Shiromani Gurudwara Prabandhak Committee's

Guru Nanak Khalsa College of Arts, Science and Commerce (Autonomous)

Matunga, Mumbai – 400 019, Maharashtra

Program: Master of Science

Syllabus

Course: MSc-II Nutraceuticals

Semester III and IV

(As per NEP guidelines-DSC model)

With effect from Academic Year 2024 - 2025)

Guru Nanak Khalsa College of Arts, Science and Commerce (Autonomous)

MOTTO

Essence of Wisdom is Service to Humanity

VISION

To emerge as a Centre of Excellence in Higher Education.

MISSION

To create strong analytical minds with scientific temper, fostering global competencies through the spirit of humanism thereby bringing about holistic development of the students by remaining in sync with the teachings of Guru Nanak Dev Ji.

QUALITY POLICY

To attain excellence in all our endeavors namely teaching, research and continuing education; adopt self-evaluation as a measure for continuous improvement and ensure accountability.
Based on the provided motto, vision, mission, and quality policy, programoutcomes for a science program of our college are:

PROGRAMME OUTCOMES (PO)

MASTERS IN SCIENCE (MSc)

Postgraduate Science Program Outcomes:

PO1	**Advanced Understanding:** Attain an advanced understanding of specialized scientific areas and theories, building upon undergraduate knowledge.
PO2	**Advanced Analytical Skills:** Develop advanced analytical and problem-solving skills for complex scientific issues.
PO3	**Research Proficiency:** Acquire proficiency in scientific research, contributing significantly to the advancement of knowledge.
PO4	**Leadership Skills:** Develop leadership skills to lead scientific initiatives and contribute to the scientific community.
PO5	**Interdisciplinary Collaboration:** Collaborate effectively with interdisciplinary teams for comprehensive scientific solutions.
PO6	**Innovation and Creativity:** Foster innovation and creativity in scientific research and practice.
PO7	**Professionalism:** Demonstrate professionalism and excellence in all scientific endeavors.
PO8	**Quality Improvement:** Embrace self-evaluation and continuous improvement for achieving excellence in scientific pursuits.

Programme: MSc Nutraceuticals

Programme Specific Outcomes (PSOs) for MSc in Nutraceuticals

Sr. No.	A student completing MSc in Nutraceuticals will be able to:
PSO 1	Demonstrate a systematic understanding of the fundamental concepts. Principles and processes in the field of Nutraceuticals and food technology.
PSO 2	Exhibit technical competence for verifying the organoleptic (Sensory), hygienic, and nutritional quality of foods using innovative methods.
PSO 3	Recognize, report, examine and solve multiple technical and organizational problems of food sector applying sustainable solutions to real world problems and develop technical knowledge to start up a food business.
PSO 4	Evaluate current issues and developments related to the nutrition discipline and propose/develop new insights applying knowledge and technology for development of safe nutritious and high-quality food products.
PSO 5	Acquire a deep scientific knowledge regarding the chemical and microbial characteristics, nutritive and functional properties, processing, preservation, packaging, engineering, and quality control technology of various food items
PSO 6	Able to contribute trained human resource with the sound knowledge and skills in total quality management and regulatory affairs to work in industrial, academics, food, and health sectors.
PSO 7	Develop into vibrant and internationally competitive food technology and nutraceutical professionals with entrepreneurial skills.
PSO 8	Generate the ability to design, conduct research for solving both health/ nutritional and food safety problems of the society; contributing to the development of scientific and technical knowledge in food technology and nutraceutical.

M.Sc. Nutraceuticals

This two-years master's program in Nutraceuticals trains the students for all facets of Nutraceutical industry. It teaches them to choose the raw material, analyze its suitability based on its chemical profile, and trace of contaminants.

Use of different techniques gives them a way to manufacture Nutraceutical supplements without losing their nutritional values. An extensive knowledge about food laws, patents, consumer behavior makes them thorough about the sustainability and growth of these Nutraceuticals in the international market. The comprehensive syllabus gives the students a chance to understand the biochemistry of what we eat, how it gets metabolized and affects the physiology, along with the dietary adjuvants under normal and disease conditions. Considering Man's age-old battle with Cancer, and the challenge of staying healthy with current lifestyle, it is a must one start looking into nutrition in a wiser way.

This program brings together the knowledge about food and nutrition from all disciplines of science. The practical training at different renowned industries also helps them to choose one aspect and excel in it. It is said, "What We Eat, We Become". Man has come a long way from being just an organism who feeds to survive, to the most dominant species on this planet. Man's ability to understand the link between different events, and then apply this information for a better outcome is one prominent reason behind this progress. The M.Sc. Nutraceutical program offers an opportunity to get a glimpse of traditional Ayurveda and then make sense of its mode of action using modern technology. Being able to bridge these gaps will one day enable man to drive away diseases and have a healthy lifestyle based only on FOOD.

Guru Nanak Khalsa College of Arts, Science and Commerce (Autonomous)

Program Structure

Semester-III

Course Code	Course Name	Teaching Hours		Credits Assigned		
		Theory	**Practical**	**Theory**	**Practical**	**Total**
GNKPSNTMJ1503	(Major) Paper-I	60	60	4	2	6
GNKPSNTMJ2503	(Major) Paper-II	60	60	4	2	6
GNKPSNTMJ1503	**(Major) Paper- III**	**30**	**-**	**2**	**-**	**2**
GNKPSNTEL1503	(Elective) Paper	45	30	3	1	4
GNKPSNTRP503	**Research project (RP)**	**--**	**--**	**--**	**--**	**4**
Total		**195**	**150**	**11**	**05**	**22**

Semester-IV

Course Code	Course Name	Teaching Hours		Credits Assigned		
		Theory	**Practical**	**Theory**	**Practical**	**Total**
GNKPSNTMJ1504	(Major) Paper-I	60	60	4	2	6
GNKPSNTMJ2504	(Major) Paper-II	60	60	4	2	6
GNKPSNTEL1504	(Elective) Paper	45	30	3	1	4
GNKPSNTRP504	Research project (RP)	--	--	--	--	6
Total		**165**	**150**	**11**	**05**	**22**

Examination Pattern for Second Year Post Graduate Degree for Science Faculty as per NEP 2020 Academic Year 2024-2025

Subject (SEM 3 & 4)	Credits	Internal Evaluation (Marks	Semester End Examination (Marks)	Total
Mandatory paper- I	04	25	75	100
Mandatory paper-II	04	25	75	100
Mandatory paper-III	02	15	35	50
Practical-I	02	-	50	50
Practical-II	02	-	50	50
Elective-Theory	03	15	60	75
Elective-Practical	01	-	25	25
Research Project (RP)	04 + 02 = 06	50	100	150
			Grand Total	**600**

Please note: The internal evaluation will be at the departmental level.

- **Combined passing with minimum 20% in Internal Component.**
- **Mandatory paper will consist of 4 units, 15 lectures each.**
- **Elective theory paper will consist of 3 units, 15 lectures each.**
- **Practical - I shall consist of a minimum of 5/6 practicals.**
- **Practical - II shall consist of a minimum of 5/6 practicals.**
- **Elective practical paper shall consist of a minimum of 4 practicals.**
- **Research Project 06 credits = (02 credits at the departmental level and 02 credits at External level).**

For 2 credits at the departmental level the students can be evaluated for the following: Overall performance throughout the projects, Paper writing (Manuscript) for the appropriate Journal, Finished Product with presentation/Licensing of Product.

