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**FIRST SEMESTER 2022-23 COURSE  
HANDOUT**

**Date: 29.08.2022**

In addition to part I (General Handout for all courses appended to the Time table) this portion gives further specific details regarding the course.

**Course No** : BIO F315  
**Course Title** : APPLIED NUTRITION AND NUTRACEUTICALS  
**Instructor-in-Charge** : Dr. RUCHI JAIN DEY (ruchij80@hyderabad.bits-pilani.ac.in)

**Instructor(s)** :  
**Tutorial/Practical Instructors:**

**1. Course Description:**

This course will provide a broad framework for understanding the significance of food and nutrition to human health and well-being. Beginning with basic concepts in nutritional biochemistry & microbiology, this course will expand into applied nutrition themes — malnutrition – under-nutrition versus over-nutrition, nutrigenomics, clinical nutrition, functional foods & nutraceuticals, food safety and security. The course will also include themes such as industrial development of functional and genotype-specific foods and beverages (example, infant-food formulations), fortified foods, phytochemicals, nutritional databases & personalized nutritional plan, using suitable case-studies.

**2. Scope and Objective of the Course:**

This course is designed to provide insight in the basic concepts as well recent advances in the area of nutrition related to human health. At the end of the course, students will be able to: a. Inter-relate concepts learned in Biology/Chemistry/Pharmacy courses and will appreciate their integration in human nutrition and in disease therapy. They can understand how some nutrients ‘promote’ health or ‘affect’ health (nutritional toxicology), through their molecular/gene interactions. Appreciate mechanism of action of functional foods, nutraceuticals and dietary supplements. Explore how certain diseases (cardiovascular diseases, diabetes, cancers, obesity, inborn errors of metabolism) can be managed by nutritional approach. Appreciate the growing strategic collaborations/alliances between food and pharma companies — immense potential in research and product development/innovations in food biotechnology and nutraceuticals. Realize the immense role that India can play in the growing nutraceutical/functional foods industry, given the knowledge that is available in traditional systems of medicine.

**3. Text Books:**

1. Textbook of Biochemistry & Human Biology, Third Edition, 2002 (Ed: GP Talwar & LM Srivastava), Prentice Hall India.
2. Harper’s Illustrated Biochemistry 31st Edition, 2018, McGraw Hill [Authors: Robert Murray, et al.]
3. Introduction to Human Nutrition, Second Edition, 2009 [ Edited on behalf of The Nutrition Society by Michael J Gibney, Susan A Lanham-New, Aedin Cassidy, Hester H Vorster], Wiley Blackwell Publication.

**4. Reference Books:**

1. Clinical Nutrition. 2nd edition, Marinos Elia, Olle Ljungqvist, Rebecca J Stratton and Susan A Lanham-



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New, 2013.

2. Relevant review / research articles / web resources will be discussed in class to enhance coverage of select topics.



## 5. Course Plan:

Module No.	Lecture Session	Reference	Learning outcomes
<b>I</b>	<b>L# 1-3: Introduction – Broad spectrum view of applied nutrition</b>	Chap 33-35, 37-39, TB1; Chap 43, TB2, Chap 3, TB3; Chap 1 RB-1.	<ul style="list-style-type: none"> <li>Definitions – Food, nutrient, balanced diet, food pyramid, malnutrition (under/over nutrition).</li> <li>Food, Nutrients and Energy Metabolism.</li> <li>Chirality of biomolecules – pharma applications.</li> <li>Age-dependent nutritional needs (infant, growing children, women, pregnant, old)</li> <li>Special nutritional needs (maternal nutrition, high altitude nutrition).</li> <li>Sports Nutrition</li> <li><b>Applications</b> – Food biotechnology, Nutraceuticals, Clinical</li> <li>Nutrition, Nutritional deficiencies/toxicity and Public Health.</li> </ul>
<b>II</b>	<b>L# 4-7: Food Microbiology</b>	Chap 14, TB3	<ul style="list-style-type: none"> <li>Microorganisms in food spoilage</li> <li>Food borne diseases</li> <li>Food fermentation</li> <li>Food safety.</li> <li><b>Application:</b> Food industry, safety and shelf life of farm, dairy, ready to eat packaged food items.</li> </ul>
<b>III</b>	<b>L# 8-13: Nutritional Biochemistry in Health and Diseases</b>	Chap 40-45, TB1; Chap 13, 16, 17, 44, 45, 58 (Biochemical Case Histories) TB2	<ul style="list-style-type: none"> <li>Macromolecules – Integration of topics related to carbohydrate/lipid and energy metabolism, protein and amino acids</li> <li>Enzyme &amp; Hormonal Regulation of metabolism</li> <li>Micronutrients - Deficiency and Toxicity conditions.</li> <li>Antioxidants: Oxidative stress and the cell and molecular roles of dietary antioxidants and pro-oxidants with implications in certain diseases.</li> <li><b>Application:</b> <ul style="list-style-type: none"> <li>✓ Role of free radical production, lipid peroxidation, protein oxidation, cellular and DNA damage in disease and health (CVDs, cancer, diabetes).</li> <li>✓ Dietary supplements - vitamins E and C, carotenoids, polyphenols, selenium, iron, zinc and copper</li> </ul> </li> </ul>



