 5	demonstrate the quality and safety assurance in cosmetic industry and the hazard analysis and critical control point.	2,4,5,6	Un
CO- 6	apply the techniques in preservation of cosmetics	2,4,5,6	Ap
CO-7	have knowledge on cosmetic production	2,4	Cr
CO-8	get knowledge about analysis of cosmetic production	2,4	Cr

SEMESTER-VI			
Core Integral–III- Cosmetic Microbiology			
Code :18UMII61	**Hrs/Week:4**	**Hrs/Sem: 60**	**Credit:4**

Unit I

Introduction to cosmetic microbiology-History of cosmetic microbiology – Biology of microbes-Bacteria, growth, diversity, molds and yeast.

Unit II

Sanitary manufacturing in cosmetic manufacturing – Cleaning (Detergent ingredients & properties,Types of surfactants) – Sanitization(Physical &chemical sanitizers)-Cleaning & sanitizing equipments-Cleaning and sanitization procedures.

Unit III

Hazard Analysis and Critical Control Point (HACCP) protocols in cosmetic microbiology-Apply HACCP to cosmetics-Waste water removal and CIP system-Selecting Critical Control Points – Parameters of an effective HACCP program.

Unit IV

Cosmetic microbiology test methods preservative efficacy methods-CFTA methods-ASTM methods-Test for factors affecting preservative efficacy-Neutralizer evaluation-Rapid methods used in preservative testing-Microbial content testing.

Unit V

Validation methods – Model for validation-Validation of equipment cleaning & sanitization-Validation in microbiology laboratory- Preservation strategies-Scope and microbiological targets of preservation.

Textbook:

1. Daniel. K. Brannan. 1997. *Cosmetic Microbiology*. *A Practical Handbook*. CRC press.

Books for Reference :

1. Brannan , D.K.,DilleJ.C., and Kaufman, D.J.1987. Correlation of invitro challenge testing with consumer-use testing for cosmetic products, *Appl.Environ.Microbiol.,53.*
2. Halleck F.E.,1978. Thermal solution sterilization,*Pharm.Technol.,*June.
3. Pflug I.J.,and G.M.Smith. 1977. "the Use of Biological Indicators for Monitoring Wet-Heat Sterilization Processes.". In *Sterlization of Medical products.*(EDS. E.R.L. Gaughran and K.Kereluk), New Brunswick, N.J.,Johnson and Johnson.
4. Gardner J.F., and M.M.Peel.1991.*Introduction to Sterilization, Disinfection, and Infection Control.* Second Edition. Churchill Livingstone, Melbourne