Shiromani Gurudwara Prabandhak Committee's

Guru Nanak Khalsa College of Arts, Science and Commerce (Autonomous)

Matunga, Mumbai – 400 019, Maharashtra

Program: Master of Science

Syllabus

Course: MSc-II Nutraceuticals

Semester III

(Major paper- I)

Name of the paper: Food safety, Quality and process Control

(As per NEP guidelines-DSC model)

Guru Nanak Khalsa College of Arts, Science and Commerce (Autonomous)
Department of Nutraceuticals

Course: MSc-II Nutraceuticals
Semester-III
Course Title: Paper I: Food safety, Quality and process Control
Course Code: GNKPSNTMJ1503
Credits: 04
No of lectures (Hours): 60
Marks: 100 (75:25)

Course Objectives:

Sr. No.	Course objectives
The course aims at:	
1	To understand the concept of Classical System of medicine A, S, U
2	To understand the relationship between Good Manufacturing Practices and Quality Control with Hazard Analysis.
3	To understand the importance of National and International Food Regulations.
4	To study about chemoprevention and nutraceuticals as remedy
5	To study regulatory concept on herbal preparation and Drug & Cosmetic Act for product development

Course Outcomes (COs):

Sr. No.	On completing the course, the student will be able to:	POs addressed	PSOs addressed	Cognitive Levels addressed
CO 1	Understand and develop the method of manufacturing of a pharmaceutical / nutraceutical product.	1,2,5	1,3,8	C, U, Ap
CO 2	Evaluate & Compare National and International regulations of the Food and Nutraceutical Industry.	3,7	3,4,7	U, Ap
CO 3	Understand the importance of guidelines and certification and apply for product development	1,2,8	5,6	U, Ap
CO 4	Identify and analyse the critical quality control point in different stages of production of food and thereby designing the HACCP system.	2,5	5,8	An, C
CO 5	Explain & analyse the role, standard and law set by Indian and global regulatory authorities with respect to food quality control	3,4	3,4,5	Ap, An, E
CO 6	Understand, analyse, and formulate a chemo preventive nutraceutical product	3,6	1,7,8	U, An, Ap

Unit		Tit le	No. of lectures	CO Mapping
Unit 1	**1503.1**	**Medicinal Plants**: **Ethnomedicine in India**	**15**	
		Traditional Herb for Healthcare and Management of HumanDiseases, Addition to Classical System of medicine A, S, U.Basic concepts, type of drug formulations, Procurement ofherbal raw materials Method of preparation Preservation andstorage of herbal material, Standardization QC for medicinalplants, Regulatory aspects from Drugs & cosmetic act 1940 **Manufacturing Operations in Nutraceuticals:** Procurement of herbal raw material, preservation and storage of herbal raw material, Processing techniques for nutraceutical ingredients to be obtained from leaves, flowers, bark/stem, fruits, seeds and animal tissue.		**1**
Unit 2	**1503.2**	**Monitoring of Food Quality**	**15**	
		Introduction to Good Hygiene Practices, Good Manufacturing Practices, Good Laboratory Practices, Good Agriculture Practices, Good Retail Practices, Good TransportPractices, Good Distribution Practices, Traceability studies. HACCP: History, structure, pre-requisites, and principles, HACCP applications, HACCP Based SOPs. Risk Analysis: Introduction to risk analysis, Risk Management, assessment, and communication. (Analytical approaches to Quality Control: Working of LCMS/ HPLC/GCMS/ ICPMS. food testing in terms of validation protocols and concepts of standards, linearities, result interpretation, trouble shooting)		**2,4,5**
Unit 3	**1503.3**	**Auditing, Certifications and Accreditation.**	**15**	
		Audits: Food Safety and Quality Audit, Audit plan, Checklist, Auditor Competence, Audit exercise and post audit activities: Report writing, verification of corrective action and follow up. NABL Accreditation, overview andrequirement of ISO 17025, Requirements specific to foodtesting laboratories- physical, chemical, and biological parameters.		**2,3,4,5**
Unit 4	**1503.4**	**Chemoprevention and Nutraceuticals:**	**15**	
		Introduction to chemoprevention Food components and foodin chemoprevention. Mechanism of carcinogenesis. Phase I & II enzymes involved in chemo prevention. Role of nutraceuticals in chemoprevention: carotenoids, vitamin A and retinoids, selenium, polyphenols, Role of NFkβ, AP-1 Role of three functional categories from dietary components as chemopreventive agents: inhibitors of carcinogen exposure, anti-initiating/blocking agents, anti-promotional / progressive or suppressing agents		**6**

References:

- Timotht. S. Tracey and Richard L. Kingston, Herbal products.
- Prof. P. H. Kulkarni, Ayurveda ahar. (Food/ diet).
- Mridula and Sreelatha, Food science and processing and technology, Vol 2.
- R. B. Silverman (2004) The Organic Chemistry of Drug Design and Drug Action, 2nd Edition, Academic Press
- Investigating Biological System using Modeling: Strategies and software, Meryl E. Wastney 60. Dale G.Deutsch, Analytical Aspects of Drug Testing, John Wiley and Sons

Examination:

- **Internal Examination (25 Marks):** 20 Marks exam (Written Exam). And 5 Marks for Overall Conduct
- **End Semester theory examination (75 Marks):** Weightage of each unit will be proportional to the number of lecture hours as mentioned in the syllabus. Duration of exam: 2hours 30mins
- **Combined passing of 40% with minimum 20% in Internal Component.**

Practical Paper I
Course Title: Practical/ Paper I
Course Code:
GNKPSNTMJ1P503
Credits: 02
No of Practical (Hours): 60
Marks: 50

Course Objectives:

Sr. No.	Course objectives
The course aims at:	
1	To explain the functional role and safety issues of food contaminants, food adulteration,
2	To describe the hygiene and sanitation in food processing plant, equipment, storage, and handling
3	To explain the various quality attributes of food and emphasizing on microbial quality control in food and water quality
4	To identify and analyse the critical quality control point in different stages of production of food and thereby designing the HACCP system
5	To interpret the role, standard and law set by Indian and global regulatory authorities with respect to food quality control
6	To enable the students to understand opening and closing of Audit plans

Course Outcomes (COs):

Sr. No.	On completing the course, the student will be able to:	POs addressed	PSOs addressed	Cognitive Levels addressed
CO 1	Develop skills for presentation and writing scientific documents.	2,3,6	1,3	U, An, Ap
CO 2	Evaluate establishments based on the hygienic and consumer-acceptable qualities.	4,7	2,3	E, Ap
CO 3	Understand opening and closing of Audit plans (GMP, Quality audits) and make standard protocols based on the Government approved gazettes to prepare report on case studies on complaints and product recall.	1,5,7	3,4,5	U, An, Ap, C
CO 4	Identify and analyse the critical quality control point in different stages of production of food and thereby designing the HACCP system.	2,3,8	3,5,6	U, E, C Ap
CO 5	Evaluate the equipment, storage, handling, and hygiene and sanitation conditions in the food processing facility.	1,8	1,5	E, An
CO 6	Identify and compare the regulations established globally by India Vs other countries.	1,5,7	1,2	U, An, Ap
CO 7	Identify and analyse Nutraceutical industry in India and abroad based on R&D, Patents, Certifications and Collaboration.	5,7	1,4	R, U, An
CO 8	Understand and apply the analytical approach towards quality control.	1,2,3	1	R, U, Ap