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IV	L# 14-19: Clinical Nutrition	Chap 32, 39 TB1	<ul style="list-style-type: none"> <li>• Role of nutrition in the prevention and management of several major chronic clinical conditions and Metabolic Syndrome.</li> <li>• <b>Application: Food as medicine- preventing and treating diseases</b> <ul style="list-style-type: none"> <li>✓ Obesity, Liver diseases,</li> <li>✓ Cancers, Cardiovascular diseases (CVDs), Diabetes, Renal Diseases</li> <li>✓ Nutritional Management of <i>Inborn errors of metabolism</i>.</li> </ul> </li> </ul>
V	L# 20-23: Nutritional toxicology	Chap 14, TB3	<ul style="list-style-type: none"> <li>• Allergenic and toxic constituents in diet</li> <li>• Food supplement toxicity</li> <li>• Food additives toxicity</li> <li>• Environmental contaminants, pesticides and other chemical residues -mutagenesis, carcinogenesis; including case studies /regulations</li> <li>• <b>Application:</b> Role of environment pollutants in nutrition and health</li> </ul>
VI	L# 24-26: Nutrigenomics and nutrition databases	Chap 4, TB3	<ul style="list-style-type: none"> <li>• Understanding nutrient-gene interactions, with case studies in cancers and cardiovascular diseases.</li> <li>• Development of nutrition databases / personalized nutrition plans; case studies.</li> <li>• <b>Application:</b> Applying new age genomics, transcriptomics, metabolomics and proteomics to understand complex role of nutrition in health and diseases.</li> </ul>
VII	L# 27-29: Nutraceuticals	Chap 37 TB1	<ul style="list-style-type: none"> <li>• Phytochemicals</li> <li>• functional foods</li> <li>• Plant and animal sources -Milk and Dairy products</li> <li>• Prebiotics and Probiotics.</li> <li>• <b>Application:</b> Nutraceutical based food industry, safety and regulations.</li> </ul>
VIII	L# 30: Course Summary	Chap 7, 12, 14, 15 TB3.	<b>Pointers for R&amp;D and industry applications, and public health policy, food security.</b>

## 6. Evaluation Scheme:

EC No.	Evaluation Component	Duration	Weightage (%)	Date, Time & Venue	Nature Component of
1.	Mid-semester Exam	90 min	<b>30% [60M]</b>	31/10 11.00 - 12.30PM	10% CB (20M) + 20% OB (40M)
2.	Class Presentation/ Announced Quizzes/Mini	Variable	<b>30% [60M]</b> 1 Class Presentation [15M, OB]	To be announced	10% CB (20M) 20 % OB (40M)



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	project/Class attendance and participation		Mini Project [20M, OB] 2 Quizzes [20M, CB] Class Attendance/Participation [5M]		
4.	Comprehensive Exam	3 hours	<b>40% [80M]</b>	17/12 AN	20% OB (40M) + 20% CB (40M)
# Weightage can be calculated based on total Marks: 200M.					

## Notes:

Students would be assessed on the basis of their regularity in the class, interactions during the lecture and laboratory sessions. Besides the regular assessment, pre-announced quizzes, records and discussion during the laboratory sessions will also be used to observe sincerity.

**7. Chamber Consultation Hour:** To be decided in consultation with students. (1 hour/week)

**8. Notices:** Notices will be displayed on CMS and via emails.

**9. Make-up Policy:** Make up for mid-semester and end-semester examination may be granted only to genuine cases such as hospitalization/medical emergencies. No make up for quiz/projects/regular class assessments under any circumstances.

## 10. Note (if any):

- Regular attendance and active participation in class will be monitored and recorded. Absenting from classes without prior permission, lack of punctuality in reporting to class, non-submission of evaluative reports/assignments as per the scheduled time-line, can all impact Grades during evaluation.
- Mini-projects will be allotted only to the students present in the class during the project topic allotment and discussion session. In-absentia students will not be considered for mini-project seminar/report evaluations.
- Academic Honesty and Integrity Policy:**  
Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

**Instructor-in-charge**      **Ruchi Jain Dey**  
**Course No.**                      **BIO F315**