List of Experiments:

1. To propose and approach a troubleshooting scenario (Minimum 2 case studies) Audit, Complaints, product recall.
2. Assignment / Case study of 10 pillars approach to working of QA.
3. SOP writing for given instrument.
4. HACCP from Manual (Case study / chart preparation and presentation)
5. Case study on Comparison of regulations in India V/s other Countries.
6. Nutraceutical industries in India and abroad (Involved in production and development of Nutraceuticals and functional foods based on Products, R&D, Patents, Certifications and Collaboration.
7. Validation study (analytical approach towards quality control)

References:

- Environmental regulation and food safety by Veena Jha.
- Jay, J.M. (1998). The HACCP System and Food Safety. In: Modern Food Microbiology. Food Science Texts Series. Springer, Boston, MA.Food safety by Laura K Egendorf, 2000
- International standards of food safety by Naomi Rees, David Watson, 2000
- Codex alimentarius by FAO & WHO, 2007
- Griepink B, Stoeppler M (1992) Quality assurance and validation of results

Shiromani Gurudwara Prabandhak Committee's

Guru Nanak Khalsa College of Arts, Science and Commerce (Autonomous)

Matunga, Mumbai – 400 019, Maharashtra

Program: Master of Science

Syllabus

Course: MSc-II Nutraceuticals

Semester III

(Major paper- II)

Name of the paper: Development & Marketing of Nutraceuticals and Functional Food

(As per NEP guidelines-DSC model)

Course: MSc-II Nutraceuticals
Semester-III
Paper II: Development & Marketing of Nutraceuticals and Functional Food
Course Title: Nutraceuticals
Course Code:
GNKPSNTMJ2503
Credits: 4
No of lectures (Hours): 60
Marks: 100 (75:25)

Course Objectives:

Sr. No.	Course objectives
The course aims at:	
1	To learn different techniques to enhance production and properties of nutraceutical products.
2	To work with the tools for capturing consumer voice & understanding consumer view as well as translating them into product design
3	To acquaint students with different formulation processing w.r.t. Nutraceuticals. To provide students with the basic practical skills required to prepare nutraceuticals in the form of powder, premix, capsule, tablets & syrup.
4	To develop the capacity of students to integrate knowledge and to analyse, evaluate and manage specific processing techniques used for various food products.

Course Outcomes (COs):

Sr. No.	On completing the course, the student will be able to:	POs addressed	PSOs addressed	Cognitive Levels addressed
CO 1	Understand & implement the role of media as an effective tool for communicating with the consumer.	1,7	7,8	U, Ap
CO 2	Design & apply the knowledge of marketing as well consumers survey to design a product	2,6	6,7,8	U, An, Ap
CO 3	Gain an overview of international laws and regulations pertaining to the safety of nutraceuticals, including regulations in the United States (DSHEA), Europe (EFSA), Japan (FOSHU and FNFC), Canada, and China.	1,6,5	4,6,7	R, Ap, E
CO4	Formulate a nutraceutical (in the form of powder, premix, capsule, tablets & syrup) and competent with respect to the principles of food chemistry and processing.	2,6,7	1,2,5	An, Ap, C
CO5	Understand, develop/ formulate a nutraceutical product using different applications of techniques.	1,2,4	1,2,4,5	U, C, E

Unit		Title	No. of lectures	CO Mapping
Unit 1	**2503.1**	**Application of techniques in development of Nutraceuticals and functional foods:**	**15**	

		Supercritical fluid extraction technology Basics and application for extraction of nutraceuticals from various sources, Application of pressurized low polarity water extraction Membranes separation technology Distillation and dehydration technologies Application of bioprocess technology for production and enhancement of properties of nutraceuticals. Green processes, cloud point, ultrasound, microwave assisted extraction		**5**
Unit 2	**2503.2**	**Manufacturing and processing of Nutraceutical Products:**	**15**	
		Introduction to Health supplement / Nutraceutical Processing, **Capsule processing (Hard& Soft gel):** Dispensing of raw material/ ingredients/ packing material, Sifting/ Sieving, Blending, Fill preparation and Gel Preparation, Suspension based fill preparation, Oil based Fill preparation Encapsulation. Preliminary analysis: Metal Detector, Empty capsule sorter/ Mini capsule sorter. Packaging & labelling. **Powder & Premix processing:** Dispensing of raw material/ ingredients/ packing material, sifting & blending, Preliminary analysis: Metal Detector/ magnetic grills, Packaging & labelling. **Liquid Processing:** Manufacturing of Syrup / Suspension and Oral liquids. Dispensing of raw material/ ingredients/ packing material, Sugar-dissolving, syrup manufacturing online filtration, vacuum transfer, homogenisation, mix of APIs, bottling and packaging, CIP. **Tablet Processing**: Dispensing of raw material/ ingredients/ packing material, sifting & blending, Compression, Coating, Packaging, and labelling.		**4 Books**
Unit 3	**2503.3**	**The role of marketing Communication in the introduction of functional foods to the Consumer:**	**15**	
		Introduction to marketing and consumer buying behaviour, food purchase habits of people. The basics of communication processes used to convey the message- written and oral Communication. Legislation and its impact on advertising and labelling of Nutraceuticals. How to communicate health claims for functional foods?		**1,2**
Unit 4	**2503.4**	**Consumers' views on nutraceuticals:**	**15**	
		Current Consumer understanding of Nutraceuticals. What are the barriers to acceptance by the Consumer? -Value added? Credibility? Ethical issues? Tools for capturing consumer voice & understanding consumer view as well as translating them into product design attribute - (CLT), (HUT), & (QFD) Traditional marketing v/s Digital marketing		**1,2**

References:

- Larry L. & Stephen W., Pharmaceutical Dosage Forms: Tablets; Vol 2, Rational Design and Formulation.
- Pharmacopeial Forum, Vol. 35(5), [Sept. – Oct. 2009].
- Harshal P. & Lalitha K., Pharmaceutical Product Development: A systematic approach.
- Karel Eckschlager, Klans Danzer, Information Theory in Analytical Chemistry, John Wiley, and Sons
- Principles of Protein structure, Schultz, G. E., and Schirmer, R. H. Dr. Shakti Sahi
- Emerging technologies; food process by Da-wen, 2005
- Jean Richard Neeser and J. Bruce German, Bioprocesses and biotechnology for functional foods and Nutraceuticals, Marcel and Dekkar Publication.
- REMINGTON - ESSENTIALS OF PHARMACEUTICS .
- LACHMAN - THEORY AND PRACTICE OF INDUSTRIAL PHARMACY

Examination:

- **Internal Examination (25 Marks):** 20 Marks exam (Written Exam). And 5 Marks for Overall Conduct
- **End Semester theory examination (75 Marks):** Weightage of each unit will be proportional to the number of lecture hours as mentioned in the syllabus. Duration of exam: 2hours 30mins
- **Combined passing of 40% with minimum 20% in Internal Component.**

Course: MSc Nutraceuticals Practical
Semester-III
Course Title: Practical Paper II
Course Code:
GNKPSNTMJ2P503
Credits: 02
No of Practical (Hours): 60
Marks: 75

Course Objectives:

Sr. No.	Course objectives
The course aims at:	
1	To familiarize students with laboratory procedures required for determining. the microbiological safety of foods.
2	To practically acquaint students with the new nutraceutical trend, including its types, mechanisms of action, and manufacturing processes for specific types of nutraceuticals
3	To provide students with basic practical skills required to prepare health supplements/ Nutraceutical product in the form of tablets, capsules, premix and syrups.

Course Outcomes (COs):

Sr. No.	On completing the course, the student will be able to:	POs addressed	PSOs addressed	Cognitive Levels addressed
CO 1	Analyse and estimate foods for their nutritional content	1,3	2,4,5	An, E
CO 3	Applying the fundamental practical abilities needed to produce and assess food.	2,8	2,3,4	Ap, E
CO 4	Illustrate aspects of toxicity, clinical testing, and the development of nutraceutical products.	3,7	5,6	R, U
CO 5	Recognise and evaluate essential concepts of consumer and business buying behaviour.	1,3,8	3,8	U, E
CO 6	Analyse and construct the document that communicates the results of a scientific test done on nutraceutical products.	2,3,6	3,4,5	An, C
CO 7	Developed competence with the ability to formulate Nutraceutical product in various forms.	2,4,6	4,6,8	C, An

List of Experiments:

1. Preparation of Functional food/ Nutraceutical product and proximate analysis.
2. To prepare a market survey report on the any one Nutraceutical functional
3. food product based on SEC Classification
4. Premix Preparation (for e.g. Milk based, herbal based)
5. Consumer Survey.
6. Extraction of Curcumin and its preparation of Certificate of Analysis.
7. Develop a new nutraceutical/Functional food in the form of Capsule/Syrup/Premix/Tablet (Using multiple scientific, FSSAI legal commercial and regulatory compliance).

   In view of above, students can be prepared for Practical or research.

   7a) To select the single nutraceutical ingredient or combination of multiple ingredients.

   7b) Study physical, Chemical and biological properties pf ingredients.

   7c) Study the incompatibility.

   7d) Select the suitable dosage form.

   7e) Check and select suitable EXCIPIENTS for the same.

References:

- Bornemann, Torsten, and Christian Homburg (2011), Psychological Distance and the Dual Role of Price Journal of Consumer Research, 38 (3), 490-504
- Coulter, Keith S., and Robin A. Coulter (2007), "Distortion of Price Discount Perceptions: The Right Digit Effect Journal of Consumer Research, 34 (2), 162–173.
- Ron Kenett & Silvia Salini, Modern Analysis of Customer Surveys - with Applications using R.

- The Handbook of Marketing Research: Uses, Misuses, and Future Advances by Grover, Rajiv, and Marco Vriens.
- Marketing Research: Text and Cases, 2nd Edition.

Shiromani Gurudwara Prabandhak Committee's

Guru Nanak Khalsa College of Arts, Science and Commerce (Autonomous)

Matunga, Mumbai – 400 019, Maharashtra

Program: Master of Science

Syllabus

Course: MSc-II Nutraceuticals

Semester III

(Major paper- Elective)

Name of the paper: Food Packaging, Labelling, Claims & Advertisements

(As per NEP guidelines-DSC model)

Course: MSc-II Nutraceuticals
Semester-III
Paper III Elective: Food Packaging, Labelling, Claims & Advertisements (Elective)
Course Title: Nutraceuticals
Course Code:
GNKPSNTEL1503
Credits: 03
No of lectures (Hours): 45
Marks: 60

Course Objectives:

Sr. No.	Course objectives
The course aims at:	
1	To train students regarding the general principles of packaging and shelf life.
2	To study the rigid containers used for food packaging
3	To develop an insight into problems associated with packaging of perishables and processed foods
4	Orientation to different packaging material with focus on special materials used for packaging
5	The course aims to develop the knowledge of students in the area of packaging of foods and the related technology used.
6	This course will enable students to appreciate the application of scientific principles in the packaging of foods
7	To understand the impact of advertising and labelling of Nutraceuticals.
8	To deal with presentation of product with Labelling, Claims and Advertisement FSSAI

Course Outcomes (COs):

Sr. No.	On completing the course, the student will be able to:	POs addressed	PSOs addressed	Cognitive Levels addressed
CO 1	Describe packaging of various food commodities	1,6	5,8	R, U

CO 2	Justify the role of food packaging as a method of food preservation	3,8	2,3,5	U, Ap
CO 3	Interpret the role of different packaging materials and their physico-chemical properties	3,5	3,5,8	An, E
CO 4	Develop the packaging materials suitable for newer processing techniques and its assessment for specific application.	2,7,8	2,4,6	U, An, Ap
CO 5	Explain and interpret various tests used in evaluating quality & safety of food packaging	1,3	2,4,5	C, Ap
CO 6	Design a label for food products based on food analysis and type of product	2,4,6	3,8	U, R, C

Unit		**Tit le**	**No. of lectures**	**CO Mapping**
Unit 1	**1503.1**	**Packaging strategies for Nutraceutical products- I**	**15**	
		Introduction to Packaging Uniqueness of Nutraceutical Packaging, Packaging Forms & their Significance Packagi ngMaterials (covering basic mfg. process, applications andsignificance) Paper, Paperboard and CFB Glass, Metals,Basic Polymer based material. Polymer based compositematerials, Ancillary. Mats, Package Material Testing Packaging Techniques- Canning, Vacuum packaging, Modified Atmospheric packaging, Controlled Atmospheric packaging, Aseptic packaging. Passive & Active packaging, Smart & intelligent Packaging, Shrink packaging, Biodegradable packaging, Compatibility & Migration Studies. Permeability.		**1,2,3**
Unit 2	**1503.2**	**Packaging strategies for nutraceutical products- II**	**15**	
		Water vapor Transmission Rate (WTR), Oxygen Transmission Rate (OTR), Deteriorative changes in foodstuffand packaging methods for prevention, shelf life of packagedfoodstuff, methods to extend shelf-life. Accelerated Shelf- Life Testing Packaging of Pharmaceutical, Packaging of Nutraceuticals Packaging Laws and regulatory compliance New Developments in Packaging.		**4,5**
Unit 3	**1503.3**	**Labelling, Claims and Advertisement**	**15**	
		Food Safety & Standards (Labelling & Display) Regulations2020. Food Safety and Standards (Advertising & Claims)Regulations 2018.		**6**

References:

- Chi-Tang Ho and Qun Yi Zheng, Quality Management of Nutraceuticals.
- Gordon L. Robertson, food Packaging Principles and practice.
- FSSAI, Manuals on food additives, Andree Voilley and Patrick Etievant, Flavours in Food, CRC Press.
- G.A.F Hendry, and J.D Houghton, natural food colorants. AVI Publications.
- Ralph Shapiro and Marcel Dekker, Nutrition Labelling Handbooks, 1995.
- James L. Summer,Dietary Supplement Labelling, compliance review 3rd edition.
- Aseptic processing and packaging of Particulate foods by Edward M. A .Willhoft.
- Food packaging and shelf life-A practical guide, Gordon L. Robertson, CRC Press/Taylor & Francis Group, 2009
- Packaging technologies of functional foods in Functional food ingredients and Nutraceuticals processing technologies John Shi (Ed.) CRC Taylor & Francis group, 2007.

Examination**:**

- **Internal Examination (25 Marks):** 20 Marks exam (Written exam). And 5 Marks for Overall Conduct
- **End Semester theory examination (75 Marks):** Weightage of each unit will be proportional to the number of lecture hours as mentioned in the syllabus. Duration of exam: 2hours 30mins
- **Combined passing of 40% with minimum 20% in Internal Component.**

Course: MSc Nutraceuticals Practical
Semester-III
Course Title: Elective Practical (Elective)
Course Code: GNKPSNTEL1P503
Credits: 01
No of Practical (Hours): 30
Marks: 25

Course Objectives:

Sr. No.	Course objectives
The course aims at:	
1	To train students regarding the general principles of packaging and shelf life.
2	To interpret the nutrition facts label.
3	To determine the percent daily value of foods
4	To analyse nutrient content claims on labels.
5	To understand the impact of advertising and labelling of Nutraceuticals

Course Outcomes (COs):

Sr. No.	On completing the course, the student will be able to:	POs addressed	PSOs addressed	Cognitive

				Levels addressed
CO 1	Asses the criteria for selecting a packaging material for a specific application.	3,7,8	1,2,5	E
CO 2	Establish the concepts of quality evaluation and testing of packaging materials using accelerated shelf-life study.	1,2	2,6	U, An
CO 3	Analyse the packaging strategies with respect to the nutraceutical product in compliance with the packaging regulations.	3,5	6,8	An, E
CO 4	Design the product presentation using labelling, claims and advertisement (FSSAI)	2,6,7	4,6,8	R, C
CO 5	Develop and apply food labelling knowledge and competency in students.	1,2,6	3,5,7	C, Ap

List of Experiments:

1. Identification of packaging materials used for the given product with case study.
2.Solving accelerated shelf-life packaging problems using case studies.
3. Design a Label for the given food product.
4. Solving problems based on WVTR, IMC, using Q10 formula.
5. Case study/ Assignment/ Report on Labelling and claims.

Group assignment: Cover all Nutra sectors under FSSAI viz Health supplements, FSDU, FSMP, Pre & Probiotics & Sport Drinks to define composition in accordance with regulation.

6. Case study/ Assignment/ Report on Packaging materials**. (Define packaging material composition as allowed by regulation & create a label artwork with all necessary details with atleast 3 permissible claims.)**

7. Visit a Food Processing? Packaging Industry

References:

- Modern food packaging, Indian Institute of Packaging, 1998
- Profile on food packaging/C.F.T.R.I and Indian Institute of packaging, 1995.
- Food packaging and preservation by M.Malthlouthi, 1994
- Food and Packaging Interactions by Risch.S.H. 1991
- Handbook of Food Packaging by F.A. Paine and H.Y. Paine 1983
- Food Packaging Technology (Vol.1 & 2) by G. Bureau and J.L.Multon, 1996

RESEARCH PROPOSAL: Credits: 04 (GNKPSNTRP503)

The project Proposal should involve proposed project work/ product development of 8 to 12 weeks period. Project must involve application of knowledge and skills as prescribed in the syllabus and data evaluationmust involve application of biostatistics.

Students must submit a project Proposal report covering the work undertaken. The project report (including mentors report) and observations / data generated will be presented and defendedbefore the panel of examiners.

Shiromani Gurudwara Prabandhak Committee's

Guru Nanak Khalsa College of Arts, Science and Commerce (Autonomous)

Matunga, Mumbai – 400 019, Maharashtra

Program: Master of Science

Syllabus

Course: MSc-II Nutraceuticals

Semester IV

(Major paper- I)

Name of the paper: Food Safety, Hygiene and Quality Management of Nutraceuticals

(As per NEP guidelines-DSC model)

Course: MSc-II Nutraceuticals
Semester-IV
Paper I: Food Safety, Hygiene and Quality Management of Nutraceuticals
Course Code: GNKPSNTMJ1504
Credits: 04
No of lectures (Hours): 60
Marks: 100 (75:25)

Course Objectives:

Sr. No.	Course objectives
The course aims at:	
1	To characterize different type of food hazards, physical, chemical and biological in the industryand food service establishments
2	To help become skilled in systems for food safety surveillance
3	To be aware of the regulatory and statutory bodies in India and the world
4	To ensure processed food meets global standards
5	To understand the concept of Quality Control and Quality Assurance
6	To understand and impart knowledge of importance of food hygiene, sanitation,and safety during food processing unit.
7	To learn the concept of basic toxicology studies with reference to Nutraceuticals; conduct clinical trials wrt regulatory compliance.

Course Outcomes (COs):

Sr. No.	On completing the course, the student will be able to:	POs addressed	PSOs addressed	Cognitive Levels addressed
CO 1	Thorough Knowledge of food hazards, physical, chemical and biological in the industry and food service establishments	2,3	1,2	R, U, Ap
CO 2	Awareness on regulatory and statutory bodies in India and the world	8	1	U, An, Ap
CO 3	Understand the importance of application of sanitation and hygiene in food industry	1,2	1,3	U, Ap,An
CO 4	Understand, identify, and apply good hygiene & sanitary practices and measure to improve industry quality standards	1,8	1,3,6	U, Ap, E
CO 5	Comprehend the importance of Good Manufacturing Practices (GMP) and current Good Manufacturing Practices (cGMP) in the context of nutraceuticals.	1,8	1	U, Ap
CO 6	Identify the requirements and factors involved in implementing QC in the production of food products and nutraceuticals.	2,8	1,4	U, Ap, E
CO 7	Apply the concept of Quality Control (QC) and its significance in the manufacturing of nutraceutical products	2	1,8	R, U, Ap

CO 8	Understand, analyse the principles of toxicology study in nutraceuticals. Develop a product by applying principle of clinical toxicology	1,3	1,2,4	R, U, Ap

Unit		Title	No. of lectures	CO Mapping
Unit 1	**1504.1**	**Quality Control and Quality Assurance**	**15**	
		Introduction, what is QC? Introduction to manufacturing of a pharmaceuticals / Nutraceutical product and role of various department Defining and understanding concept of QC and QA, 10 pillars approach to working of QA. Preparation and Implementation of QA, QC including conceptof TQM, Quality management principals and responsibilities of QA personal, GMP, cGMP and its applicability to nutraceuticals, validation, verification, and qualification Interrelationship between QA & QC Annual product quality review (APQR), Handling of complaints and product recall.		**6,7**
Unit 2	**1504.2**	**Global Food control system**	**15**	
		USFDA, EFSA Food Codex Alimentarius: Introduction, standards, codex of practice, guidelines and recommendations, applying codex. standards, Codex India, core functions of National Codex Contact Point, National Codex Committee of India. Introduction to Other International Standards setting Bodies: FAO, SQF: 1000, SQF: 2000., SQF 8.1, Food Standards Australia, New Zealand (FSANZ), New Zealand Food Safety Authority (NZFSA), BRC food and BRC IOP standards, Food standards Agency (UK), China and Japan.		**1,2**
Unit 3	**1504.3**	**Food Sanitation & Hygiene**	**15**	
		Sanitary practices and Good Manufacturing practices (GMPs) with reference to Codex, FSSAI, US FSMA, and FSSC 22000. Including - Personal Hygiene, Supplier Control, Sanitary Design of Equipment and Infrastructure, Procedures for Raw Material Reception, Storage and Finished Product Loading, Sanitation Program. (Sanitation Standard Operating Procedures (SSOPs)., Training programs, Infrastructure, Personal habits, Hygiene verification, Water in the food industry, Water sources, Water uses, Water quality, Treatments, Cleaning, and sanitation, cleaning agents, Sanitizing agents, Equipment and systems, Evaluation of sanitation efficacy- Pest Control, Pest Classification (insects, rodents and birds), Prevention and control.		**3,4**
Unit 4	**1504.4**	**Clinicals Trials of Nutraceuticals and health food**	**15**	

		Basic Toxicology, Acute Toxicity studies with reference to Nutraceuticals: Multiple exposure studies Basic Pharmacology & pharmaceutical chemistry **History of clinical research regulations in India:** Indian Laws, Experimental design of clinical trials, Clinical Trial Life cycle, Phases of clinical trials, Metabolism studies Clinical trials and Regulatory affairs Testing drugs in-vitro and in-vivo, Indian Legal framework for clinical trials for Nutraceuticals& medical research; Regulatory Bodies Sampling for microbiological assays, Laboratory set up for microbiological testing Microbiological testing for nutraceuticals. Emerging new models for testing the claims and Safety tests		**8**

References:

Quality Management in Nutraceuticals, Chi Tang Ho & Quan Yi Zheng (Ed.), American Chem. Soc., 2002

33. Quality Assurance for the Food Industry by J. Andres Vasconcellos CRC press

34. Regulations and Quality: Pharmaceutical Manufacturing Handbook, Shayne Cox God (Ed.), Wiley Interscience 2008.

• Chi-Tang Ho and Qun Yi Zheng, Quality management of nutraceuticals, American chemical society,200.

• Shayne Cox God (Ed.) Regulations and Quality: Pharmaceuticals Manufacturing Handbook, Wiley Inter science 2008.

• Food Safety and Standards Act.2006, Rules and Regulations 2011,8th edition.

• FSSAI, Manuals on Milk and Milk products.

• FSSAI, Manuals on oils and fats

• FSSAI, Manuals on fruits and vegetables

• FSSAI, Manuals on cereals and its products

• FSSAI, Manuals on food additives

• FSSAI, Manuals on mycotoxins

• FSSAI, Manuals on spices and condiments

• FSSAI, Manuals on metals

• FSSAI, Manuals on water analysis

• FSSAI, Manuals on general guidelines on sampling

• FSSAI, Manuals on methods of testing of alcoholic beverages.

• FSSAI, Manuals on beverages, sugar products and confectionary

• FSSAI, Manuals on meat and its products, fish and its products

• Mridula and Sreelata, Food science and processing and technology, Vol 2.

• Timotht. S. Tracey and Richard L. Kingston, Herbal products.

• Prof. P. H. Kulkarni, Ayurveda ahar. (Food/ diet).

• Nutraceutical and Functional Food Regulations in the United States and around the world, Second edition, Debasis Bagchi, Elsevier Press

Examination:

- **Internal Examination (25 Marks):** 20 Marks exam (Written Exam). And 5 Marks for Overall Conduct

- **End Semester theory examination (75 Marks):** Weightage of each unit will be proportional to the number of lecture hours as mentioned in the syllabus. Duration of exam: 2hours 30mins
- **Combined passing of 40% with minimum 20% in Internal Component.**

Course: MSc Nutraceuticals Practical
Semester-IV
Course Title: Practical/Paper I
Course Code: GNKPSNTMJ1P504
Credits: 02
No of Practical (Hours): 60
Marks: 75

Course Objectives:

Sr. No.	Course objectives
The course aims at:	
1	To enable students, evaluate food establishments for their consumer acceptability and sanitation attributes.
2	To describe the hygiene and sanitation in food processing plant, equipment, storage, and handling
3	To acquaint students with nutraceutical product development, clinical testing and toxicity aspects.

Course Outcomes (COs):

Sr. No.	On completing the course, the student will be able to:	POs addressed	PSOs addressed	Cognitive Levels addressed
CO 1	Understand the basics of microbiological analysis, which include culture media preparation, microorganism separation, preservation of culture media, and spoilage detection.	1,8	1,3,5	U, C
CO 2	Assess the effectiveness of disinfectants and sanitizers.	1,2	5	U, An
CO 3	Evaluate the BOD, COD, and microbiological content of industrial effluents for quality and safety.	1,2,5	1,5	R, E
CO 4	Assess the milk and water's microbiological safety in terms of the presence of coliforms and live organisms.	6,7,8	5,6	U, E
CO 5	Comprehend the effects of adulterants and toxic products in foods.	3,5	4,7	R, An, E

List of Experiments:

1. Efficacy of sanitizing agents at various dilutions – microbiological tests
2. Microbial analysis of water and milk-Total count, Viable count, MPN Coliform and MBRT.
3. Biochemical tests for characterization of bacteria (IMVIC).
4. Bacteriological analysis of foods, yeast, and mold count in food samples.
5. Testing of sanitizers, disinfectants for antimicrobial activity.

6. BOD & COD of water

References:

- Handbook of food toxicology by S. S. Deshpande
- Nutritional and safety aspects of food processing by Tannenbaum SR
- Microbiological safety of food by Hobbs BC, 1973,
- Chemical toxicology of food by Galli, C.L, 1978
- Principle method of toxicology by Andrew Wallace Hayes, 2001
- Food toxicology by William Helferich, Karl Winter, 2001
- The food safety information handbook by Cynthia A. Robert, 2009

Shiromani Gurudwara Prabandhak Committee's

Guru Nanak Khalsa College of Arts, Science and Commerce (Autonomous)

Matunga, Mumbai – 400 019, Maharashtra

Program: Master of Science

Syllabus

Course: MSc-II Nutraceuticals

Semester IV

(Major paper- II)

Name of the paper: Entrepreneurship skills for Nutraceuticals/Food Industry

(As per NEP guidelines-DSC model)

Course: MSc-II Nutraceuticals
Semester-IV
Course Title: Nutraceuticals
Paper II: Entrepreneurship skills for Nutraceuticals/Food Industry
Course Code: GNKPSNTMJ2504
Credits: 04
No of lectures (Hours): 60
Marks: 100 (75:25)

Course Objectives:

Sr. No.	Course objectives
The course aims at:	
1	To expose the student with fundamental knowledge of Entrepreneurship. It will also impart knowledge related to the applications of computation in food industries
2	The students will be able to understand Entrepreneurial spirit and resourcefulness, learn the concept and process of entrepreneurship - its contribution in and role in the growth and development of individual and the nation, strive for entrepreneurial quality, competency, and motivation, learn the process and skills of creation and management of entrepreneurial venture.

Course Outcomes (COs):

Sr. No.	On completing the course, the student will be able to:	POs addressed	PSOs addressed	Cognitive Levels addressed
CO 1	Recognize, report, examine and solve multiple technical and organizational problems of food sector applying sustainable solutions to real world problems and also develop technical knowledge to start up a food business	2,3,7	3,4	U, Ap
CO 2	Understand and compare different types of entrepreneurship styles and qualities	1,7	1,7	U, An, E
CO 3	Prepare business plan	2,4	4,6,7	C, Ap
CO 4	Gain knowledge of basic branding and marketing strategies, financial management for food industry ventures.	1,5,7	1,3,6	R, U, Ap
CO 5	Analyse the factors that influence entrepreneurship in the food industry, including market trends, consumer preferences, and regulatory environment	2,3	4,5,8	R, U, An
CO 6	Develop the necessary skills required for entrepreneurship in the food industry, such as creativity, leadership, problem-solving, and decision-making	2,3,6	5,7	U, Ap, E
CO 7	Assess the competencies, scope, and opportunities available for new entrepreneurs in the food industry	3,7,8	2, 8	Ap, An, E

Unit		Title	No. of lectures	CO Mapping
Unit 1	**2504.1**	**Introduction to Entrepreneurship**	**15**	
		(Concept, Functions, Need, Importance, Myths about Entrepreneurship, Pros and Cons of Entrepreneurship, Process of Entrepreneurship) Definition and meaning of entrepreneurship -Types, Classification, and trends of Entrepreneurial ventures in foods and nutrition -Qualities and skills of an entrepreneur -Resources required for a business -Project formulation, Government and non-government opportunities for funds and resources. – Franchising opportunities		**1,2**
Unit 2	**2504.2**	**Conceptual Framework**	**15**	
		Concepts need and process in entrepreneurship development. • Role of enterprise in national and globaleconomy • Types of enterprise – Merits and Demerits • Government policies and schemes for enterprise development • Institutional support in enterprise development and management. WTO: Functions and Agreements with Reference to TRIPS, TRIMS and GATS.		**1,2,7**
Unit 3	**2504.3**	**Financial Management**	**15**	
		Understanding the role of finance in Organizations Performance appraisal and assessment; Enterprise selection, market assessment, enterprise feasibility study, SWOT Analysis. Resource mobilisation – finance (sources of Funding) technology, raw material,site, and manpower. Budgeting and Financial Forecasting • Sources of Funding for Entrepreneurial Ventures, Costing and marketing management and quality control. Feedback, monitoring, and evaluation		**4,7**
Unit 4	**2504.4**	**Marketing Management**	**15**	
		Concepts of marketing -Channels of distribution -Market Research and Marketing strategies Understanding the Microenvironment (Strengths andWeaknesses vis-à-vis your company and its competition) and the Macro Environment (Opportunities and Threats – PEST Analysis) Exit strategy. Brief Introduction to Demand Forecasting Market segmentation, targeting and positioning (5P's (Product, Price, Place, Promotion,People) Brand development and promotion. **Activity: Creating a marketing plan for a startupventure**		**5,6**

References:

- Chhabra TN and Suria RK. 2001. Management Process and Perspectives. Kitab Mahal.
- Jhingan ML. 2005. International Economics. 5th Ed. Virnda Publ.
- Kotler P. 2000. Marketing Management. Prentice Hall.
- Reddy SS, Ram PR, Sastry TVN and Bhavani ID. 2004. Agricultural Economics. Oxford & IBH.
- Blank, S. G., & Dorf, B. (2012). The startup owner's manual: The step-by-step guide for building a great company. Pescadero, California: K&S Ranch.

Examination:

- **Internal Examination (25 Marks):** 20 Marks exam (Written Exam). And 5 Marks for Overall Conduct.
- **End Semester theory examination (75 Marks):** Weightage of each unit will be proportional to the number of lecture hours as mentioned in the syllabus. Duration of exam: 2hours 30mins
- **Combined passing of 40% with minimum 20% in Internal Component.**

Course: MSc Nutraceuticals Practical
Semester-IV
Course Title: Practical/Paper II
Course Code: GNKPSNTMJ2P504
Credits: 02
No of Practical (Hours): 60
Marks: 75

Course Objectives:

Sr. No.	Course objectives
The course aims at:	
1	To familiarize students with the practical development of a business model.
2	To make students competent in marketing a business idea.
3	To identify scope for entrepreneurship in nutraceutical and utilize the schemes promoted through various governmental and non-governmental agencies.

Course Outcomes (COs):

Sr. No.	On completing the course, the student will be able to:	POs addressed	PSOs addressed	Cognitive Levels addressed
CO 1	Applying a strategic plan to construct a new business.	2,4,6	7,8	C, Ap
CO 2	Develop the ability to market, appraise, and advertise the business.	5,7,8	6,7	C, U
CO 3	Develop competencies (leadership, technical and managerial) needed to recognise and explore a nutraceutical-based business opportunity, support.	2,4,7	3,4,6	C, U, Ap1,3,4

	development of self and the team and articulate skill development through reflective practices.			
CO 4	Carry out research; produce and present a business plan to venture capitalists and funding agencies; follow ethical practices in a proposed business idea.	1,3,4	3,4,6	C, Ap, An
CO 5	Develop entrepreneurial skills to execute a start-up in food business.	5,7,8	7,8	C, Ap, E

List of Experiments:

1. The contribution of notable entrepreneurs in the field of Food technology & Nutraceuticals/Functional Food. (Case studies)
2. Activities could include researching different funding sources such as bootstrapping, loans, venture capital, angel investors, and crowdfunding. Students could analyze casestudies of successful startups that utilized various funding options.
3. Activity: Drafting a business plan for a hypothetical venture
4. Activity: Case study analysis on legal and regulatory challenges
5. Activity: Creating a marketing plan & Financial modeling exercise for a startup venture
6. Visit a start Up

References:

- Innovation and Entrepreneurship (1985) by Peter F. Drucker
- Barney, J. B., & Hesterly, W. S. (2006). Strategic management and competitive advantage: Concepts and cases. Upper Saddle River, NJ: Pearson/Prentice Hall.\
- Baron, R. A., Shane, S. A., & Reuber, A. R. (2008). Entrepreneurship : a process perspective (1st Canadian ed.). Toronto, ON: Thomson/Nelson.
- Blackburn, R. (2011). Foreword. In L. P. Dana (Ed.), World Encyclopedia of Entrepreneurship. Cheltenham, UK: Edward Elgar Publishing Limited.

Shiromani Gurudwara Prabandhak Committee's

Guru Nanak Khalsa College of Arts, Science and Commerce (Autonomous)

Matunga, Mumbai – 400 019, Maharashtra

Program: Master of Science

Syllabus

Course: MSc-II Nutraceuticals

Semester IV

(Elective)

Name of the paper: Intellectual Property Rights

(As per NEP guidelines-DSC model)

Course: MSc-II Nutraceuticals
Semester-IV
Paper III: Intellectual Property Rights (Elective)
Course Code:**GNKPSNTEL1504**
Course Title:
Credits: 03
No of lectures (Hours): 45
Marks: 60 (75:25)

Course Objectives:

Sr. No.	Course objectives
The course aims at:	
1	Understanding of laws and legal provisions for food in India
2	Understanding of FSSAI standards and amendments.
3	Understanding of quality parameters for food safety.
4	To give an idea about IPR, registration and its enforcement

Course Outcomes (COs):

Sr. No.	On completing the course, the student will be able to:	POs addressed	PSOs addressed	Cognitive Levels addressed
CO 1	Understand regulatory based knowledge.	1,7,8	5,6	R, U
CO 2	Analyse and formulate a product based on regulations.	1,2,3	6	U, Ap, An
CO 3	Analyse and apply IPR and its value in economy	7,8	5,6	U, Ap, E
CO 4	Develop skills in conducting IPR searches, including novelty/patentability searches using patent databases.	1,2,3	6	C, U, Ap
CO 5	Apply intellectual property law principles to Nutraceutical research and product generation.	1,3,4	3,5	U, Ap
CO 6	Understand the legal and practical steps needed to ensure that IPR remains valid and enforceable; demonstrate the capacity to identify, apply and assess ownership rights and marketing protection to Nutraceutical-based products.	1,5,7,8	4,5,6	U, Ap, An, E
CO 7	Analyse ethical and professional issues arising in Nutraceutical research and development about IPR.	1,4,5	4,5,6	U, An

Unit		Tit le	No. of lectures	CO Mapping
Unit 1	**1504.1**	**Introduction to IPR**	**15**	
		Introduction: Concept of IPR - Understanding the meaningof IPR & its significance in knowledge-based economy Types of IPR - Patents, Trademarks & Service Marks, Design Registration, Trade Secrets, Geographical indications, Protection of New Plant Varieties, Copyright. Global Harmonization - Impact of IPR on global trade andthe need for harmonization, WTO, and its role in a global harmonization, AGREEMENTS AND LEGISLATIONS: TRIPS and introduction to the articles in TRIPS document. International Agreements related to IPR & Patents -Paris Convention,PCT, UPOV – Important examples of IPR		**1,2,3**
Unit 2	**1504.2**	**REGISTRATION OF IPRs**	**15**	
		Meaning and practical aspects of registration of Copy Rights,Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registrationin India and Abroad. Patents Introduction, Key definitions, Filing of Patent Application, Publication of application, Provisional and complete specification, Divisional application and patent of addition, Convention application, international application and national phase application, Examination and grant, Post-grant opposition, Post-grant procedures, Appeals, Revocation of patent, Compulsory licensing, Use of patent for purposes of Government, Patent agents, Offences and penalties		**4,6**
Unit 3	**1504.3**	**ENFORCEMENT OF IPRs**	**15**	
		Concepts of piracy, reverse engineering and knowledge worker Benefits of creating and/or owningPatents and other IPR. IP clearance – Precautions before launching of product anywhere in the world. Basics of Patents Searching, Understanding of Patent databases, Concepts of Freedom to operate. (FTO) search and analysis for patents, Exclusivity and SPC status check. Other IPR checks like trademarks, copyrights (for printed data on leaflets, packages etc. PuttingIPR related disclaimers while advertising product list or selling products Trademarks: Trademark Act, Overview of application andgrant process		**5,6,7**

References:

- Erbisch FH and Maredia K. 1998. Intellectual Property Rights in Agricultural Biotechnology. CABI, Wallingford.
- Ganguli, Prabudha. 2001. Intellectual Property Rights: Unleashing Knowledge Economy. McGraw-Hill, New Delhi.

- India, Ministry of Agriculture. 2004. State of Indian Farmer. Vol. 5. Technology Generation and IPR Issues. Academic Foundation, New Delhi.
- Intellectual Property Rights: Key to New Wealth Generation.2001. NRDC and Aesthetic Technologies, New Delhi.
- Rothschild, Max & Newman, Scott (Ed.). 2003. Intellectual Property Rights in Animal Breeding and Genetics. CABI, Wallingford.
- Saha R. (Ed.). 2006. Intellectual Property Rights in NAM and Other Developing Countries: A Compendium on Law and Policies. Daya, Delhi.
- The Indian Acts - Patents Act, 1970 & Amendments; Design Act, 2000; Trademarks Act, 1999; The Copyright Act, 1957 & amendments; Layout Design Act, 2000; PPV & FR Act 2001, and Rules 2003; National Biological Diversity Act, 2003.

Examination:

- **Internal Examination (25 Marks):** 20 Marks exam (Written Exam). And 5 Marks for Overall Conduct
- **End Semester theory examination (75 Marks):** Weightage of each unit will be proportional to the number of lecture hours as mentioned in the syllabus. Duration of exam: 2hours 30mins
- **Combined passing of 40% with minimum 20% in Internal Component.**

Course: MSc Nutraceuticals Practical
Semester-IV
Course Title: Elective Practical
Course Code: GNKPSNTEL1P504
Credits: 01
No of Practical (Hours): 30
Marks: 25

Course Objectives:

Sr. No.	Course objectives
The course aims at:	
1	To ideate and apply IPR skills for innovations based on Nutraceutical
2	To equip students with information on intellectual property rights (IPR), associated legal frameworks, their importance, and how to use IPR to generate income and value in a knowledge-based economy
3	To analyze ethical and professional issues arising in nutraceutical research and development about IPR.
4	The student will gain the ability to understand Intellectual property rights and their value in economy

Course Outcomes (COs):

Sr. No.	On completing the course, the student will be able to:	POs addressed	PSOs addressed	Cognitive Levels addressed
CO 1	Distinguish the legal and practical measures required to guarantee that intellectual property rights (IPRs) are upheld; exhibit the ability to recognize, utilize, and evaluate ownership rights and marketing. protection for goods based on biotechnology.	1,2,3	3,5	R, Ap, An
CO 2	Apply intellectual property law principles to nutraceutical research and development.	2,5	6,8	Ap
CO 3	Analyse ethical and professional issues arising in nutraceutical research and development about IPR.	4,7,8	6,7,8	An, C
CO 4	Understand Product Development and International Trade for the food sector	2,3,7	1,8	R, Ap

List of Experiments:

1. Patent evaluation and assessment.
2. Patent database search and reporting.
3. Hands-on Exercise of Patent Search /Patent Specification / Claims writing

RESEARCH PROJECT: Credits: 06 (GNKPSNTRP504): 150M

The project should involve project work/ product development of 8 to 12 weeks period. Project must involve application of knowledge and skills as prescribed in the syllabus and data evaluation must involve application of biostatistics.

Students must submit a project report covering the work undertaken. The project report (including mentors report) and observations / data generated will be presented and defended before the panel of examiners.

DISSERTATION RESEARCH PROJECT

COURSE OBJECTIVES:

Sr. No.	Course Objectives
The course aims at:	
1	To enable students, explore, independently, topics of research importance related to the food industry
2	To empower students to design a research study based on the principles of scientific research
3	To train students in interpreting, analysing, and reporting collated data related to a topic of study
4	To endow students with skills required for scientific writing and publication

COURSE OUTCOMES

Sr. No.	On completing the course, the student will be able to:	POs addressed	PSOs addressed	Cognitive Levels addressed
CO 1	Identify a research query based on the knowledge acquired across the earlier 3 semesters and relevant scientific literature.	3,6	1,4,8	An, R
CO 2	Apply ethical principles of scientific research in collecting relevant data, analyse and represent it appropriately.	3,4,5	1,8	Ap, An
CO 3	Critically evaluate the data obtained and compare it with existing scientific literature for its validity and applicability	2,3,5	1	U, R, An
CO 4	Design the research study, plan and execute the research project and validate the methods for reliability and reproducibility.	6,8	1,8	C, Ap, An
CO 5	Proficiently document the research work based on the principles of scientific writing.	6,7,8	1,5	C, An, E

Project Evaluation:

The project shall be for at least 4 to 5 month which can be accommodate in last whole semester for project only. Student can even opt for outhouse project work.

Guide mark: 50 Mark

Examiner: 50 Mark

External Examiner: 50 Mark

Internal and external will take presentation exam of student at the end of semester. The average mark shall be recommended from internal and external examiner.

If research paper publish on the student work in given duration then you can keep choice to give +25 marks.

This can increase the publication from department without external funding.